Integrated Urban Regeneration and Water Transport System (IURWTS) in Kochi

Detailed Project Report on Muttar Sewerage Project for Chilavanoor and Edappally canals North Catchment

Project # : WT/2024
Revision # : R2
Date : 26-10-2022

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EXECUTIVE SUMMARY OF DPR FOR MUTTAR SEWERAGE SYSTEM & STP

The Govt of Kerala's Coastal Shipping and Inland Navigation Department [CSIND] conceived the "Integrated Urban Regeneration and Water Transport System" [IURWTS] during 2018 to preserve the valuable river ecosystem blessed by Mother Nature. The project objectives comprise two distinct components for holistic regeneration as itemized below

- Restoration and Rejuvenation of five major dilapidated canals and canal catchment.
- Urban Regeneration of the canals for flood mitigation and restoring the canals for navigation to enhance last-mile connectivity, and providing pollution-free rivers

The IURWTS project covers **32.13 Sq.km** in **74 wards** of the Kochi Corporation and 11.81 sq.km area in the three contiguous Municipalities of Kalamassery, Thrikakkara and Thripunithura. The targeted Urban Regeneration Component (URC) entails strengthening of the sanitation system in the IURWTS project area comprising Kochi Corporation and three other Municipalities. GoK's CSIND Department accorded administrative sanction for INR 1528.27 crores vide G.O (Ms) no 1/2021/CSIND dated 12 Feb 2021 for the IURWTS Project which caters outlay of INR 393.13 crores for Urban Regeneration Components [URC]. The objective of URC is to provide sewerage system to regenerate the five canals in IURWTS catchment area and ensure sewer connectivity to cent percent individual households confining only isolated houses to on-site treatment options. The SPV formed with Kochi Metro Rail Limited [KMRL] as the Nodal Agency will take up the project implementation funded by Kerala Infrastructure Finance and Investment Board [KIIFB]. The laying of sewer network in the project area and construction of 4 Nos of adequate capacity Sewage Treatment Plants [STP] will ensure holistic sewage interception, collection, conveyance, transport and treatment.

The existing sewer network facility available in Kochi area is only for **5% of the households** and the remaining area is served by soak pits and septic tanks. The septic tank systems mostly malfunction due to inept design or poor maintenance and excess flow discharged into the storm water drains leading to the main canals. The high ground water table conditions can cause hydraulic failures contaminating groundwater, nearby water source and canals/ rivers. Accordingly, the Sewerage Project DPRs have been formulated in four modules by KMRL by engaging Consultancy Services of Antea Group. The project vetting is entrusted to **C**entre for **U**rbanization **B**uildings and **E**nvironment (CUBE), an unit IIT M Unit and the Centre of Excellence (CoE) of GoTN. IURWTS project catchment area of about 80% lies within Kochi corporation limits and the remaining 20% in three municipalities [Kalamassery, Thrikkakkara and Thripunithura Municipalities]. The total project area of 42.14 sq.km is comprised in four Urban Local Bodies [ULB] as itemized below:

i. Bulk of 31.07 Sq.km forms part of Kochi Corporation.
ii. Remaining area of 11.07 sq.km on the eastern side falling in three municipalities.

The composition of the total 74 wards catered the under IURTWS project area in the four constituent ULBs [Kochi Corporation & 3 other municipalities] are:

i. 54 wards in Kochi Corporation,
ii. 19 wards each in Kalamassery and Thrikkakkara municipality and
iii. Parts of three wards in Thripunithura municipality.

The IURWTS Catchment Area comprises six zones covering the tributary areas in northern and southern parts of three canals [Edapally, Chilavanoor & Thevara-Perandoor]. The intervening ridge along NH544 in the west-east direction is the boundary and dividing line of the catchments. The Detailed Project Reports for the four-sewer network system and STPs prepared and submitted to KMRL was with 10 MLD STP each at Vennala and Elamkulam, 7

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MLD STP at Muttar and 4 MLD STP at Perandoor, adopting base year as 2021. KMRL, **before final submission to KIIFB,** transmitted the DPRs prepared by consultant for design vetting by CUBE-IIT M Research Park.

CUBE's vetting observation catalysed revision of Population projection from **base year 2021 to 2025,** as per the guidelines of "CPHEEO Manual on Sewerage & Treatment System, 2013". KMRL by joint discussion with KWA decided to adopt population forecast under KWA's Sewerage Master Plan for Kochi city and its Urban Agglomeration. Pursuantly, the population projections done under the Master Plan of KWA is adopted in this project. The population projection and sewer load calculations got revised by KMRL as per KWA's Sewerage Master Plan with Ultimate design horizon as 2055 [Base Year: 2025 and Intermediate stage: 2040]. The sewage loads of the left-out area of Kochi Corporation adjoining IURWTS areas are also calculated as per KWA Master Plan and the ultimate capacity of STPs computed. As such, the IUWRTS project scope revised by increasing the design Capacity of STPs by harmonising the tributary areas of KWA and its sewage load by synergising the flows into the proposed 4 STPs [Vennala, Muttar, Elamkulam and Perandoor]. Hence, the original DPRs underwent a paradigm shift in sewer grid design and STP capacities from 31 MLD to 77 MLD including contiguous left out areas of KWA with inherent need for revisions in the DPR as shown below:

Table 1: Sewerage Zones/systems, Catchment Area and STP Capacities

S. No	IURWTS Project Area	Sewer grid Length-km (IUWRTS)	Area sq.km	No. of Blocks		No. of SPS		Ultimate STP capacity in MLD	
				Old	New	Old	New	DPR–Base Year 2021	Modified-Base Year 2025
1	**Vennala system – Zone 1** (Covering part of Kochi Corporation, part of Kalamassery/ Thrikkakkara / Thripunithura Municipalities)	185 km	15.14	27	9	27	5	10	24
2	**Muttar system- Zone 2 & 3** (Covering part of Kochi Corporation, part of Kalamassery Municipality)	104 km	4.00+ 4.92 =8.92	21	5	21	2	7	16.5
3	**Perandoor system- Zone 5** including Vaduthala Zone (Covering part of Kochi Corporation)	67 km	5.35	8	2	8	1	4	19
4	**Elamkulam system- Zone 4 & 6** (Covering part of Kochi Corporation)	138 km	8.67+ 4.06 =12.73	24	9	24	9	10	17.5
	Total	**494 km**	**42.14**	**80**	**25**	**80**	**17**	**31 MLD**	**77 MLD**

The vacant land nearby the existing Land Acquisition proposal is available with sufficient area for the construction of STP of increased capacity. The revised Detailed Project report prepared by KMRL is already vetted and clearance accorded by CUBE for Perandoor Sewerage Project comprising 67 km Collection system [**Est cost: Rs137 Cr**] and 19 MLD capacity STP [**Estimate cost: Rs 79.01 Cr**]. There is no existing sewerage scheme in Zone 2 or Zone 3 of IURWTS Project and hence a new sewerage scheme became necessary. Accordingly, DPR is prepared for the Muttar Sewerage Project covering Zone 2 [Edappally north catchment],

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Zone 3 [Chilavanoor north catchment]. The design population and average sewage load adopted in the sewer grid design is tabulated below:

Table 2: Area Coverage and population served for Muttar STP (IURWTS)

S. No.	Corporation / Municipalities	Covered Area Sq.km	Population 2011	Population 2025	Population 2040	Population 2055	House hold Nos
CHILAVANOOR CATCHMENT							
1	Kochi Corporation	4.92	30,123	32,698	35,702	38,981	6,540
EDAPPALLY CATCHMENT							
1	Kochi Corporation	1.47	17,136	18,600	20,309	22,174	3,720
2	Kalamassery	2.53	11,157	12,607	14,369	16,379	2,521
	TOTAL	**8.92**	**58,416**	**63,905**	**70,380**	**77,534**	**12,781**

The sewer network for Chilavanoor canal north catchment starts from Kaloor JLN stadium and ends at Puthukkalavattom with slope towards South - North. The sewer network caters to 7 Divisions [33,34,35,36,39,70,71,72] of Kochi Corporation. The density of population as per 2011 is about 6775 persons/sq.km.

The sewer network for Edappally north catchment starts from NH544 near Lulu mall and ends at Muttar with natural ground slope in the South-North direction. The left bank of Edappally north catchment includes a portion of Kochi corporation and East bank of the canal includes a portion of Kalamassery Municipality. The sewer network covers 11 Divisions [33, 34, 35, 36, 37, 38, 39, 40, 70, 71, 72] of Kochi Corporation and 8 wards [40,39,38,41,36,34,35,37] of Kalamassery Municipality. The tributary area is conveniently divided to gain maximum gravity flow in the sewer grid and minimum lift/ pumping within the collection system of Perandoor north catchment. The Map showing Project area, alignment of Trunk mains / Pumping Main and STP locale of Muttar Zone 2 & 3 is appended in **Fig 1 & 3**.

The estimated sewage load [Ultimate:2055] for the IURWTS catchment under Muttar System is 14.03 MLD [2.1 MLD for KWA-left out areas] as tabulated below:

Table 3: Sewage load of Muttar STP

S. No	STP Zone	Projected Sewage Generation/Load in MLD		
		Base year 2025	Intermediate 2040	Ultimate 2055
1	Muttar Blocks 2,3A,3B,3C, and 4 (KMRL)	11.61	12.92	14.03
2	KWA area	1.76	1.95	2.10
Daily Sewage Load		**13.37 MLD**	**14.87 MLD**	**16.13 MLD**

Accordingly, STP Capacity is computed as 16.5 MLD for Ultimate and 15 MLD for Intermediate horizons. The pertinent detail concerning the tributary Blocks considered in the Muttar sewerage system under the 5 Tributary Blocks is as below:

(i) The sewage load generated from Block 2, & 3B is collected by gravity in WW1 at BTS bridge at Chainage 2300m of Chilavanoor canal as itemized below:

(a) Block 2, Southern end of Chilavanoor canal north catchment area up to chainage of 2000m is resized as Block 2 to collect the sewerage load into WW1.

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(b) Block 3B Consists of southern portion of north catchment area of Chilavanoor canal up to a chainage of 1800m of Chilavanoor canal east side.
The sewage from WW1 is proposed to be pumped to Wet well WW2 at Chilavanoor Canal chainage of 900m, through 2 km long 400 mm DI K9 pumping main.

(ii) The sewage load from the entire block of 3A is gravitated into a collection Wet-well (WW2) proposed at Chilavanoor Canal chainage of 900m of, wherein pumped quantity of WW1 also joins.

(a) Block 3A consists of balance catchment area of Chilavanoor Canal on either side, eastern side as well as western, other than taken in Block 2 in the west side and Block 3B in the east side.

(b) Pumped quantity from WW1for Block 2 & 3B also cumulates in WW2
The combined sewage load collected in WW2 is directly pumped to STP Inlet chamber though a 3.5 km long 450 mm diameter DI K9 pumping main.

(iii) The sewer load from Block 3C and Block 4 is collected by gravity through trunk main of varying sizes for delivery into the newly proposed Collection **Wet-well at STP site as below:**

(a) Block 3C Consists of the west side of Edapally canal Catchment. A small portion of east side [Kalamassery which is not feasible to convey to Block 4] is also included in this block.

(b) Block 4 consists of the east side of Edappally North catchment area which included Kalamassery Municipality alone.

The Muttar DPR contemplate to construct a comprehensive Under Ground Sewerage System (UGSS) with 16.5 MLD STP including left out KWA areas adjoining for treatment amenable to the stringent standards of KPCB/CPCB. The redesign of Muttar system by CUBE's vetting reduced the Block from 21 to 5, 21 Pumping stations modified to mere 2 Nos and 315 Lift Manholes to 20 Nos **[Refer Fig 2]** with enormous cost savings in CAPEX and OPEX. The Collection system entail street sewers, branch sewers, Trunk sewer Mains, Manholes and Lift / Pumping stations to intercept, collect, convey and transport the sewage load generated to the STP for treatment. The sewer pipes range from 200 mm DWC SN 8 pipes to 450 mm HDPE PN8 pipes. The Collection System details are summarized below for quick glance of the components covered under the scope of Muttar Sewerage system:

Table 4: Muttar STP Catchment/ Block-wise and Collection System Details

S. No.	Catchment Area -Zone	Tributary-area/ Blocks		Sewer length m	House No.	Sewer Appurtenances		
		Description	Block No.					
					HSC	**MH**	**LiM**	**SPS**
1	Zone 2- Edappally-Canal North	Edappally East	**4**	18295	6540	753	8	-
		Edappally West	**3C**	21289		847	5	-
2	Zone 3- Chilavanoor Canal North	Chilavanoor North	**3A**	17828	6241	1009	1	1
		Chilavanoor N- SE	**3B**	23166		876	3	-
		Chilavanoor N - SW	**2**	23041		945	3	1
		Total	**5**	**1,03,619**	**12781**	**4430**	**20**	**2**

The site for Sewage Treatment Plant is located at Muttar at the tail end of Edappally Canal at 10°2'31.66" N and 76°18'5.25" E. The ultimate STP capacity of 16.5 MLD [Intermediate @2040:15 MLD for EMI components] includes 14 MLD from IURWTS project area and about 2.50 MLD from left out areas of KWA is received in the STP site for treatment to the acceptable

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standards of KPCB. The land for Muttar STP components, access roads, utilities, Transformer and green belt etc. is 1.23Ha [Edappally canal] for which Administrative Sanction from Revenue and Financial Sanction from KIIFB is in place. The Electro-mechanical devices and pumping plants of Collection system and STP are designed for 15 years and Civil structures for 30 years considering the service life.

The 16.5 MLD STP proposed is based on SBR Technology prudently selected from the proven Technology menu available factoring N-P removal also and the customised plant automation. The STP with SBR technology is preceded by hierarchy of preliminary treatment comprising set of Fine/Coarse screens, Grit removal, post-treatment for sludge dewatering/thickening and disinfection by Chlorination. The latest Turbo Aeration system with SS 316 decanters, compatible diffuser modules with manifolds and laterals and Screw Press Technology is proposed for sludge dewatering/thickening to facilitate energy savings, ease of maintenance and functional efficacy. The latest Turbo Aerators/Blowers with non-contact Air foil bearings in place of lobe blowers consume less power and makes it suitable for STPs in residential areas due to low vibration and less noise. The treated effluent should achieve BOD < 5 ppm, COD < 100 ppm, TSS < 10 ppm, to get recyclable quality of water for industrial / agricultural purposes or regeneration into rivers. The Components of STP including design, execution, commissioning and trial run with O& M for 10 years is to be implemented under DBOT mode with sturdy specifications, standards and practices.

The Estimate for the Muttar Sewerage System and STP is prepared based on PRICE Software of GoK using DSR 2018.

1. The Estimate for Collection System of Muttar includes laying of sewer lines [104 Km], Construction of Manholes [4430 Nos], Lift manholes [20 Nos] Sewage Pumping Station [2 Nos], Pumping Main [2 Nos: 400 mm DI K9 - 2km for WW1 to WW2 & 450 mm DI K9 - 3.5km for WW2 to STP] and providing Household Service connections [12781 Nos].
   a. The total Estimate cost for Collection System including GST 18% is **INR 226.18 Crores**.
   b. Collection system Cost of Rs 226.20 crore includes Capital Cost of Rs 206.34 crore and **Operation & Maintenance cost (10 years)** @ Rs 19.84 crore [O& M: Rs 15.49 crore & Energy cost: Rs 4.35 crore].

2. The Estimate Cost for components in STP site includes the components of 16.5 MLD STP including Wet-Well [1 No] for Collection of Raw Sewage at STP for Block 3C and Block 4:
   a. The Estimate cost for Components in STP site including GST 18% is **INR 74.15 Crore**
   b. The STP Cost of Rs **74.15 crore** includes Capital cost of **INR 43.89 Crores** and 10-year Operation & Maintenance cost of **Rs 30.26 crore** [O& M: Rs 17.93 crore & Electrical Energy: Rs 12.33 crore].

3. The total project cost is projected as INR **324.28 Crores** [by KMRL] including land acquisition for pumping station [30 Cents for 2 Wet wells] and allied overheads of DPR Preparation and Supervision charges for project execution. The project financing is from KIIFB, Government of Kerala.

Team Leader Antea Group	General Manager KMRL	Maj Gen L Padmanaban [Retd.] CEO, CUBE

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Fig 1: Muttar System showing Blocks / Wet-wells, PM and STP site

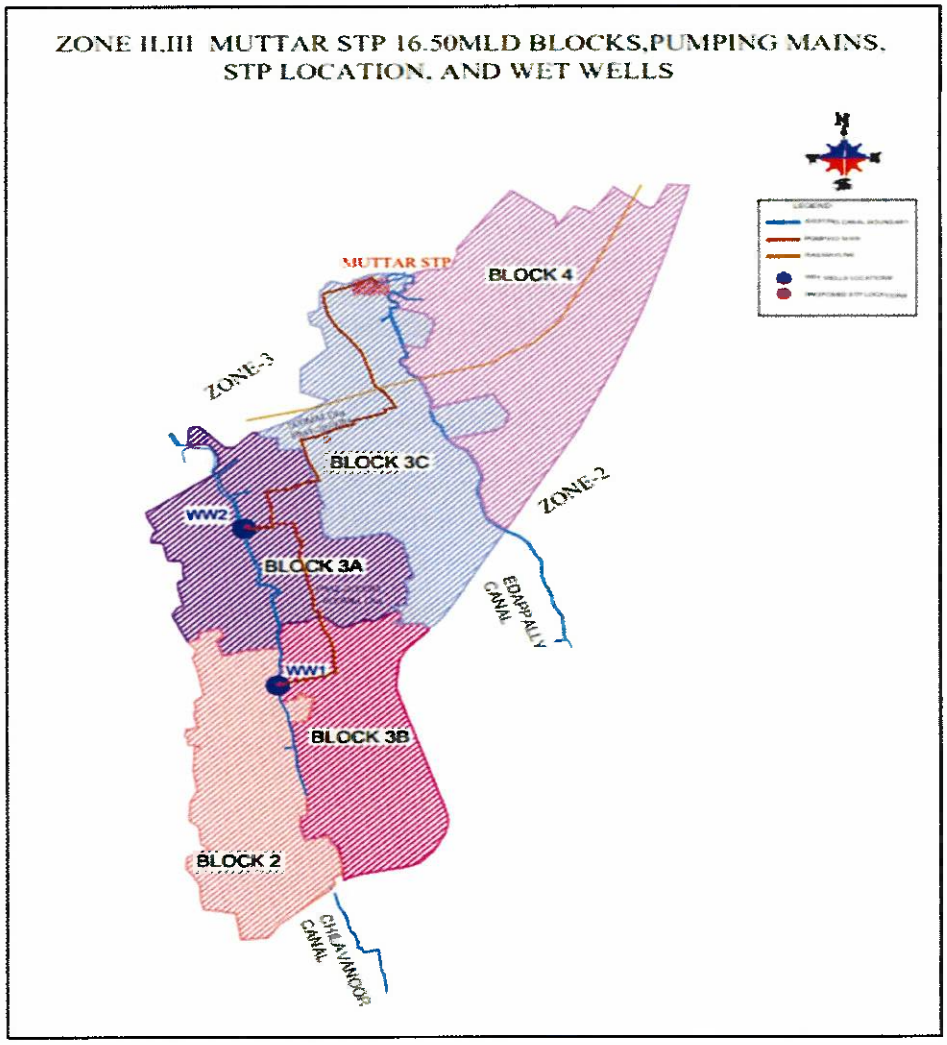

Table 5 - Muttar System - Lift Manholes & Wet-well Collection Arrangements

1. Details of Lift Manholes [LiM]

Total No. of LiM	Dia in m & Nos	Depth range - Nos	Length in m / Nos	Flow in lpm / Nos
20 Nos	2.5 m: 17 Nos 3 to 4.0 m: 3 Nos	< 6 m: 17 Nos >6 m:3 Nos	< 30 m: 15 Nos >30 m: 5 Nos	< 1000 lpm: 16 Nos >1000 lpm: 4 Nos

2.Details of Pumping Stations (PS) with Wet-Wells (WW) and Pumping Mains

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S. No	PS / WW arrangement	Dia / Depth	Sewage Load MLD	Discharge lpm DWF 1/2/3	Pump-set HP	Pumping main size & length
1	WW1 (Bl 2 /3B) - WW2	5.5/6.6m	4.33/8.66/13	3007/6014/9028	40 /20 /10	400 DIK9 -2km
2	WW2 (Bl 3A / WW1) STP	7 /7.8 m	6.52/13.04/19.57	4528/9056/13590	25/60/115	450 DI K9 -3.5km
3	WW @ STP (Blk 3C-4)	5.5/6.2m	3.91/7.82/11.74	2715/5431/8153	40 /20 / 10	350 DI K9-20 m

3.Abstract of Collection system & Appurtenant structures

Description	Blocks	Road network length in km	HSC nos	No of Manhole	No of Lift stations	Pumping stations
Muttar System	5	103.62	12781	4430	20	2 +1 No @STP)

Fig 2: Chart shows enormous reduction in Blocks, PS and LiM

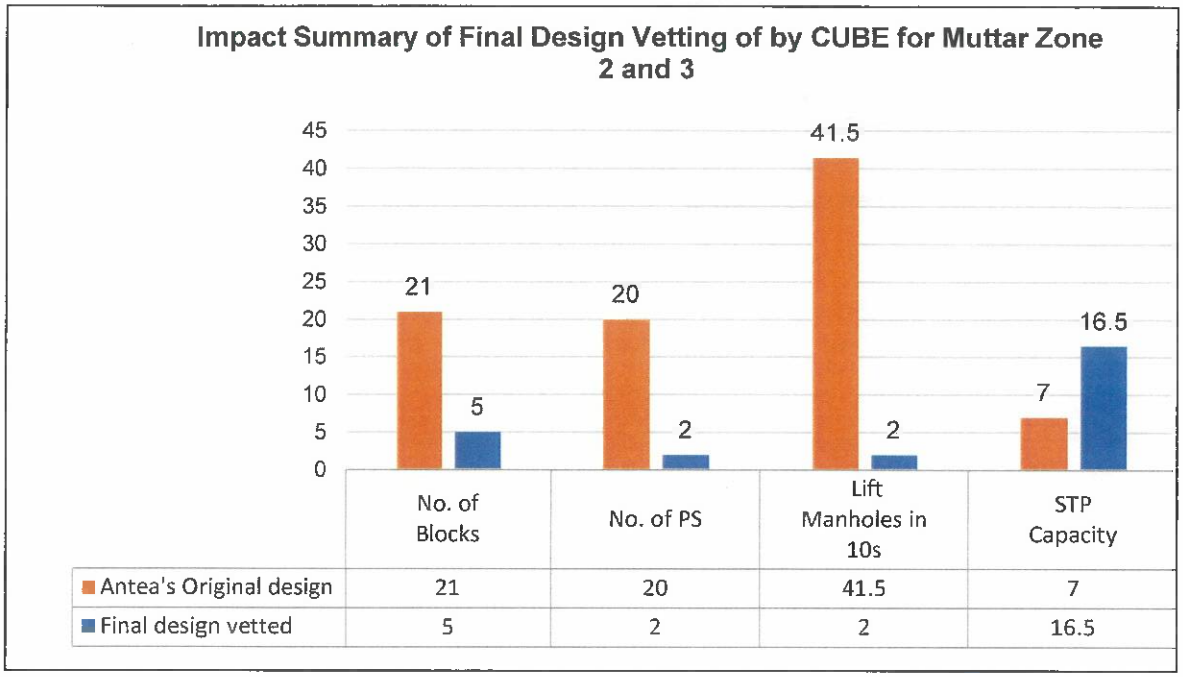

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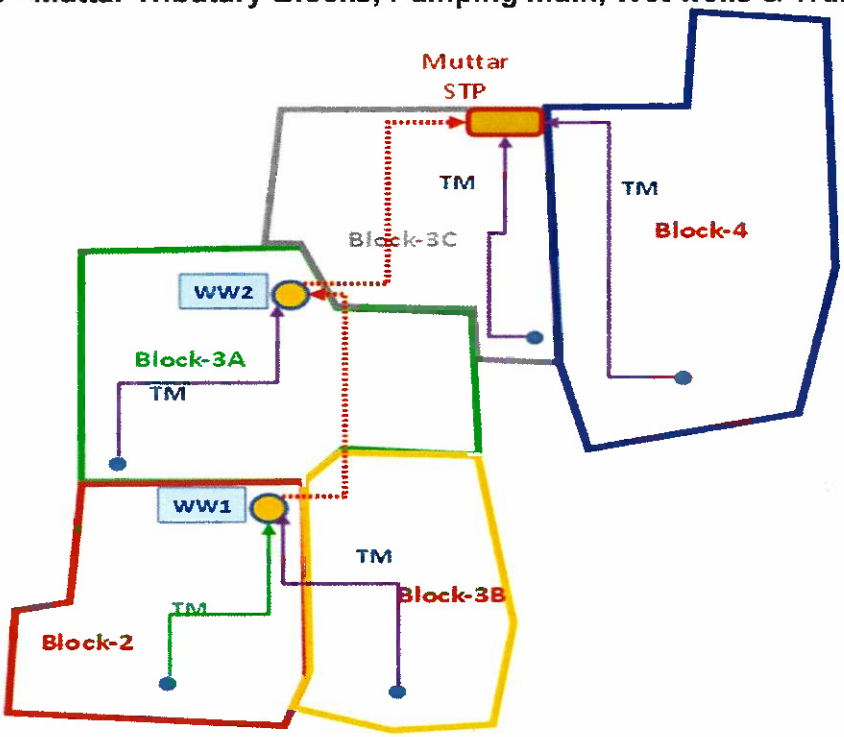
Fig 3: Map - Muttar Tributary Blocks, Pumping main, Wet wells & Trunk Sewers



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General Consultancy Services for Integrated Urban Regeneration and Water Transport System, Kochi, India

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Submitted by,

General Consultant – IURWTS Project

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Client:

Kochi Metro Rail Limited, (A Joint Venture of Govt. of Kerala and Govt. of India)

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Executive Summary

Kochi is a metropolitan city lies in Ernakulam District surrounded by back waters. In the past decades the urban population was increased in a rapid rate which results in an increase of urban poor. Urban sprawl, unplanned development, encroachment into the canal commands, flooding, solid waste management, lack of sewer facilities resulting in water and air pollution issues, are the list of woes faced in the Kochi urban fabric. In addition, Kochi city being a coastal/riverine city climate change impact has also become a major contributing factor to climate induced devastation.

The "Integrated Urban Regeneration and Water Transport Studies" (IURWTS), a project for rejuvenating the existing dilapidated five canals of Kochi city, was conceived by CSIND, Govt of Kerala in the year 2018, as a part of improving the quality of life in Kochi city in line with the directives of the Ministry of Urban Development, Government of India. The Detailed project report was prepared for an estimated amount of INR 1528.27 crores and administrative sanction issued by CSIND dept, Govt. of Kerala vide G.O (Ms) no 1/2021/CSIND dated 12-02-2021.

The IURWTS project has 2 main components, one to restoration five major dilapidated canals and canal catchment thereby mitigate floods, restoring the canals for navigation to enhance last mile connectivity and provide pollution free water bodies. The second component of the project includes urban regeneration of the canal banks by providing household sewer connectivity and adequate capacity sewage treatment plants and thus maintaining the restored canals, free of contamination.

The IURWTS project consists of 3 major canals and a minor canal, Thevara canal and manmade canal-Market canal . Their catchments are delineated. The catchment area of Thevara canal falls inside Thevara-Perandoor and hence it is treated as a single catchment for calculation of sewer loads generated. The catchment map is overlaid with the wards map and the individual catchment is clipped to assess the population contributing to the respective canals. The NH-544 forms a ridge line cutting the catchment in the east-west direction. The wards falling on the southern side and the northern side catchments of the 3 canals (Thevara-Perandoor (combined), Chilavanoor, and Edappally canals) was segregated. Based on the population projections estimated till 2055 the sewer loads were calculated for the catchment areas on the northern and southern side catchments using Sewer DEM software.

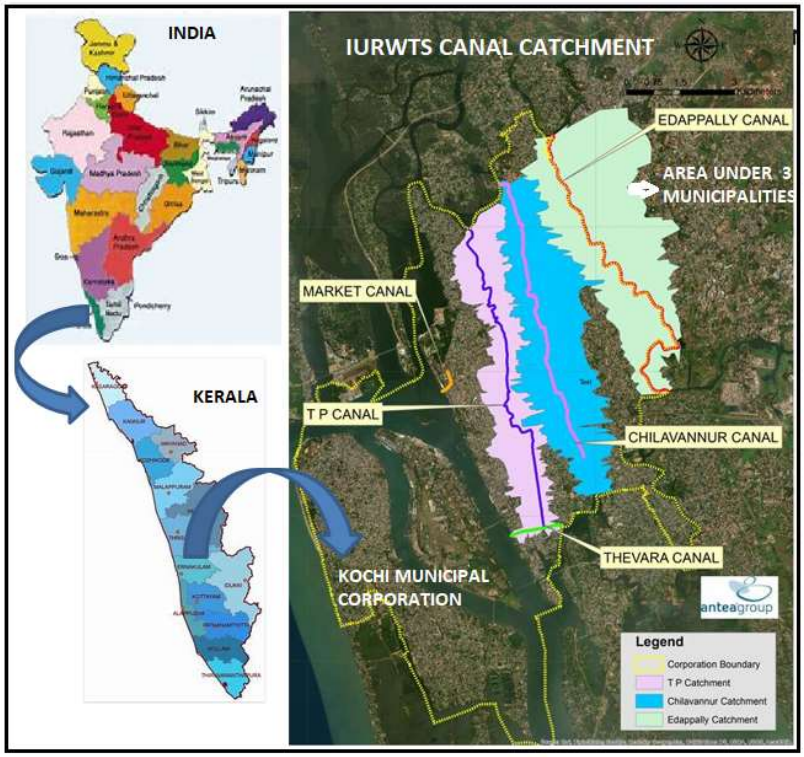

Figure 1: Physiographic setting of IURWTS Catchment

Since Edappally canal has three municipalities on the eastern bank, portions of these municipalities should also be considered for planning Sewerage system in the north and south catchment area of Edappally Canal. At Muttar STP, northern catchment area of Edappally canal is taken in which left bank is part of Kochi corporation and Right banks is part of Kalamassery Municipality. For the north catchment area of other two canals, Chilavanoor canal and Thevara-Perandoor canal, only Kochi Corporation lies on both the banks.

About 80 percent of IURWTS project command lies inside Kochi corporation limits, i.e., out of the total catchment area of 43.93 sq.km, 31.07 Sq.km forms part of Kochi Corporation and an area of 12.857 sq.km on the eastern side falling in 3 municipalities (Kalamassery, Thrikkakkara and Thripunithura Municipalities). Out of 74wards of Kochi Corporation, 31wards (parts or fully) fall under IURTWS project including 20 and 21 wards (parts or fully) each in Kalamassery and Thrikkakkara municipality and parts of 3 wards in Thripunithura municipality.

For providing sewer network connectivity, the IURWTS catchment has been divided into 6 zones and the dividing line of the catchments being the national highway running on a ridge of the catchment in the west-east direction.

The existing sewer network facility is only available for 5 percent of the households and the remaining area is served by soak pits and septic tanks. The excess flow from these units are discharged into the storm water drains and thereby drained into the main canals. As per this project an effective sewerage system is proposed to be implemented for the treatment of all sewers loads from households, flats, and commercial buildings.

Initially for IURWTS project, five numbers of Sewerage Treatment Plants were suggested at the tail ends of the canals to avoid the effect on urban life. The locations are Vennala, Muttar, Puthukkalavattom, Perandoor and Elamkulam. Later Puthukkalavattom location was cancelled due to insufficient land area. Hence sewer covered of 2MLD planned to Puthukkalavattom STP is proposed to convey to Muttar STP by increasing its then calculated capacity of 5MLD to 7MLD.

Detailed Project Reports for four STPs and sewer network system were prepared and submitted to KMRL with 10MLD STP at Vennala and Elamkulam, 7 MLD STP at Muttar and 4MLD STP at Perandoor, which were then forwarded to IIT CUBE for vetting before final submission to KIIFB.

Kerala water Authority (KWA) is the nodal agency in Kerala State for the maintaining and implementation of various water supply and sewerage Schemes. KWA has prepared a master plan for the year 2051, projected from the census population 2011, for Kochi city and the surrounding municipalities, the urban Agglomeration, for water demand which consists of floating population, industrial and commercial water demand and unaccounted water loss. Based on water demand, sewer load generation was also calculated including ground water infiltration. As per the joint discussion with KWA and KMRL, it was decided that the sewerage schemes if proposed for Kochi should be in an holistic approach covering to a maximum extent. Hence, the sewer load generation of KWA area is also to be included for finalizing the treatment capacity in individual STPs under IURWTS project and is done accordingly.

Since the STPs were decided as common to both IURWTS and KWA sewerage schemes. The sewer loads of the left out area of Kochi Corporation which are to be considered by KWA are also calculated and included to find out the ultimate capacity of STPs.

Hence the population projection and sewer load calculation were revised according to the KWA MASTER PLAN for Kochi city and adjoining municipalities (Kochi Urban agglomeration) and the population and sewer load of the IURWTS catchment areas were computed up to a projected year of 2055 directed by the vetting agency, CUBE-IIT, Chennai.

This DETAILED PROJECT REPORT is a revised (R2) report of submitted Muttar STP which is now proposed for treatment of sewer load generated both in Chilavanoor canal north (Zone 3) and Edappally canal north (Zone 2). The projected population and sewer load calculations are based on MASTER PLAN of KWA and sewer network design is being done only for IURWTS Project area and capacity of STP was calculated for total area of IURWTS Project and KWA area in the ultimate year of 2055. Directions from M/s. CUBE IIT had also been taken in redesigning process of network area.

This report relates to the implementation of the sewer network for Edappally canal and Chilavanoor canals north catchments and construction of a SBR technology-based Sewage treatment plant of 16.5 MLD at Muttar on the northern catchment of Edappally canal as part of the urban regeneration component of IURWTS project. The land required for the STP serving northern side of Edappally and Chilavanoor Canal has been identified at Perandoor for an area of 1.23 hectares. Land acquisition proposal has already been processed.

This report includes design and estimate of sewer network included in the IURWTS Project, of 14.03 MLD with necessary sewer appurtenances. The treatment capacity of Sewage treatment plant of Muttar was calculated 16.5 MLD including left out portions of IURWTS project which is under KWA. Two collection wells and pumping stations are included in the system for which a total land area of 0.1214 Ha.

Cost Summary of the Sewer network for 16.5MLD plant with appurtenant structure details for Chilavanoor and Edappally north catchment amounts to,

1) Design and build SBR Sewage Treatment Plant of 16.5MLD installed capacity and all appurtenant structures and allied works including Operation & Maintenance for a period of 10 years including defect liability period of 24 months – **INR 74.15 Crores.**
2) Build new underground sewerage network for with interception sewer (manholes 4430nos. and lifting stations 20nos.) of about 103.63 km sewer length and all sewer appurtenant structures and allied works including Operation & Maintenance for a period of 10 years including defect liability period of 24 months – **INR 226.18 Crores**
3) Collection wells cum pumping station for the blocks 3A, 3B & 2 : The gravity main system seems to be uneconomical and results in improper functioning of sewer system. Hence, two Collection well cum Pumping stations are proposed. The land acquisition for the same is considered as 0.123 Hectare costing @ INR 10.79 Crores is **INR 1.33 Crores**

4) Land acquisition proposed for an area of 1.23 Ha for 16.5MLD STP and its green belt, access roads etc. for which Revenue Administrative Sanction and Financial Sanction from KIIFB was already obtained
5) Preparation of Detailed Project Report for the Sewerage Scheme for Muttar Zone @1.5% of the total estimate Amount – **INR 4.52 Crores**.
6) Project Management / Supervision charges for the execution of the entire sewerage scheme @ 6% of the Estimate cost – **INR 18.10 Crores**.

The total project cost thus works out to **INR 324.28 Crores**.

Funding for the project is from KIIFB, Govt of Kerala, appraisal of the project has been completed by KIIFB and the final appraisal amount will be cleared by KIIFB after the land acquisition process is complete.

To manage this project during implementation and post implementation stage, as per the GO (Rt) No. 2010/2019/RD dated 23rd July 2019, KMRL was entrusted the job of Special Purpose Vehicle (SPV). Antea Group, Nederland was selected as the General Consultant (GC) for assisting SPV.

To manage this project during implementation and post implementation stage, as per the GO (Rt) No. 2010/2019/RD dated 23rd July 2019, KMRL was entrusted the job of Special Purpose Vehicle (SPV). Antea Group, Nederland was selected as the General Consultant (GC) for assisting SPV. The Scope of GC under this project involves the planning, Design and supervision and project management. GC will ensure compliance and monitoring of the project activities using innovative tools and techniques such as online monitoring of the work sites. GC will work in close collaboration with the Municipal corporation and the concerned stake holder departments during the execution phase of the project and will be responsible for the follow up tasks. A separate SPV involving all stake holder departments is also proposed so that departments involved in the project command do not work in silos and implementation and post operation activities are properly address.

Appraisal Form

Checklist for Submission and Scrutiny of DPR for Muttar STP and Sewer network under IURWTS project for treatment at Muttar

Sl. No	Description	Write 'Yes' or 'No' etc in the column below **If Yes, give** Page No./DPR volume reference. **If No, reasons thereof**
1	**General Components (MAIN DPR OF IURWTS PROJECT)**	
1.1	Name of the town/city/District/State for which scheme has been formulated with name of the scheme:	Kochi/Ernakulam/Kerala/Integrated urban regeneration and Inland Transport Studies (IURWTS)
1.2	Date of DPR appraised by SPV (KMRL) and whether a copy of appraisal report (duly authenticated by the competent authority) has been forwarded with DPR	Appraisal sheet attached as Annexure 8 of this DPR
	(a) Date of appraisal	30-01-2021
	(b) Name of the appraisal agency	Kerala infrastructure investment Fund board (KIIFB)
	(c) Original Estimated cost:	INR 1528.27 crores
	(d) Appraised cost	To be received from KIIFB after LA process is completed
	(e) Major comments/observations made by appraisal agency	No Major comments . Appraisal sheet attached as Annexure:10 of this DPR
1.3	Whether Administrative approval of State Government is obtained to implement the IURWTS scheme	Yes. G.O (Ms)no 1/2021/CSIND dated 12-02-2021 for INR 1528.27 crores Page 1 /Section 1.1 of DPR
1.4	(a) Whether Project formulation justification (need for the project) has been furnished in DPR.	Yes Justification: Page 2 /Section 1.2 of DPR
1.5	(b) Whether executive summary of the project is furnished in DPR	Yes DPR Page:1
1.6	Whether linkages of this scheme have been established with other ongoing sewerage schemes being funded by the Central/State Govt./other agencies, if any. Pl. Furnish relevant information.	NA
1.7	Whether the map showing administrative and political jurisdiction of the project area (IURWTS) has been given in DPR.	Page 16 / Figure 1 of DPR
	(a) Area within Kochi Corporation limit = 31.07 Sq.km	Page 26,27/Section 2.2.1
	b) Area of Kalamassery municipality limit : 5.418 Sq.km	Page 26,27/Section 2.2.1
	c) Area of Thrikkakkara municipality limit : 6.797 Sq.km	Page 26,27/Section 2.2.1
	d) Area of Thripunithura municipality limit : 0.65 Sq.km	Page 26,27/Section 2.2.1
	Total Extent of area considered in the DPR : 43.93 Sq.km	Page 26,27/Section 2.2.1
1.8	Whether the land use pattern of the project area has been given in DPR (Bureau e of Economics and statistic ,Govt of Kerala)	Yes. Page 66,67 Tables 15-18
1.9	Whether the DPR including the design, drawings, cost estimates, analysis of rates has been authenticated by Competent Authority of State Govt. (KMRL)/ Technical sanction of DPR by KIIFB / Technical & Financial Verification Certificate by KIIFB	To be obtained by SPV (KMRL) before tender on DBOT mode

2	Whether the proposals for setting up STP received clearance / consent from the State Pollution Control Board: Consent to establish received from	Included as Annexure:9 of this DPR
2.1	In case proposed pumping main /sewer line is crossing Railway line/ Highway & their bridge (wherever applicable), whether the clearance from concerned authority such as State Pollution Control Board (SPCB), Highways, PWD, Corporation, Municipalities, Railways has been obtained and copies of the permission and their estimate for the same has been provided in DPR.	No. (Clearance from Highway and KPWD (roads) dept to be obtained)
	If not, the present status of action initiated may be furnished below.	To be obtained by SPV (KMRL) from National highway and PWD roads/Corporation/ Municipalities during execution
2.2	Whether the provision for separate electric feeder line to the sewage treatment plant and pumping stations (to take care of frequent power failure and voltage fluctuation problem) from HT line and an agreement between Kerala state Electricity Board (KSEB) and Urban Local Bodies (ULBs) has been furnished in the DPR:	No. To be obtained by SPV (KMRL) from KSEB during implementation
2.3	Whether the commitment from Electricity Department for un-interrupted power supply is obtained	To be obtained by SPV (KMRL) from KSEB
2.4	Whether the Topographic map of the city/town/project area to the scale has been given in DPR/Zone wise maps to scale showing all streets.	YES. Included as Annexure:6 of this DPR
2.5	Whether soil investigation report – bore hole logs has been appended with DPR.	Included as Annexure:4 of this DPR
2.6	Whether Contour map of the project area has been annexed with the DPR.	Included as Annexure:6 of this DPR
2.7	Whether resolution from the ULB for implementation of proposed tariff structure to ensure self- sustainability of the scheme is enclosed in DPR.	Included as Annexure:9 of this DPR
	ENGINEERING COMPONENTS	
2.8	(i) Please furnish the details of IURWTS project area,	
	(a) Total covered Area of the Kochi Corporation: 31.068 Sq.Km, Municipalities: 12.864 Sq.Km	Page 138-179/Section 7 of DPR
	(b) Extent of the project area (North catchment areas of Chilavanoor and Edappally Canal) considered in the DPR: Kochi Corporation:6.391 Sq. Km. Kalamassery Municipality -2.529 m	Page 138-179/Section 7 of DPR
	(c) Additional Area (beyond Corporation/municipal limit) considered in the DPR:	Sewer load of left out portions of IURWTS zones which are proposed to be covered by KWA is included in Sewer load calculation of Muttar STP
	(d) No. of Households (as per 2011 census)Muttar STP sewer area :	58416 Section III, Page 138-179
2.9	Population For Muttar Sewer area-Ultimate stage 2055: 77534 persons + Floating population 37011 Total 114545	Section III, Page 138-179
3.0	Population growth rate adopted 5-6%/10 years for corporation and 10-9% 12%/10 years for Municipalities	Section III, Page 138-179
3.1	Demographic Method adopted and justification: Arithmetic progression method	Page 78 Section II of this DPR
3.2	(a) Whether population projection has been made as per CPHEEO Manual and given in DPR:	Yes Page 78 Section II of this DPR

	(b) Project Area (part or 100% area of the IURWTS catchment): 20.305%	Section III, Page 138-179
	(c)Ultimate stage: 77534 persons + Floating population(55% for Corporation and 20% for Kalamassery) 37011 = 114545 total (2055)	Section III, Page 138-179
	(d)Population growth rate adopted 5-6%/year for corporation and 10-12%/10 years for Municipalities	Section III, Page 138-179
	(e) Block wise Population (Kochi Corporation/Municipalities)	Section III, Page 138-179
	(f) No. of wards (within Corporation/ municipal limit)	Section III, Page 138-179
	(g) Total projected population to be accommodated in the existing corporation /municipal area	77534 in the year 2055. Section III, Page 138-179
3.3	Whether existing details of sewerage system for urban / urban agglomeration has been furnished in DPR. Please furnish details	No Existing sewerage schemes in Muttar zone
	(a)Total sewage generation in TP canal east side north catchment , northern catchment of Edappally and Chilavanoor canal from the scheme (Kochi corporation/Municipalities)	NA
	(b) Industrial treated effluent (to the desired level) being discharged in the sewer system MLD	NA
	(c) Existing capacity of Project sewer area	NA
	(d) No. no. pumping stations and capacity: ……(MLD) (nos.)	NA
	(e)% of population coverage with sewer network in the project area %	NA
	(f) % population coverage of various blocks (block -wise) w.r.t total catchment	NA
3.4	**Sewage Generation**	
	(a) Per capita sewage generation considered in the DPR	(85% of water supply) 123lpcd
	(b) Sewage Generation from (specify treated industrial effluent if any)	**Nil**
	(c) Net capacity of Sewage Treatment Plant required in IURWTS command	58.405 MLD
	(d) Net STP capacity required –	50.04 MLD. Muttar Sewer area =14.03 MLD (excluding KWA area)
3.5	Please furnish the major project components and component-wise estimated cost (Rs, in lakhs)	
	1. Sewage network	
	(a) Design period (30 years as per CPHEEO Manual)	30 years
	(b) Total length of road of Perandoor north catchment	103.63 km
	(c) Total length of sewage network Perandoor north catchment	103.63 km
	(d) Total length of proposed line accounted for in the DPR(estimate)	103.62km Page 168 Section 10.2.1 Table 49 of DPR
	(e) Per capita sewage considered in the design (85% of water demand 150lpcd) 127.4lpcd	Section III, Page 138-179
	(f) Ground water infiltration based on area/length of network/no. of manhole :	4500liters/sewer length /day
	(g)Peak factor adopted (2 to 3) based on population as per Manual :	2.25 (since this is a part of Kochi Corporation with population 633553 in 2011)
	(h) Pipe material of "n" value (coefficient of roughness)	0.01 to 0.050) : (as per manual) (specify material) : 0.01
	(i) Minimum velocity considered in the design	(0.3 m/s as per CPHEEO manual

	(j) Maximum velocity considered in design	3m/sec Section III, Page 138-179
	(k)Actual minimum velocity:	0.3m/s Section III, Page 138-179
	(l)Actual maximum velocity:	2.25m/s Section III, Page 138-179
	(m) Whether sewers have been designed to flow 0.8 (d/D) full at ultimate peak flow:	**YES** Section III, Page 138-179 For
	(n) Actual d/D ratio:	0.75 Section III, Page 138-179
	(o) Spacing between manholes (please specify size wise) (30m -300 m depend on size of sewers as per CPHEEO Manual) :	30m Section III, Page 138-179
	(p) Depth of cutting (1m -6m asp per manual) :	1.06-4.5 for Corporation and 1.06-5.5m for municipality) Section III, Page 138-179
	(q) Minimum (Actual)	1.06 M Section III, Page 138-179
	(r) Maximum (Actual):	4.5 m for Corporation and 5.5m for Kalamassery Municipality considering the site specific requirement and topography of the area Section III Pages 156-188
	(s) Total no. of layouts (blocks) :	5 Nos.
	(t) Total No. of nodes :	12781 Nos
	(u) Total length of sewer network	104 km
	(v) Proposed pipe sizes each block :	200mm – 450mm (trunk main)
	(w) Peak flow from the outlet of trunk sewer as per the design	trunk main for each block- max peak flow 7.94 mld in Block 2,6.57mld in Block 3A and 5.06mld in Block 3B
	(x) Total peak flow of all the outfall sewers in all blocks and average flow	Section III, Page 138-179
	(aa)Whether the average out flow from all the trunk sewer is matching the ultimate sewage generation of the project area (please specify)	Yes Section III, Page 138-179
	2. Pumping Station and Pumping main/gravity main	
	Pumping Station	
	(a) Design period (30 years for civil structure and 15 years for electro-mechanical items as per CPHEEO Manual)	15 years
	(b) Main pumping station (please specify nos. and capacity):	2 No.
	(c) Types of pumping station based on dry well or wet well (please specify):	Wet well cum pumping station
	(d) Types of pump, size of pumps, no. of pumps, capacity or flow rate of each pump, head of pumping, etc., (please specify):	Non-clog submersible pumps. Discharge2 ,15 HP and 2 ,10 HP and 3 Nis 30HP and 1 No 25 HP in each Pumping station 138.43 LPS and 124.42LPS with head 8.07, 15.77m
	(e) Standby for pump sets (Please specify 50% or 100%): 50%	50%
	3. Pumping main	
	(a)No. of pumping mains & capacity:	2 Nos. 13 MLD and 3.91 MLD
	(b) Design period (30 years as per CPHEEO Manual)	30 Years

	(c) Whether economic size of pumping main has been done using computer software and furnished.	Not applicable in sewage pumping mains, due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night. (ref CPHEEO Manual 4-20) However furnished
	(d)Pipe material used:	Ductile Iron Class K9
	(e) "c" value adopted (as per Manual) :	140
	(f) Pumping hours considered (22 to 24 hrs) :	23 hrs
	(g) Pumping Head :	8.07m and 15.77 m
	(h) Pumping efficiency (60% to 80%)	70%
	4. Gravity Main	
	(a) No. of gravity mains and capacity:	2
	(b) Size and length -	450mm, 4.285km 200mm
	(c) Material	HDPE PE 100 SN 8
	(d)C Value adopted:	140
	(e) Available Hydraulic Head:	20
	Sewage Treatment Plant	
	(a) Design period (30 years as per CPHEEO Manual)	30 Years
	(b) Capacity of STP (proposed)	16.5 MLD Section III, Page 138-179
	(c) Proposed Technology:	Sequential Batch Reactor
	(d) Whether hydraulic design of STP has been done for design period of 30 years and furnished in DPR:	YES
	(e) Whether Life-cycle cost assessment of treatment technologies has been furnished in DPR	Appendix -1 of DPR
	(f)Whether temperature, elevation and location of the town has been taken into account while designing the process of the STP, Main pumping station wherever required and furnished in DPR :	YES
3.6	**House service connection (sewers) p**roposed :	12781
3.7	Whether the proposed scheme envisages Supervisory Control and Data Acquisition (SCADA) arrangement :	yes
3.8	Whether modular approach has been adopted to facilitate "addition" units to SWTP at a future date, whenever required :	Yes
3.9	Whether computer Aided Design (both design & simulation) for Sewage Treatment Plant, pumping station, distribution network has been furnished in DPR	YES Computer based design in MS Excel
4.0	Whether the sewage characteristics of source have been tested by NBEL accredited laboratory and furnished in DPR	YES Annexure 2 of DPR
4.1	Whether treated sewage shall conform to the effluent standards notified by the respective SPCB/CPCB	YES Section III, Page 138-179
4.2	Whether surge analysis using computer software for pumping main has been done and furnished in the DPR	NA
4.3	Whether Hydraulic Flow Diagram (HFD) with head loss calculation for STP and layout plan of STP with other components has been furnished in DPR	YES Computer based design in MS Excel Section III, Page 138-179

4.4	Whether maps of proposed sewer networks indicating RL, Node no, Link no, for all the zones (Project area) are enclosed with the DPR.	Section III, Page 138-179
4.5	Whether the provision of the land for land acquisition for the Sewage treatment plant, pumping stations/mains , sewer network, if any, has been made as per 30 years requirement and future expansion in the DPR : YES	YES Section III, Page 138-179
	(a) Total requirement of land for:	
	STP	1.23 Ha
	Laying of Pumping Stations, pumping mains and primary lines-	.07 Ha and 0.053 Ha, 2 Nos
	(b)Whether land in possession with Implementing Agency:	No, LA in process
	(c)Whether Govt. land is yet to be transferred to the Implementing Agency and specify time required for transfer	8 months
	(d) Whether private land under acquisition and time required for acquisition:	1.30Ha. / 8 Months
	(e) Status of action initiated for transfer of Govt. land and acquisition of private land (please specify) :	Revenue AS received from GoK and LA in process
4.6	Whether Bill of Qualities (BOQ) and cost estimates of individual components of sewerage system prepared as per latest SOR of KIIFB and copy of latest Schedule of Rates (SOR) and Pro-forma invoices have been annexed with DPR :	Yes. Annexure 5 of DPR
	(a) Schedule of Rates adopted (please specify the year) :	PRICE 2018
	(b) In case the SOR adopted is old, please specify the cost index:	Yes 35.59%
	(c) Any price escalation proposed in cost estimates (no price escalation shall be included in the DPR):	NA
	(d) Whether analysis of rate has been worked out for all the items and appended with DPR	
	(e) Whether Bill of Quantities of individual component has been furnished in DPR :	Yes Annexure 5 of DPR
	(f) Whether lumpsum provision for any item has been proposed, please specify :	Yes Annexure 5 of DPR
4.7	Whether detailed drawing, estimation & detailed BOQ for ancillary works such as boundary wall / fencing, approach & internal road, external electrification, buildings, water supply & drainage, site development /landscaping etc. has been provided in the DPR :	Yes Annexure 5 of DPR
4.8	Whether provision for road restoration, if any has been made as per CPWD/ State PWD/ Urban Local Body norms	Yes Annexure 5 of DPR
4.9	Whether detailed PERT/CPM network showing implementation schedule has been furnished in DPR	yes
5.0	Whether Internal Rate of Return (IRR) / Economic Rate of Return (ERR) has been furnished in DPR:	Yes for Whole project Section 10.5.1 Page 188 of DPR
5.1	Whether traffic diversion/ control management for public and workers‟ safety, arising out of construction phase of sewerage works have been furnished in the DPR:	Yes Section 11 of DPR
5.2	Whether Institutional and financial status of Project Executing Agency (PEA) has been reported in DPR	Yes Page 1 /Section 1.1 of DPR
5.3	Whether project implementation period of project has been furnished in DPR Specify the implementation period:	18 months Section 9 Page 189 of DPR
5.4	Whether Environmental and social problem (if applicable) has been furnished in DPR	yes

5.5	Whether Rehabilitation and Resettlement plan (if applicable) has been given in DPR :	NA
5.6	Whether all the hard copies of the DPR furnished along with soft copies:	yes
5.7	Period of completion of the project :	138 months including O&M of 10 years

SECTION – I

GENERAL FEATURES OF IURWTS CATCHMENT

1. Introduction

1.1 Introduction

It is found that about 95perecnt of sewage and sullage discharged by the individual households in the catchment are let into the existing drains and canals of the catchment. The prime aim of the project is to rejuvenate and maintain the five canals of Kochi city and enabling navigation through these canals for mile to mile connectivity. The reinstated canals shall be maintained as such, free of contamination up to maximum and is possible only after implementation of an effective sewerage scheme for the catchment area.

The sewer network planned is such that the sewage waste is properly collected, transported, and treated in sewage treatment plant. The output after treatment will adhere to the regulatory effluent standards and disposed in such a way that it will not cause health and environmental related issues to the inhabitants of the catchment.

Under AMRUT and JNNURM, many sewer networks and STPs were envisaged in Kerala but the schemes did not take off in Kerala and the implementation was rated poor. Kochi corporation also tendered a 5MLD STP (2018) under AMRUT at Elamkulam without network facilities, and the work is nearing completion.

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The sanitation facilities provided through cent percent sewer network connectivity to the house holds of IURWTs catchment is in conformity with the sanitation policy in India. The improved facilities will be a key to achieving improved public health and enhanced socio-economic outcomes.

1.2 Regulatory and legal Framework

Government of India as well as States and ULBs bring out regulations in the sector from time to time. The regulations relevant to sewage management are as below. (i) Central Laws include the Environment (Protection) Act, 1986, the Water (Prevention and Control of Pollution) Act, 1974, Notifications of MoEF&CC and the Municipal Laws from time to time, which provide a framework for control of effluent, sewage and septage discharge.

Govt. of India EIA notification of 2006 (replacing the EIA notification of 1994) sets out the requirement for Environmental Assessment in India. This states that Environmental clearance is required for Specified activities/projects, and this must be obtained before any construction of work

or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and nature of its impact.

Category A projects requires environmental clearance from central Ministry of Environment, Forest, and Climate Change (MoEF&CC). The IURWTS Catchment development comes under Category A and hence the Employer based on the preliminary details required to be provided submitted the same to MOEF &CC and the Expert Appraisal Committee (EAC) approved the Terms of Reference (ToR) for the EIA Study. The project has got approval of environmental clearance from MoEF&CC on March 2021.

1.2.1 Other Legislations applicable to Construction Project

The provisions of the Bureau of Indian Standards (BIS) (IS:2470) as applicable for Septic tanks, soak pits, cess pools, leach pits, drainage fields etc. are also relevant while strengthening on-site sanitation system.

The Government has also laid down standard e.g., IS 11972 – 2002: Code of Practice for Safety Precautions to Be Taken When Entering a Sewerage System. This standard lays down guidelines for selection of sewer-person and safety measures against gas hazard, infection with a view to provide some basic guidance for selection of employees for sewer cleaning and proper job instructions for safe working in a sewerage system. The treated sewage effluent discharge standards published by (MoEF&CC) is given in **Table 1**.

Table 1: Treated sewage effluent discharge standards by MOEF &CC

SL. No.	Parameters	General norms 1986				MoEF&CC Notification, October 2017**	NGT order 2019**(for Mega and metropolitan cities)
		Inland Surface water	Public sewers	Land irrigation	Land coastal areas		
1.	BOD [mg/L]	30	350	100	100	<30 <20(metro cities)	<10
2.	COD [mg/L]	250	_	_	250	Not more than 50 (for new STP design)	<50
3.	TSS [mg/L]	100	600	200	100 process water 10% of	<100 <50(metro cities)	<20

SL. No.	Parameters	General norms 1986				MoEF&CC Notification, October 2017**	NGT order 2019**(for Mega and metropolitan cities)
		Inland Surface water	Public sewers	Land irrigation	Land coastal areas		
					influent cooling water		
4.	TKN [mg/L]	100	_	_	100	Not more than 10 (for new STP design)	<10
5.	NH3-N [mg/L]	50	50	-	50	Not more than 5 (for new STP design)	-
6.	Dissolved phosphorus [mg/L]	5	-	-	-	-	<1
7.	Faecal coliform [MPN/100ml]	-	-	-	-	<1000	Permissible <230

Source: NGT 2019, MoEF&CC 1986, 2015 and 2017 & CSE report on Performance study of FSTPs in India 2020

2. Review of Sanitation Sector in Kochi and IURWTS Project Command

Kerala water Authority is a state level agency which is operating the 4.45 MLD Elamkulam plant in IURWTS catchment and is responsible for sanitation services inside the catchment.

Greater Cochin Development Authority (GCDA) is the planning and development Authority of the Metropolitan area of Kochi. One STP plant of 0.9MLD is at present being operated by GCDA in Marine drive area.

The premises or properties of individuals that are not served by piped sewer systems adopt onsite sewage treatment systems in IURWTS catchment. The on-site sewage treatment systems treat sewage within the premises of its generation and are also termed as non-sewered sanitation. Conventional Septic tank with soaking options Septic tank combined with soak pit is the most common type of on-site sewage treatment system that is currently practiced in IURWTS catchment in non-sewered areas.

Hence for a proper coordination of KWA, GCDA, and Corporation a Special Purpose Vehicle (SPV) has been proposed for proper operation and maintenance of IURWTS STP and sewer network components.

The details of covered area under IURWTS Project is as given in the **Table 2**.

Table 2: IURWTS Sewer Area

Corporation/Municipality	Covered Area in Sq. km
Kochi Corporation	31.07
Kalamassery Municipality	5.418
Thrikkakkara Municipality	6.797
Thripunithura Municipality	0.65

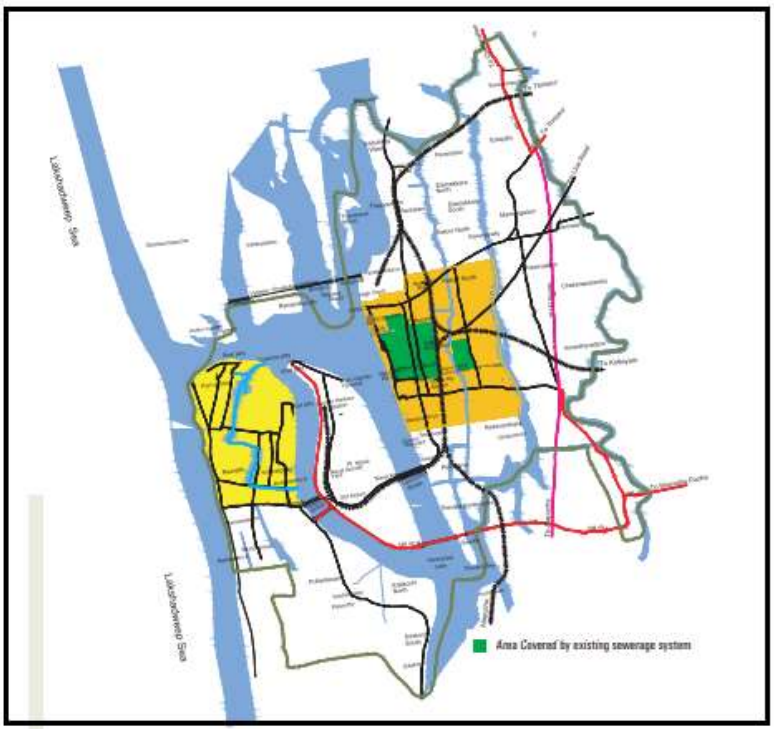

Figure 2: Treated sewage effluent discharge standards by MOEF &CC

Kochi city is one of the fastest growing economies among Indian cities and this pace of growth is likely to continue in coming decades. The IURWTS catchment occupies one third of the area of Kochi corporation including area coming under 3 municipality (Kalamassery, Thrikkakkara and Thripunithura). Census data 2011 indicates the total urban population Kochi corporation is 633553 Nos. and the 3 municipalities together is 240907 nos. The population census data from (1971-2011)

for Kochi corporation and the adjoining municipalities forming part of IURWTS catchment is as given in **Table 3**. The projected population for the year 2055 for Kochi corporation is 8,26,928 Nos and the 3 municipalities together work out to 3,42,493 nos. The fast pace of urbanization –primarily due to quest of good quality education, healthcare facilities, job opportunities, rapid changes in lifestyle and growing aspirations–coupled with spurt in economic activities has compounded the public health issues in Kochi. To address the challenges, adoption of both short term and long-term solutions with due leveraging of technology, is need of hour.

Table 3: Population census

Corporation/ Municipality	Area (Sq. Km)	Population Census					Density/Sq. Km
		1971	1981	1991	2001	2011	2011
Kochi Corporation	94.88	439066	513249	564589	595575	633553	6775
Kalamassery Municipality	27.00	29546	43767	54342	63116	71038	3015
Thrikkakkara Municipality	28.01	26862	38318	51166	65984	77319	3121
Thripunithura municipality	29.17	49884	59163	69490	81397	92550	3465

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2.1 Sanitation issues in IURWTS Catchment

The ultimate aim of the IURWTS project is to ensure cent percent sewer network to the household and make the catchment an open defecation free zone. For individual or group of households who have constraints of space, tenure, or economic constraints in gaining access to sewer network and cent percent upkeep and management of public sanitation facilities will be assured with community planned and manged toilets. Provision for the same has been included as part of the IURWTS project DPR.

The urban poor (Below Poverty line) population in IURWTS catchment was assessed based on SIA studies undertaken by the General consultant. There are reported 3 slums in the AOI of the canal corridor. Stakeholder analysis was conducted to find out key stakeholders and their interest and involvement in the proposed sanitation improvement process. After the secondary data collection, social Impact Assessment team developed a questionnaire for social survey and visited all likely impacted households (both title and non-title holders) and gathered their perception on the project, family details, Socio-Economic details, and suggestions to improve the project objectives. Apart from

this SIA team has conducted discussion and consultation with Local Body Representatives and local public and recorded their suggestions and opinion. The study team also did transit walk and observation visit to crosscheck the suggestions and grievance which were recorded. The study team reviewed the relevant and available documents (land records and socio-economic data) in Kochi Corporation, Greater Cochin Development Authority, and different municipalities. SIA team conducted one to one discussions and consultations with all Title Holder families. A snap shot from the survey is given in **Figure 3**.

Figure 3: Snap shots of the household survey

Source: Household survey, KVHS- June 2020

3. Sanitation Proposal for IURWTS catchment

Many proposals for STP works that Kochi Municipal Corporation (KMC) had taken up earlier failed due to protest from the public of the locality. This was mainly because the locations proposed for construction of STP's in the vicinity of highly urbanized colonies. Hence before the DPR preparation of IURWTS commenced the first initiative taken by KMRL (SPV) and General consultant Antea group, Nederland was to organize stake holder meetings.

During stakeholder and NGO meetings held in December 2019 and January 2020 organized by the Client the following demands were raised:

1. Identify STP site location that are not in the middle of an urbanized colony area.
2. Improve the sewage treatment facility for the entire IURWTS catchment rather than limiting the area of interest in and around the main canals only.
3. Provide sanitation facilities for the those not connected with sewer networks.

As an output of various discussions and meetings with various stake holders and public, and final concurrence from Kerala state pollution Control Board, 4 STP sites are identified in IURWTS catchment. Vennala and Elamkulam on the Southern tail end and Muttar and Perandoor at the northern tail end of IURWTS catchment.

The 3 major canals and their catchments are delineated. The catchment area of Thevara canal falls inside Thevara-Perandoor and hence it is treated as a single catchment for calculation of sewer loads generated. The catchment map is overlaid with the wards map and the individual catchment is clipped to assess the population contributing to the respective canals. The present proposal is to have 4 STP's. The NH-544 forms a ridge line cutting the catchment in the east-west direction. The wards falling on the southern side and the northern side catchments of the 3 canals (Thevara-Perandoor (combined), Chilavanoor, and Edappally canals) was segregated. The flow direction based on the ground topography is as given in **Figure 4**.

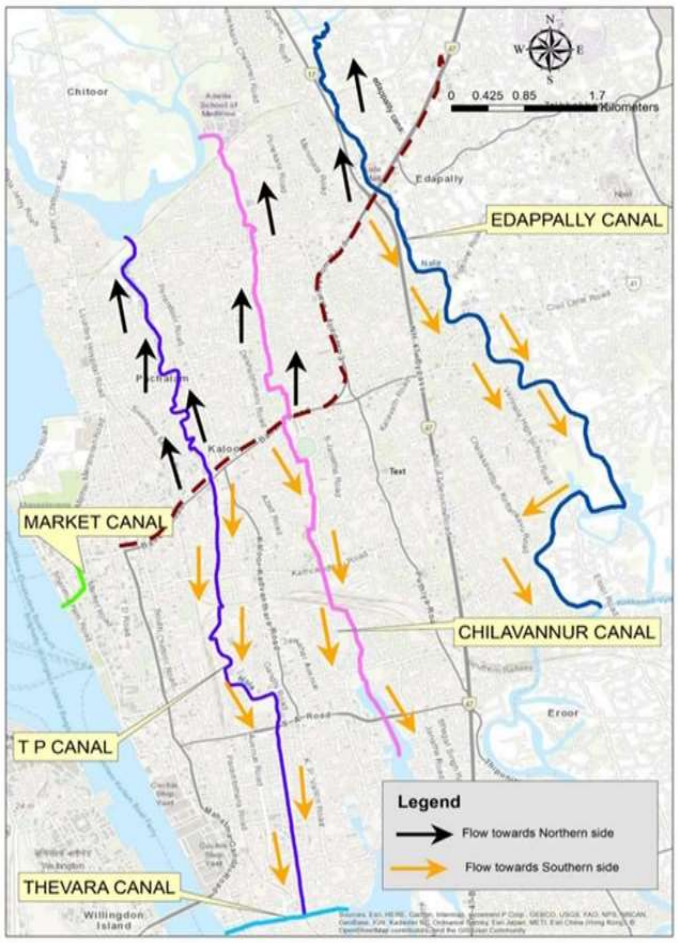

Figure 4: Flow direction based on topography

All the sites proposed were at the tails ends of the catchment areas of the canals. Two STPs on the northern side of the NH 544 proposed are at Perandoor (4MLD) and at Muttar (7MLD) and two on the southern side at Elamkulam (10MLD) and Vennala (10MLD) and the location details are given in **Figure 5**.

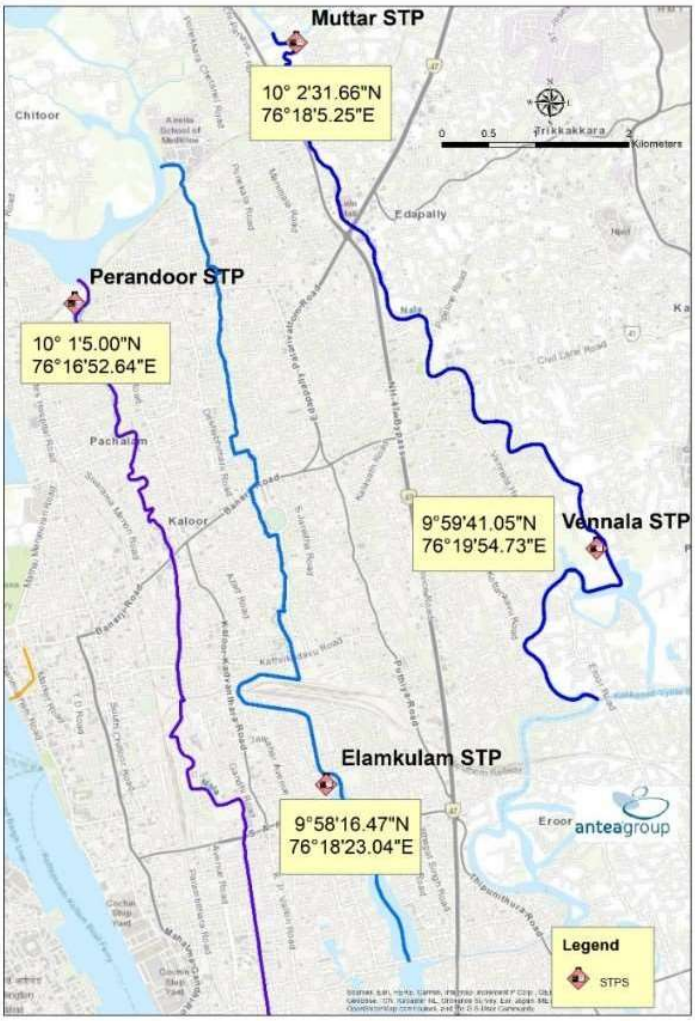

Figure 5: Location sketch of 4 STPs in IURWTS Catchment

All the STPs are proposed at the tail end of the canals at the outer limit of the urban fabric and adjacent to water bodies so that minimum environment disturbance is caused. The site selected is such that no inhabitants live within a radius of 50m from the STP location. The STP sites are at the tail ends of the canals which are the least urbanized except Elamkulam.

At Elamkulam, the existing 4,45MLD STP is proposed for upgradation to a 10MLD plant. The area requirement for the STPs is as given in **Table 4**.

Table 4: Location of STPs with Area details

Sl. No	Location/Capacity	STP Area (in Ha)	Acquisition Area (in Ha)
1	STP at Vennala-10MLD	0.50	1.64
2	STP at Muttar -7MLD	0.48	1.26
3	STP at Elamkulam -10MLD	0.50	1.86
4	STP at Perandoor- 4MLD	0.40	0.40

The catchment areas of project canals is divided into 6 zones for implementation of the scheme and to avoid distant transportation of sewage and reduce the energy expenses.

Table 5 and **Figure 6** shows the zoning of IURWTS Catchment.

Table 5: Different Zones of IURWTS catchment

Zone 1	Catchment area of Edappally Canal on southern side of NH544 from near Lulu mall up to Chithrappuzha River.	15.14 Sq. Km
Zone 2	Catchment area of Edappally canal towards northern side of NH 544 from Edappally Lulu mall to Muttar puzha	4.00 Sq.Km
Zone3	Catchment area of Chilavanoor Canal in the northern side of NH 544 from Edappally up to Elamakkara.	4.92 Sq.Km
Zone 4	Catchment area of Chilavanoor canal in the southern side of NH 544 up to Elamkulam.	8.67 Sq. Km
Zone 5	Catchment area of Thevara Perandoor Canal northern side from NH 544 up to Perandoor near Perandoor School	4.07 Sq. Km
Zone 6	Catchment area of Thevara Perandoor canal southern side from NH 544 up to Thevara and Catchment area of Thevara Canal	5.355 Sq. Km

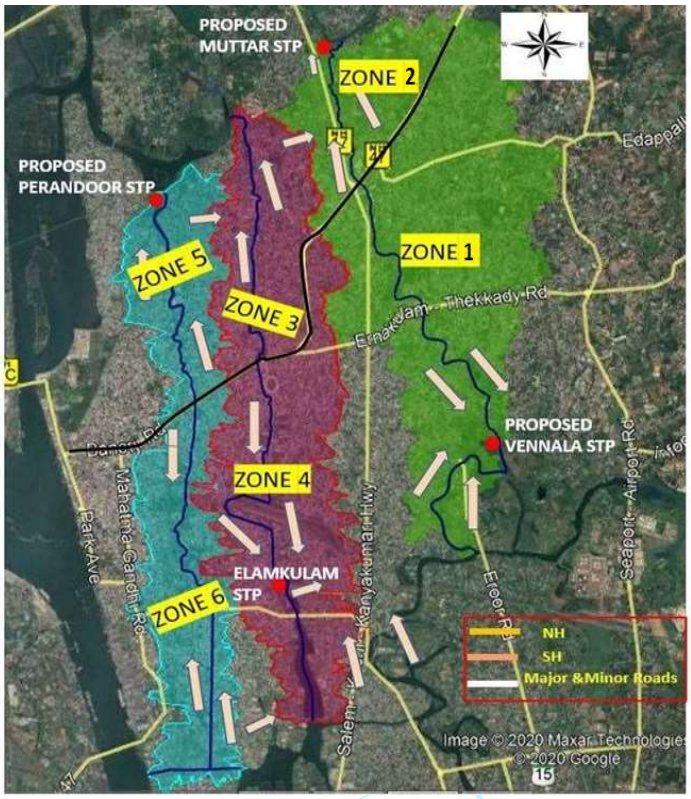

Figure 6: Zoning of IURWTS catchment area

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General Methodology

1) Held discussions with concerned Stake holders, NGOs, Public representatives, Senior citizens, Retired stake holder of various departments and undertook site visits to get a holistic picture of the IURWS catchment.
2) Obtained Secondary information about Kochi city and municipal areas in general and collected specific data of IURTS catchment related to, such as area, population, rainfall, climatic conditions, existing water supply facilities, present water supply through them in different seasons, ward wise information etc.
3) Obtained various maps related to the IURWTS catchment area and topographical maps
4) Worked out population projection of IURWTS catchment by adhering to the [procedures contemplated as per Manual of CPHEEO and finalized realistic figures.
5) Worked out sewage load to be collected from different zones delineated and ideal location of sewage treatment plants adhering to the Environmental norms.
6) Collected characteristic of the sewage to be treated and identified the Techno-economical solution for the treatment technology to be adopted.to be adopted.

7) Carried out detailed survey including taking levels all along the roads not available in the secondary data collected, fixing benchmarks, fixing location of STP, Sump & Pump house etc.
8) Designed various components from the scheme as per guidelines given in the manual on Sewerage and Sewage Treatment by CPHEEO, New Delhi / NRCP Guidelines.
9) 9)Prepared detailed estimates of the project based on 2016 PRICE schedule with cost index and prepared rate analysis for items.

3.1 Present scenario of IURWTS Project command sewerage system

Detailed Engineering Reports for individual STP and sewer network for the covered area were prepared and submitted to KMRL for a total amount of INR 836.976 Crores which were then forwarded to the vetting agency M/s. CUBE-IIT before submission to KIIFB for approval.

After several discussions, meetings with the vetting agency and KWA, the nodal agency for Sewerage schemes in Kerala all the sewerage schemes were redesigned after the optimization of zones in the induvial sewer zones.

The population projection and sewer load calculation were revised according to the KWA MASTER PLAN for Kochi city and adjoining municipalities (Kochi Urban agglomeration) and the population and sewer load of the IURWTS catchment areas were computed up to a projected year of 2055 and is attached as **Annexure I.**

The sewer loads in the left-out portions of IURWTS project were proposed to be under KWA and were designed for collecting and conveying to Perandoor/Muttar STPs based on the location and topography. The zone wise sewer load calculation and the STP details for IURWTS Project area is as given in **Table 6**.

The said loads are taken in the sewer design and treatment capacity of STPs. In Perandoor STP covered area there was no such left out portions.

Table 6: Sewer load estimation for IURWTS catchment

STP and Catchment	Sewerage Flow					TOTAL MLD (2055)	Proposed sewer load (REVISED) (IURWTS) MLD
	Sewage (2021) in MLD	Sewage (2025) in MLD	Sewage (2040) in MLD	Sewage (2055) in MLD			
	KMRL				KWA		
Zone 1_Vennala STP catchment	**14.818**	**15.025**	**16.905**	**18.742**	**4.70**	**23.442**	**24.00**
Zone 2&Zone 3_Muttar STP catchment	11.679	11.929	12.924	14.035	1.48	15.515	
From Perandoor to Muttar				0.62		0.62	
						16.14	**16.50**
Zone 5_Perandoor STP catchment	7.78	7.94	8.56	9.24	0.62	9.87	
To Perandoor						9.24	
From Vaduthala Zone of KWA					9.30	9.30	
To Muttar						0.62(-)	
						18.54	**19.00**
Zone 4& Zone 6_ElamkulamSTP catchment	**13.51**	**13.78**	**14.85**	**16.03**	**24.93**	**40.96**	**KWA STPs- 17.5 MLD , 15MLD, and 10 MLD at Elamkulam**
				58.05			
					TOTAL	**99.08**	**102.00**

This DPR is prepared for sewerage system for Perandoor zone under IURWTS Project and 19 MLD STP at Perandoor. Separate sections for Sewage Treatment Plant and Sewer networks are added in this DPR along with a brief description of the various advanced technologies, advantages and disadvantages of Secondary treatment of STP, Technology recommendation for IURWTS project, Sewer network designs in line with the recommendations from M/s. CUBE IIT and KWA officials.

SECTION – II

SEWAGE TREATMENT PLANT
16.5 MLD SBR AT MUTTAR

4. Sewage treatment and Selection of appropriate technology

4.1 General

The objective of wastewater treatment is to remove pollutants from waste and to bring the quality of effluent to the desired standard. It is necessary to know the characteristics of raw sewage water, its mode of use or disposal of effluent to determine the degree of treatment required. Different types of treatments provide different percentage removal of BOD and suspended solids. In general treatments are classified as primary, secondary, and tertiary. The general yardstick for evaluating the performance of sewage treatment is the degree of reduction in BOD, COD, Suspended solids etc. Sewage treatment Plants are classified as ASP, SBR, MBBR etc base on the secondary or biological treatment technology

4.2 Primary Treatment

Any material that can enter the sewer lines through the sanitary system in the homes or through manholes on the sewer line or in any other manner will be delivered to the treatment plant. Such materials may include refuse of every type of garbage, rags, pieces of wood cans and children toys and other playthings. These materials would injure subsequent equipment, clog piping, or wrap around pump impellers and interfere with treatment process. The object of the provision of primary treatment is to provide protection to the subsequent treatment units and to enhance the efficiency of the treatment processes.

Primary treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease, and lighter solids float to the surface. The settled and floating materials are removed, and the remaining liquid may be discharged or subjected to secondary treatment. All sewage treatment plants should follow a process chain depending upon the technology chosen and the treatment capacity. In general, treatment is to be done in three stages. Specifications and treatment objectives at each stage of treatment are as follows. The preliminary treatment follows:

a) Three Stage Screening
   - 25 mm bar racks (before pumping) - Coarse screen channel
   - 12 mm bar racks -fine screen channel
   - 5 mm mesh (< 2 mm mesh to grit chamber
b) Aerated Grit Chamber if following unit operation is aerobic and Normal Grit Chamber if following unit operation is anaerobic.

Primary treatment is actually the pre-treatment which consists of separation floating and suspended organic and inorganic matters by physical process such as screening by which materials larger in sizes than the opening of the screening device is strained out and grit removal by which coarse particles of ash and other materials which have subsidence velocities substantially greater than those of organic putrescible solids are removed.

Screening is an essential step in sewage treatment for removal of materials which otherwise damage equipment, interfere with the satisfactory operation of treatment units or equipment. Screens is the first step in all treatment works.

A screen is a device with openings generally of uniform size for removing bigger suspended or floating matter in sewage. The screening element may consists of parallel bars, rods gratings or wire meshes, and the opening may be circular or rectangular shapes.

Coarse Screens are the bar screens comprised of vertical or inclined bars at equal intervals across a channel through which sewage flows. The size of the openings ranges from 75mm to 150mm. Medium bar screens have clear openings of 20mm to 50mm. Bars are usually 10mm thick and are rectangular or circular section. A weir on the side of the screen may be used as an overflow bypass. Fine screens are mechanically cleaned devices using perforated plates , woven wire cloth or very closely spaced bars with clear openings of less than 20mm. Grit removal is necessary to protect the moving mechanical equipment. Grit chambers are of two types. Mechanically cleaned and manually cleaned. Scrap blades or ploughs rotated by a motor drive. The grit washing mechanisms are also of several designs most of which are basically agitation devices using either water or air to produce washing action. The grit chambers must have sufficient storage capacity. A detention period of 60seconds is usually adopted.

Expected effluent quality after preliminary treatment: Primary sewage treatment removes 40%-60% of suspended solids and about 30% of organic matter. The quality of effluent is expected such that no floating materials including polythene bags, small pouches, etc. present in the sewage flow.

4.3 Secondary Treatment (Biological Treatment)

Secondary treatment is designed to substantially degrade the biological content of the sewage such as are derived from human waste, food waste, soaps, and detergent. Most municipal and industrial

plants treat the settled sewage liquor using aerobic biological processes. For this to be effective, the biota requires both oxygen and a substrate on which it live. The process is depicted in **Figure 7**.

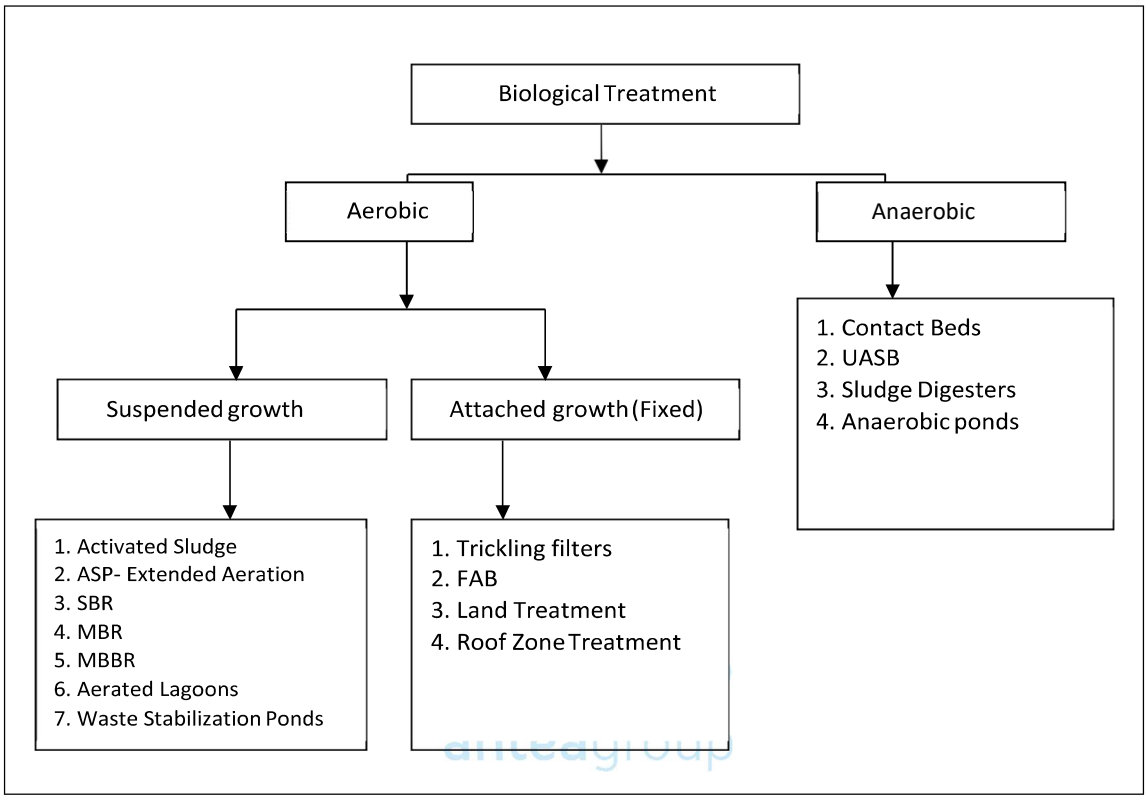

Figure 7: Biological treatment processes

There are several treatment systems that have been applied for sewage treatment and have their own merits and demerits. The strategy for wastewater treatment is to provide low-cost treatment with a robust process that considers local conditions. The overall objectives of biological treatment of sewage water are to transform or oxidise dissolved and particulate biodegradable constituents into acceptable end products and bind much of the less soluble fractions into flocs and to transform or remove nutrients such as nitrogen and phosphorus.

To select the feasible alternatives, the process requirements must be known. Apart from construction and running costs, factors that need to be considered in selecting appropriate processes include Effluent quality, Process complexity, Process reliability, Land requirements, Energy requirements, Sludge handling, Effluent Reuse.

The principal biological process for sewage treatment can be divided into two main categories; suspended growth and attached growth processes.

4.3.1 Suspended growth process

In suspended growth process the microorganisms responsible for treatment is maintained in liquid suspension by approximate mixing methods. Examples of suspended growth processes are: Activated sludge and its modification, Aerobic and anaerobic digesters, Up flow anaerobic sludge blanket (UASB Unit), Aerated Lagoon, Waste stabilization ponds etc. The most common suspended growth process used for wastewater treatment is activated sludge process.

The various treatment options considered to find out the techno-economically best suitable treatment scheme to suit wastewater and effluent characteristics, climate, and land constraints for the STPs in IURWTS project are as follows.

i. Up flow Anaerobic sludge Blanket (UASB) reactor
ii. Conventional Activated Sludge Process
iii. ASP with extended aeration
iv. Sequential Batch Reactor (SBR)
v. MBBR
vi. MBR/ FAB

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4.3.1.1 Up flow Anaerobic sludge Blanket (UASB)

The development of the up flow Anaerobic sludge Blanket (UASB) reactor dates back from early 1970's Pre-sedimentation, anaerobic wastewater treatment and final sedimentation including sludge stabilization are essentially combined in one reactor making it most attractive high-rate wastewater treatment option. In the Up-flow Anaerobic Sludge Blanket (UASB) process, the wastewater to be treated is introduced at the bottom of the reactor. The wastewater flows upward through a sludge blanket composed of biologically formed granules or particles. Treatment occurs as the wastewater comes into contact with the granules.

UASB initially was developed for the anaerobic treatment of industrial wastewater with a moderate to high COD and BOD concentrations. The basic idea is flocculent or granular sludge developed in the reactor depending on the wastewater characteristics and operational parameters will tend to settle under gravity when applying moderate upward velocities in the reactor. In this way no separate sedimentation basin is necessary. Anaerobic bacteria are developed in the reactor and are

kept in the biological reaction compartment for sufficient time. Organic compounds present in the wastewater are absorbed or adsorbed on the sludge particles in the reaction zone during its passage through the sludge bed. Organic compounds there after getting anaerobically biodegraded converting it into methane- enriched biogas and a small part into the new bacterial mass.

The BOD and SS requirements will not be met, and Additional treatment is necessary for UASB. The UASB/ FPU system is a 2-stage system in which the main degradation processes take place in the UASB system. The polishing of the UASB effluent takes place in the Final Polishing Unit (FPU), which has a hydraulic retention time of 1 day. The anaerobically stabilized sludge is dried and transported offside. The gas is used for energy recovery by dual fuel engines. The excess gas is flared.

4.3.1.2 Conventional Activated Sludge Process

The conventional Activated Sludge Process (ASP) for sewage treatment in widely applied in India and abroad. The process basically involves the aeration of settled sewage – mixed with return activated sludge in an aeration tank, the air being introduced into the liquid by either surface aerators or a diffused air system. The biomass generated in the aeration process is normally flocculent and settles out relatively easily, in secondary sedimentation tanks. The majority of this secondary, or activated, sludge is recovered to the aeration tank. The principal units required after screening include primary settlement tanks, aeration tanks, secondary settlement tanks and a pumping station for returned sludge and given in **Figure 8**.

The mechanism of the process is that the raw (or generally after primary treatment i.e., Screening, grit removal) sewage is separated in the aeration tank for few hours in which the microorganisms metabolize the soluble and suspended organic matter. Part of the organic matter is synthesized into new cells and part is oxidized into Carbon dioxide and water to derive energy. In the activated sludge system, the new cells formed in the reaction are removed from the liquid stream in the form of flocculent sludge in settling tanks. A part of this activated sludge is recycled to the aeration basin and the remaining forms the waste or excess sludge. The process is named activated sludge because it involves the production of an activated mass capable of aerobic stabilization of organic material in wastewater.

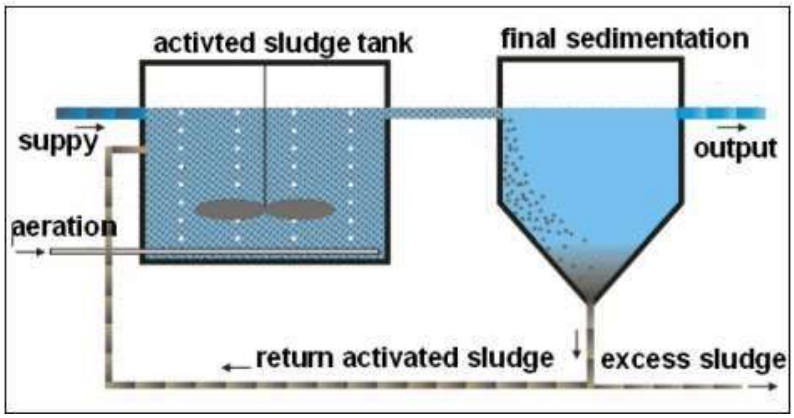

Figure 8: Flow diagram of Conventional activated sludge process

The suspended solid concentration in the aeration liquor, also known as mixed liquor suspension solids (MLSS), is generally taken as an index of mass of active microorganism in aeration tank. However, the MLSS will contain not only active microorganisms but also dead cells as well as inert organic and inorganic matter derived from the influent sewage. The mixed liquor Volatile Suspended solids (MLVSS) is also used and is preferable to MLSS as it eliminates the effect of organic matter. The aerobic and facultative bacteria are the predominant microorganisms which carry out the reactions of organic matter that is oxidation and synthesis.

The basic activated sludge treatment process consists of the three following basic components.

- A reactor in which the microorganisms responsible for treatment are kept in suspension and aerated.
- Liquid solid separation generally in sedimentation tank.
- A recycle system for returning the solids from liquid solid separation unit back to the reactor.

An important feature of activated sludge process is the formation of flocculent settleable solids that can be removed by the gravity settling in sedimentation tanks. In most cases activated sludge process is used in conjunction with physical processed that are used for primary treatment of wastewater, including the disinfection and possibly filtration

There are two types of mixing regime in aeration tank. When sewage moves down progressively along the aeration tank and remains unmixed with the rest of the contents of the tanks, it is called plug flow. When there is disposal of incoming sewage flow in the tank in which complete mix takes

place, it is termed as complete mix activated sludge (CMAS). Understandably in case of plug flow system, F/M and the Oxygen demand will be highest near the inlet of the tank, which then reduces gradually. In case of complete mix flow system F/M and Oxygen demand would remain uniform throughout.

Conventional system of treatment of sewage represents the methods adopted during early development of activated sludge process. The conventional system is always preceded by primary settling tanks. The plant itself consists of an aeration tank, a secondary settling tank, as sludge return line and an excess waste line leading to a digester.

In the conventional activated sludge process, sewage is mixed with sludge separated from previously aerated sewage sludge mixture. It is then aerated and settled. Part of the settled sludge is returned to the aerating tank, the excess sludge, not returned is wasted, The BOD removal in the process is 85 to 92 %. The plant employs a plug flow regime which is achieved by a long and narrow configuration of the aeration tank with length equal to five times the width.

The requirement of air in conventional system is high and there is slack of operational stability when there is variation in flow. Still for historical reasons, conventional treatment system is most widely used type of activated sludge process in the world over and so in our country also, particularly in case of large plants.

The activated sludge process produces a large quantity of unstable sludge that requires additional treatment before disposal. The most common method of sludge treatment for plants of more than 50,000p.e. is anaerobic sludge digestion. The methane gas produced during digestion is a potential source of energy.

4.3.1.3 Activated Sludge Process with extended aeration

The extended aeration system is modification of the conventional activated sludge process. The activated sludge plant with extended aeration employs a complete mix flow regime and the primary settling tank is omitted. The process employs low organic loading, long aeration time, high MLSS concentration and low F/M. The BOD removal efficiency is high up to 95 %. Due to long retention in aeration tank, the mixed liquor undergo considerable endogenous respiration and get well stabilised. The excess sludge does not require separate digestion and can be directly disposed of after dewatering. Also sludge production is a minimum.

The Oxygen requirement for the process is higher and the running cost is also therefore high. Filtration and sterilisation is required to meet the effluent standards for hygienic quality. However the operation is simple due to elimination of primary settling and separate sludge digestion. This method is suitable for medium and large cities.

The above 3 technologies (Activated Sludge Process (ASP), Waste Stabilization Pond (WSP), Up flow anaerobic Sludge Blanket (UASB) Reactor), were the earlier technologies used for sewage treatment plants.

Over the last two decades, a few newer treatment technologies have come into practice. The innovative technologies include Sequencing Batch Reactor (SBR), Moving Bed Biofilm Reactor (MBBR)/ Fluidized Aerobic Bioreactor and Membrane Bio Reactor (MBR) which are described in sub-sequent sections. These are widely used and have been approved for projects executed under JNNURM, AMRUT and NMCG program of Govt. of India considering their various parameters such as effluent discharge after tertiary treatment, capital cost, area requirement, operation maintenance cost (energy cost, repair cost, chemical cost manpower cost etc).

4.3.1.4 Sequencing Batch Reactor (SBR)

SBR technology is a variant of ASP technology. This is essentially a batch treatment process by combining, primary settling, aeration, secondary settling and decanting the treated sewage in a series of sequenced and or simultaneous reactions in the same basin on a time deferred cycle. Thus, multiple basins are used whereby when one basin is in one part of the cycle such as aeration, another tank will be settling and discharging the treated sewage in a cyclically repeated operation. High efficiency fine bubble non-clog membrane diffused aeration is preferred. Schematic diagram of Sequencing Batch Reactor process is presented in **Figure 9**.

A photograph of an actual plant is given in **Figure 10**.

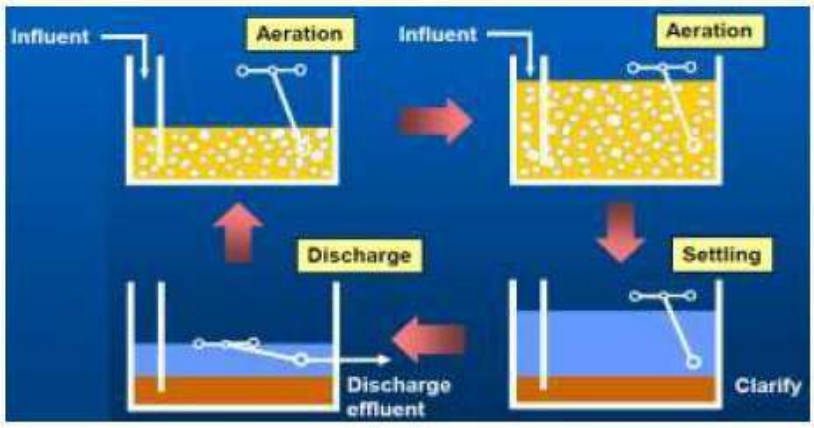

Figure 9: Schematic diagram of Sequencing Batch Reactor (SBR) process

Figure 10: Photo image of SBR technology plant

Advantages	Disadvantages
• Can remove N and P concurrent with BOD. • Absence of odour and corrosive gases. • Improved aesthetics. • Does not require separate secondary clarifiers and major return sludge. • pumping stations, good use of common walls, simple square, rectangular or circular structures, can reduce the footprint compared to conventional activated sludge process. • **Capability to manage and treat variable loading conditions, such as normal, diurnal, dilute monsoon, and shock loads.**	• No provision for sludge management. • No provision of primary treatment to moderate pollution load variations. • Higher energy input if used without bio-methanation. • Requires at least semi-skilled manpower. • Patented process technology and decanters defying local cannibalization.

• Less manpower due to automatic control and easy to operate and to maintain. • High quality effluent for reuse without separate nutrient removal and fine filtration. • Can be expanded as a modular system. • Can also be used with primary clarifiers and conventional F/M ratio for bio-methanation and energy recovery. • The system can generate a stabilized sludge. • Track record for treating 27 MLD diluted sewage at Haridwar and 11.5 MLD at Goa.	

4.3.1.5 Moving Bed Bio Reactor (MBBR)/ Fluidized Aerobic Bioreactor FAB

This technology is essentially the same as activated sludge except that the media suspended in the reactor offers additional surfaces for the microbes to grow and this in turn maximizes the growth of microbes in a given volume of aeration tank compared to the conventional aeration without the media and to that extent, it does appear preferable. Diffused aeration is of course needed. FAB technology is akin to MBBR except that instead of the media in suspension, the media is kept stationary and fluidized in the aeration tank. Schematic flow diagram of Moving Bed Bio Reactor process is presented in **Figure 11**.

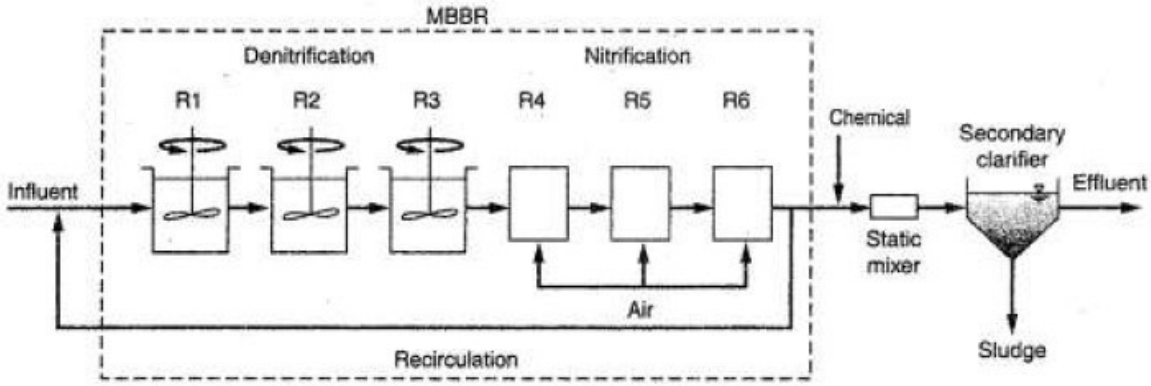

Figure 11: Schematic flow diagram of MBBR process

Advantages	Disadvantages
• There are no limitations of height as long as compressors can be suitably used. • Circular structures can be used to economize on construction costs & time. • The structures can be easily covered for indoor air quality when needed. • Requires lower footprints compared to conventional activated sludge. • Easy to operate and maintain.	• The area per unit volume of the media offered by various vendors are different and also each vendor advocates his own criteria for the relative ratio of volume of media to volume of aeration tank, which makes it difficult to bring about a common and validated standard design criteria. • The quality of plastic of media varies. • The verification of whether the media is moving about the entire volume of the tank or merely clumping at the top layers and if so the method of mixing it up through the tank volume without shearing of the biomass on it are issues of infirmity and which may need gentle movers of the media through the volume of the tank. • Furthermore, the media is a patented product. • Higher energy input if used without bio-methanation.

4.3.1.6 Membrane Bio Reactor (MBR)

The MBR is an important improvement of the widely used activated sludge process. Membranes replace the space consuming final clarifiers. This brings along quite a few important benefits. MBR is more compact. Not only do the membranes require a much smaller footprint, but the biomass concentration in the aeration tanks can also be 10 kg/m3, more than twice the concentration in activated sludge tanks. MBR provides better effluent quality. Depending on the design, very low effluent concentrations for BOD, COD, N and P can be obtained. The TSS concentration is virtually nil. Removal of micro-pollutants is usually better than activated sludge systems. MBR effluent is hygienically safe. The membranes are impermeable to bacteria and viruses. A schematic of the Bioreactor process is shown in **Figure 12**.

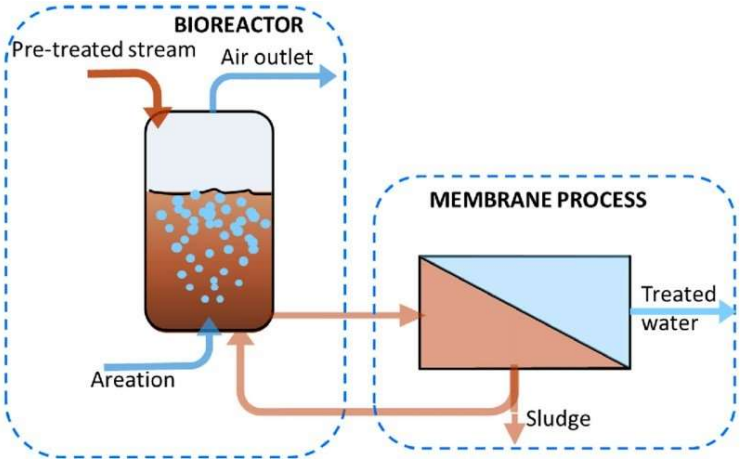

Figure 12: A schematic of the Bioreactor process

The MBR process requires extensive mechanical pre-treatment, for example with rotating sieves, in order to remove all material that can clog or wrap around the membranes. After pre-treatment, the wastewater enters an aeration basin that is very much identical to the ones found in common activated sludge process, but more compact. The basins may be compartmented in order to achieve nitrification and denitrification. Aeration takes place by common bubble aeration. The wastewater then enters the membrane tanks, where the effluent will pass the membrane pores. The sludge is returned to the aeration basin.

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Drawbacks of the MBR are its higher energy consumption and the sensitivity of the membranes to clogging. It requires skilled operation. The investment cost is higher than conventional activated sludge plants.

The result of effective primary plus secondary treatment is removal of about 90% of the organic matter, virtually all pathogens, and most solids. Between 10% and 20% of the nitrogen is also automatically removed because the decomposer bacteria require this much for their own growth.

4.3.1.7 Advantages and Disadvantages of selected technologies

The advantages and disadvantages of the technologies in vogue have been consolidated and comparison undertaken and is as given in **Table 7**.

Table 7: Advantages and Disadvantages of selected technologies

Technology	Advantages	Disadvantages
Conventional activated sludge	‣ small land requirement ‣ widely used and proven technology	‣ primary and secondary sedimentation required ‣ skilled operation necessary ‣ large quantity of unstable sludge produced ‣ high proportion of mechanical and electrical equipment necessary ‣ high energy consumption ‣ additional sludge treatment required
Sequencing batch reactor (SBR)	‣ small land requirement ‣ proven technology ‣ Capacity to handle shock loads ‣ relatively simple operation ‣ production of stabilized sludge ‣ Absence of odor and corrosive gases. ‣ Improved aesthetics. ‣ nitrogen reduction readily achievable ‣ moderate investment	‣ high proportion of mechanical and electrical equipment necessary ‣ high energy consumption ‣ medium construction cost ‣ skilled operation needed
Moving Bed Biofilm Reactor (MBBR/FAB)	‣ small land requirement ‣ robust process and proven technology ‣ relatively simple operation ‣ production of stabilized sludge	‣ Equalization tank is necessary. ‣ high proportion of mechanical electrical equipment necessary ‣ high energy consumption ‣ medium construction cost ‣ poor nitrogen reduction ‣ secondary sludge treatment required. ‣ Reliance on patented media
Membrane Bio Reactor (MBR)	‣ small land requirement ‣ production of stabilized sludge ‣ nitrogen reduction readily achievable ‣ disinfection of effluent	‣ very high proportion of mechanical and electrical equipment necessary ‣ complex operation (skilled personnel required) ‣ relatively new technology ‣ very high energy consumption ‣ very high construction cost

4.3.2 Attached growth processes

In attached growth process the microorganisms responsible for conversion of organic material or nutrients are attached to an inert packing material. Attached growth system (fixed film reactor) occurs naturally at any water solid interface as in solids lakes and river bottoms.

Their engineered forms are:

- Trickling filters
- Rotating biological contactors
- Submerged media beds (down flow, Up flow, and fluidized bed)
- Land treatment and infiltration system

4.3.2.1 Trickling Filters

Trickling Filters possess a unique capacity to handle shock loads and provide dependable performance with a minimum of supervision. The filter consists of a permeable bed of medium through which the sewage or liquid waste is allowed to percolate. The materials used as filter medium include crushed or broken rock, gravel, blast furnace slag or inert synthetic materials such as plastic and ceramics. Randomly packed solid media like rock gravel and slag are characterised by lower porosities (40% - 60%). The trickling filters may be generally circular but square or rectangle may also be used. The sewage is evenly distributed over filter medium, and the treated effluent is collected by the underdrains. The trickling filter is preceded by primary sedimentation so that settleable solids in the sewage may not clog the filter. The trickling filter serves both to oxidise, and bio flocculate the organic material in sewage and their efficiency is assessed on the total reduction in BOD effected through the filter and the subsequent settling tank, since the effluent quality is reckoned after the settlement of bio flocculated solids. Trickling filters My be categorised as low rate , high rate and super rate based on hydraulic and organic loading rates.

4.3.2.2 Rotating biological Contactor

Rotating Biological Contactor (RBC) is one of the relatively recent additions to the family of biological treatment devices. The RBC include low food to microorganism ration resulting in higher efficiencies of organic matter removal, low hydraulic retention periods minimizing tank volume and capital costs ,low head loss and lower power requirements , inherent simplicity. The RBC can be adopted for small and medium towns. The RBC consists of a series of closely spaced vertical discs mounted on a horizontal shaft rotating at low speeds normally less than 10 rpm. The disc being perpendicular to the wastewater movement in a cylindrical vessel. The discs also called bidiscs, support biomass and partially submerged in waste water.

The rotation of the disc causes the biomass to be alternatively submerged in wastewater to absorb food and to pick up a thin layer of waste water film to slide down the biomass. The basic process

flow sheet of waste water treatment system may consist of primary sedimentation following screening and grit removal, aerobic biological treatment in RBC unit and secondary settling for solid -liquid separation of sloughed film from treated waste water. The settled sludge from primary and secondary sedimentation has to be suitable treated and disposed.

4.3.2.3 Submerged media beds

Submerged media beds treatment is a process used to reduce the organic loading of residential and commercial sewage / wastewater, and in doing so will reduce the Biological Oxygen Demand (BOD) and a significant quantity of Suspended Solids (SS) which if otherwise untreated would contaminate river and sea outfalls, in other words it is used to substantially improve effluent discharge quality. Larger solids settle into the bottom of the primary tank and are removed periodically as sludge, and where other buoyant material which floats upwards is to be removed usually by a scraping/screening method. The biodegradable Organic Matter is degraded by the biomass on the media. The Submerged media process uses support media to retain an active biomass to reduce the influent BOD Levels. Tubular diffusers are used with the media giving a good air dispersal and low level of blockage due to growth of biological film.

4.3.2.4 Land treatment and infiltration system

Land treatment is the controlled application of wastewater to the land at rates compatible with the natural physical, chemical and biological processes that occur on and in the soil. The three main types of land treatment systems used are slow rate (SR), overflow (OF), and rapid infiltration (RI) systems. wastewater is applied to shallow basins constructed in deep and permeable deposits of highly porous soils. Wastewater application can be by flooding, or occasionally by sprinklers. Treatment, including filtration, adsorption, ion exchange, precipitation, and microbial action, occurs as the wastewater moves through the soil matrix. Phosphorus and most metals are retained in the soil while toxic organics are degraded or adsorbed. As wastewater percolates through the soil, it can be collected, or it can flow to native surface water or groundwater aquifers. Where the groundwater table is relatively shallow, the use of underdrains allows control of groundwater mounding and recovery of the renovated water. In areas with deeper groundwater, wells are used to recover the renovated water. This recovered water can be for irrigating crops or for industrial uses. This is known as “beneficial reuse.” Water that is not recovered can recharge groundwater aquifers. Requires long term commitment of a significant land area for treatment, with minimal secondary benefits such as

are possible with other natural treatment systems (i.e., crop or forest production, habitat enhancement, etc.).

However, fixed-film systems (Attached growth process) are more able to cope with drastic changes in the amount of biological material and can provide higher removal rates for organic material and suspended solids than suspended growth systems. Roughing filters are intended to treat particularly strong or variable organic loads, typically industrial, to allow them to then be treated by conventional secondary treatment processes. Characteristics include typically tall, circular filters filled with open synthetic filter media to which wastewater is applied at a relatively high rate. They are designed to allow high hydraulic loading and a high flow-through of air. On larger installations, air is forced through the media using blowers. The resultant wastewater is usually within the normal range for conventional treatment processes.

4.4 Tertiary Treatment

This treatment is done to polish the effluent received from secondary treatment units to improve the quality of effluent further for reuse. Tertiary treatment is needed only when such greater reuse of waste is contemplated or where the situation dictates the higher quality of effluent. Tertiary treatment may include processes like rapid sand filtration, carbon absorption, ammonia stripping, coagulation and flocculation and ion exchange etc. Evidently the cost of such a treatment is prohibitive and may hardly prove economically viable particularly in developing countries except in certain extremely critical situations.

In order to select the treatment method, cost factor is the prime consideration. The cost of the treatment plant would include the cost of installation, cost of maintenance and operation. The other factors which deserve consideration are cost of construction and maintenance, location, land availability and topographical conditions.

a) The various tertiary treatment processes are as under:
    1. Intermittent Sand filters
    2. Oxidation
    3. Rapid Sand filters

4.4.1 Intermittent Sand Filters

Intermittent sand filter is a specially prepared bed of sand or other fine material on the surface of which sewage is applied by a under drainage system. Primary and secondary treatments are the requirements before putting the effluent for tertiary treatment on sand beds. Quality of effluent is such that no subsequent treatment is required except disinfection or chlorine dosing. The demerit of this process is that it requires large area of land and considerable quantity of sand. It does not require constant skills of attendance and electrical/ mechanical energy for operation and maintenance. This treatment is suitable for small towns and institutions where discharge is not much. The rate of filtration is between, 20000 gallons to 50000-gallon/ acre/day, depending upon the quality of raw sewage for the treatment.

Quality of effluent of intermittent sand filter is very good. In a properly designed and operated plant, the effluent is clear, colourless, odour less and sparkling. It is completely nitrified, is suitable for irrigation and contains high percentage of dissolved oxygen. It has no settle-able solids, efficiency of removing the bacteria is between 98 to 99% B.O. D about 90% and suspended solids over 80%. The main drawback of this system is the huge area of land requirement, which makes the option very uneconomical as the cost of land is very high in urban areas.

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4.4.2 Oxidation

This can be divided into three categories.

i. Where the oxygen is recovered from atmosphere by the contact of sewage with atmospheric air and by sunlight. In this case large Area of land is required and is not suitable for big cities.

ii. Where Aerators are used for providing extensive air contact and to increase the probability of adding oxygen into the sewage. In this case also, large area of land is required and is not suitable for big cities.

iii. Aeration of sewage can be done by diffusion of air by perforated pipes and air compressor, this Process is widely in use, but it is economical up to the 1 MGD. Plant only. Further it requires skilled labour for its maintenance and operation, electrical/ mechanical energy is also required for the operation of this process. This process is not suitable.

4.4.3 Rapid Sand Filters

This process is suitable where primary and secondary treatment has been given to the sewage and B.O.D contents of sewage are reduced to less than 30, suspended solids, grease and floating material are also removed in secondary and primary treatment, the rate of filtration is this case is about 2 gallons per sq. ft per minute or 80 to 100 LPM/M2. The rate of filtration can further be increased up to 150 LPM/M2 by correcting the filter media by using coarser sand of effective size up to 1mm or by using dual media filters.

The rapid sand filter comprises of bed of sand serving as a single medium granular matrix supported on gravel overlying an under-drainage system. The distinctive feature of rapid sand filter compared to intermittent sand filtration is to treat the raw sewage carefully to reduce its BOD to less than 5, along with reduction of suspended solids. Further to effectively flocculate the colloidal particles, use of higher filtration rates and coarser but more uniform filter media to trap influent solids without excessive head loss and back washing of filter bed by reversing the flow direction to clean the entire depth of filter. Pre- treatment of filter influents should be adequate to achieve efficient removal of colloidal and suspended solids.

When water containing suspended material is applied to top of filter bed, suspended and colloidal solids are left behind in the granular media. Accumulation of suspended particle in the pores and on the surface of filter medium leads to build up of head loss as pore volume is reduced and greater resistance is offered to flow of water simultaneously with the build-up of head loss to a fore determined terminal value. The suspended solids removal efficiency of successive layers of filter medium is reduced as solids accumulate in the pore space and reach ultimate value of solid concentration, which results into breakthrough of suspended solids and filter quality deteriorates.

Effluent from the secondary treatment plant is pumped to the sump of Tertiary Treatment Plant (T.T.P). This effluent flows in the channel, and required quantity of coagulant (alum), lime and chlorine are mixed before the sewage passes through chute. Increase in the velocity in chute helps in mixing the coagulants in effluent. Thereafter this sewage enters into rapid mixing chamber, (flash mixer) where instantaneous mixing of coagulant is effected through a high speed stirrer. Thereafter this sewage enters into the flocculation chambers at different speeds. Here the flocks will be tendered at different speed to increase in size.

After this, flocculated water passes through the settling Tank. In settling tank most of the flocks settle down, then this decanted water is placed over the filter beds, and after filtration the effluent which is quite neat and clean is collected in collecting tank/ sump.

The sludge collected in flocculators & settling tank is drained out by hydraulic pressure and is collected in sludge tank from where it is pumped to Centrifuge /sludge digestion tank.

As a precautionary measure, a heavy chlorine dose @5mg/litre is added in the beginning of tertiary treatment. After pre-chlorination, alum dose @ 30-35 mg/litre, lime @25MG/litre is added as coagulant for flocculating and removing the suspended matter. After going through the entire process, the filtered tertiary treated water is again disinfected with chlorine dose @3 P.P.M. The effluent after tertiary treatment can achieve the following treatment level as given in **Table 8**.

Table 8: Effluent standards fixed after tertiary treatment

Total suspended solids	: Less than 1 mg/ltr
BOD	: Less than 5 mg/ltr
COD	: Less than 60 mg/ltr
Turbidity	: Less than 2 units
Color	: Less than 30 unit

4.4.4 Recommendations on Tertiary Treatment

For many reasons, tertiary treatment is applied with reservation at present. Some of the reasons are:

1. Psychological attitude of public towards reuse of sewage.
2. Public health conditions also come into hindrance.
3. Economic viability.
4. Public discourage in use of reclaimed waste for agriculture.

In India rarely Tertiary Treatment Plants have been constructed and hence it is recommended that Tertiary Treatment Plants can be added later on in future keeping in view availability of land and funds. Since the final effluent from the proposed STP based on SBR technology will be well within the SPCB accepted standards for discharge into water bodies no tertiary treatment is necessary and as such not included in the project. There are no major industries which can utilize treated effluent in the project area or nearby locations.

For discharging into the nearby waterbodies, the wastewater after secondary treatment of SBR technology need not require any tertiary treatment. For supplying to nearby industries and agricultural and irrigation purposes, the quantity proposed for such industrial and agricultural/irrigation demand in the surrounding area shall be arrived. The sand filter shall be provided with piping and a collection reservoir. Since KWA is nodal agency for pipe water supply for industrial demand, a new industrial water supply scheme may be proposed with source of water as treated wastewater. The drinking water service level can also be improved by sparing the present industrial water supply to drinking water supply.

4.5 Treated Sewage Recycle & Reuse / Disposal System

The reuse and recycling of sewage is defined as the percentage of sewage recycled or reused after appropriate treatment in gardens and parks, irrigation, etc. and, is to be at least 20% to begin with.

The treated sewer can be discharged into a stream river, or it can be used for:

a) Irrigation of green spaces such as parks, golf courses etc.
b) Ground water recharge if sufficiently clean
c) Restricted irrigation of fields where crops can be grown keeping in view the parameters of effluent.
d) Industrial units
e) Domestic use for flushing etc.

The STP sites under IURWTS project are in areas where there are no inhabitants in a radius of 50m from the boundaries of the STP sites and there are no paddy fields nearby. Any kind of industrial units are also not existing in the vicinity of the proposed STP sites. Hence for irrigation of lawns, domestic use of flushing and for use in industrial units, the effluent must be pumped, and distribution system has to be laid which becomes a very costly affair. Proper maintenance for this additional component is also required. Moreover, the ground water is available in sufficient quantity and the same is used economically for the above-mentioned uses.

In general, public of IURWTS catchment are not inclined to the concept of wastewater recycling within the community. The only option left is restricted irrigation in fields and that too only during dry seasons. During rainy season, there is no alternative except disposal of effluent in the nearest water bodies as per prescribed effluent standards. The economic considerations are necessary

because, when “first-hand” water is available at a cheaper price, it may not be worthwhile to reuse wastewater, unless there are other special conditions.

Despite a long history of wastewater reuse in many parts of the world, the question of safety of wastewater reuse remains an enigma mainly because of the quality of reuse water. There always have been controversies among the researchers and proponents of extensive wastewater reuse, on the quality the wastewater is to meet. In general, public health concern is the major issue in any type of reuse of wastewater, be it for irrigation or non-irrigation utilization, especially long-term impact of reuse practices. It is difficult to delineate acceptable health risks and is a matter that is still hotly debated.

Considering the wide-ranging potential for wastewater reuse, it may be difficult to set some common quality standards for all types of reuses. Many countries in the world do not have detailed standards or guidelines for recycle and reuse of wastewater. Standards or guidelines for other possible reuses such as groundwater recharge, industrial uses etc., are not common, mainly because such types of reuses are not widespread.

For many countries in Europe, follow either the guidelines of World Health Organization (WHO) or the US Environmental Protection Agency (USEPA) standards form the basis for any decision or for granting permission to any kind of reuse. Countries like old USSR, Israel and Tunisia have developed their own standards for reuse.

The Government of Karnataka has issued an official directive to take all necessary steps to ensure that only tertiary treated sewage is used for non-potable purposes, like all gardening including parks, resorts, and golf course. In major metropolitan cities like Delhi, Mumbai, Bangalore, and Chennai treated grey water is being used for toilet flushing in some of the major condominiums and high-rise apartment complexes on a pilot scale. In this case, care should be taken to ensure that Ultra filtration membranes are used in the treatment process to safeguard against chances of waterborne diseases.

The only solid waste from the plant is the biological sludge cake. This is used in the root zone of trees in the greenery as a soil filler/organic fertilizer. The quality of the blended discharge for greenery meets the requirements of pollution control.

4.6 Recommendation of sewage treatment plant for IURWTS project

Amongst the recent advanced anaerobic / aerobic treatment processes, processes with reactors such as MBBR, SBR (Sequential Batch Reactors) etc. are being tried. The footprint areas of such processes are lesser as compared to conventional activated sludge process, but their capital cost, process energy requirements as well as operation and maintenance costs are generally high. Such processes have however the advantage of consistent better quality of treated effluent. SBR Technology is amongst one such emerging technology which has the advantage of low footprint area with low sludge production and better effluent quality (BOD < 15).

With the development of simple inexpensive logic controllers (PLC) and the availability of level sensors and automatically operated valves, the sequential batch reactor process (SBR) becomes more widely used. Dissolved Oxygen levels, air flow rates to basin, growth of micro – organisms, decanting rates, etc. are controlled, monitored online, and are adjusted automatically based on varying incoming flow and organic load conditions. This offers consistent and optimized performance of plant with excellent outlet quality even under varying incoming conditions.

Because of the dual function of the SBR tanks, civil construction costs and plant area are lower than for conventional activated sludge. There is a lower requirement for mechanical equipment compared to conventional activated sludge but, against this, the process control system is normally automated and requires extensive use of motorized valves, timers, programmable logic controllers or computers, and other devices. Operation of the system with automated control is relatively easy but skill is needed to adjust the system to cope with changes in loads or wastewater characteristics. Moreover, the absence of odour and corrosive gases added to its advantage and will have a good aesthetics.

In recent years SBRs are used for sewage treatment in large cities in many parts of the country. At present more than 24 STPs are in operation and 7 plants are under construction in various states of India.

Comparative analysis of SBR and MBBR technologies has been undertaken by General Consultant based on report publishes by institutes of excellence, Private consultants, government stake holders.

A detailed analysis has been undertaken and based on the findings published by these institutes and researchers, SBR technology was recommended for IURWTS catchment by the General consultant

(GC). A technical report has been submitted to the client (KMRL) on 27-11-2020 titled "Selection of appropriate technology for sewage treatment plants for IURWTS Catchment" attached as **Annexure 9** of this report.

The most adaptable technology chosen for IURWTS catchment is Sequential Batch Reactor (SBR). This is based on the land constraints, and Cost of land in Kochi city, Effluent quality and operation and maintenance, skill requirements and cost of O&M.

5. Profile of IURWTS Catchment

5.1 Base line Status

5.1.1 Climate and Rainfall

The rainy months in this catchment is during May, June, July, August, September, October, and November. On an average, June is the wettest and January is the driest month. The average decadal amount of annual precipitation in Kochi (1974-2013) is 2885.94 mm. The highest daily rainfall recorded in Kochi in two consecutive year 2018 is 172.9mm and in 2019 it was 197. 60mm.The average daily humidity of Kochi is estimated as 85 percent. The annual variation in temperature is between 22^0 C to 33^0 C. Temperature increases after February. March and April are generally the hottest months. In the interiors, the day temperature may be a little higher than the coastal region. Winds are generally light to moderate with some increase in force in the summer and monsoon seasons.

In the Southwest Monsoon season the winds are mainly Westerly or North-easterly. During rest of the year winds are North –easterly in the morning and from between South-West and North-West in the afternoon. The average annual rainfall is reported as 3014.8 mm, and most of which is received in the period from May to October under the influence of south-west monsoons. June and July are the wettest months of the year, accounting for more than 50% of the annual rainfall. On an average, there are 124.1 rainy days in a year. The average monthly rainfall and rainy days recorded at IMD station Cochin is summarized in **Table 9.**

Table 9: Rainfall statistics of IURWTS catchment

Month	Rainfall (mm)	No. of Rainy days
January	24.3	1.1
February	27.1	1.2
March	45.0	2.6
April	113.1	6.9
May	284.5	11.0
June	700.3	23.0
July	575.5	22.8
August	378.8	19.0
September	310.3	13.4
October	366.6	14.2
November	150.4	7.2
December	39.0	1.8
Total	**3014.8**	**124.1**

Source: IMD data, 2019

5.1.2 Geomorphology and soil

The IURWTS catchment fall mainly in the Coastal low land and very limited area in the mid lands of Ernakulam district. The general elevation of the catchment lies from 7.5m to 1m above MSL from east to west. The IURWTS catchment is surrounded by backwaters of Kochi lagoon and low-lying wetlands. Five main canals and several sub drains crisscross the catchment. All the canals and sub drains reaching the main canals are in a dilapidated stage.

5.1.3 Ground water fluctuation

The depth of water level in the western part of the catchment is less than 2mbgl in general and the eastern parts the water table ranges between 4 to 4.5mbgl. When the catchment was in a saturated condition bore logs were taken by the General Consultant and the level of the water table below ground level is given in **Table 10** and **Figure 13**.

Table 10: Geotechnical Investigation data by FUGRO 2020

Sl. No.	Location ID	Field Activity Dates		Coordinates		RL (m CD)	TD (m)	Borehole Water Dept (m wrt CD)
		From	To	Easting (m)	Northing (m)			
1	EDC-LBH-01	24/07/2020	28/07/2020	642701.00	1110401.00	1.670	33.52	-0.730
2	EDC-LBH-03	20/08/2020	22/08/2020	642685.00	1110084.00	1.895	32.05	1,895
3	EDC-LBH-04	14/08/2020	17/08/2020	643005.70	1109340.70	1.780	21.40	0.380
4	EDC-LBH-05	26/07/2020	28/07/2020	643510.00	1108449.00	2.760	26.55	-2,340

Sl. No.	Location ID	Field Activity Dates		Coordinates		RL (m CD)	TD (m)	Borehole Water Dept (m wrt CD)
		From	To	Easting (m)	Northing (m)			
5	EDC-LBH-06	30/07/2020	02/08/2020	643658.00	1108265.00	3.945	28.05	2.445
6	EDC-LBH-07	03/08/2020	05/08/2020	643722.00	1107924.00	2.535	24.05	0.935
7	EDC-LBH-08	30/07/2020	03/08/2020	643723.00	1107873.00	4.430	29.05	1.180
8	EDC-LBH-09	11/08/2020	13/08/2020	644677.00	1106858.00	4.360	23.05	-0.440
9	EDC-LBH-10	05/08/2020	10/08/2020	645831.70	1105694.70	4.440	35.08	0.140
10	EDC-LBH-11	02/08/2020	05/08/2020	645838.00	1105391.00	1.035	16.58	0.585
11	EDC-LBH-13	11/08/2020	13/08/2020	645550.30	1104709.00	1.495	30.00	-0.605
12	EDC-LBH-14	10/08/2020	14/08/2020	645487.00	1103769.00	3.550	35.70	-0.750

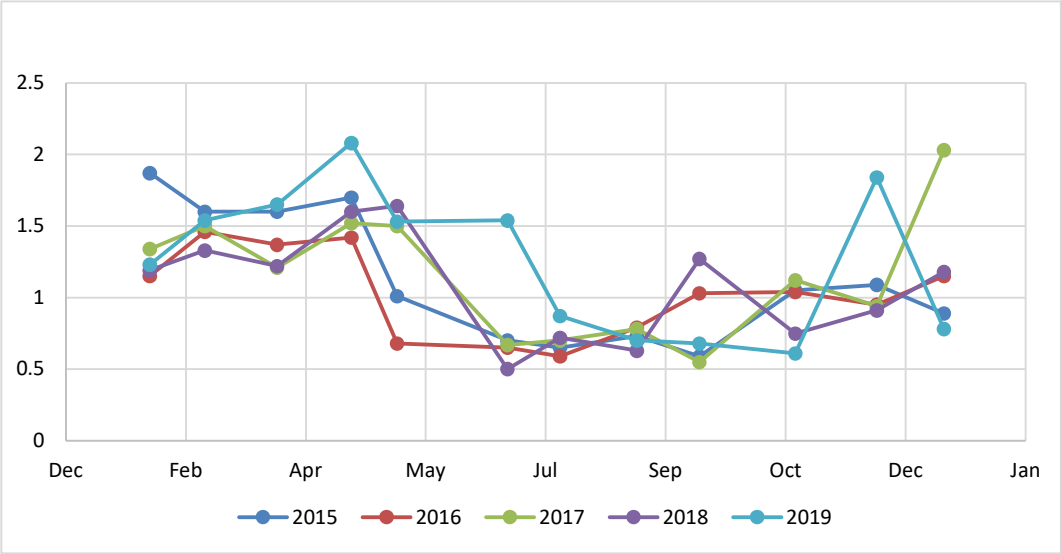

Figure 13: Ground Water Variation in project command

5.1.4 Geology

The geological succession of IURWTS Edappally catchment is as follows,

- Recent sediments (Alluvium, Teri's, Brown sand etc.), Mud banks Laterite.
- Achaean – Basic Dykes, Charnockites, Gneisses.
- The entire western part is covered by recent sediments.

5.1.5 Land Use

As per the land use survey undertaken by Department of Town and country planning (2009)3, the general land use of Kochi corporation is followed. Edappally south catchment corporation limits has

residential area (73%), commercial (3%), Public and semi-public area (6.5%), Industrial area (2.50%), Transportation (8%), Parks and open spaces (1%), unclassified area (5.75%), Agriculture (0.25%).

The land use pattern for Kochi corporation is as given **Table 11**.

Table 11: Existing land use (2009)-Kochi Corporation

SL. No.	Land use category	Land area in Ha	Existing %(Gross)	Existing % (Net)
1.	Residential	5040.93	53.13	73.07
2.	Commercial	211.64	2.23	3.07
3.	Public & Semi public	444.8	4.69	6.45
4.	Industrial	173.5	1.83	2.51
5.	Transportation	553.58	5.83	8.02
6.	Park & Open spaces	66.68	0.7	0.97
7.	Other (SEZ and Unclassified area)	397.3	4.19	5.76
8.	Paddy land / Wet land	441.02	4.65	
9.	Agriculture/Dry Cultivation	10.22	0.11	0.15
10.	Water bodies	2148.33	22.64	
	Total	**9488**	**100**	**100.00**

Source: Land use survey updated by the Department of Town and Country Planning in 2009

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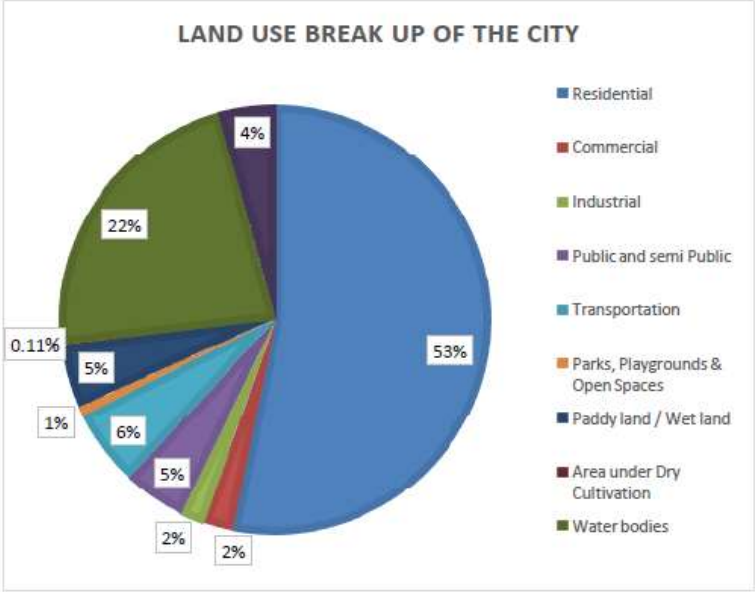
Land use pattern for Kalamassery municipality is as given in **Table 12**.

Table 12: Existing land use (2009) - Kalamassery Municipality

Sl. No.	Land use category	Land area in Ha	Existing % (Gross)	Existing % (Net)
1.	Residential	1176.23	43.56	52.61
2.	Commercial	26.87	1.00	1.20
3.	Public & Semi public	405.55	15.02	18.14
4.	Industrial	385.1	14.26	17.22
5.	Transportation	195.55	7.24	8.75
6.	Park & Open spaces	1.42	0.05	0.06
7.	Hazardous	0.8	0.03	0.04
8.	Paddy/ Wet land	430.41	15.94	
9.	Agriculture/Dry Cultivation	44.28	1.64	1.98
10.	Water bodies	33.79	1.25	
	Total	**2700**	**100**	**100.00**

5.1.6 Land environment

The characteristic feature of the land utilization pattern in the Kochi City is the predominance of water bodies and wetland. A pictorial representation is given below in **Figure 14**.



Source: ENVIS Newsletter Volume IV (1), January - March 2015

Figure 14: Land use break up of Kochi city

5.1.7 Water Quality of the IURWTS canals

The water samples from various locations were collected where the canal is found to be stagnant, at locations where there was change in canal characteristics, near identified sources of pollution etc. The physical, chemical, and biological parameters have already been analysed in NATPAC DPR (2018) in detail. To validate the findings in the NATPAC report (2018), ANTEA GROUP has arranged a separate NABEL accredited agency in March 2020 for undertaking water quality studies. The water sampling locations are provided in **Figure 15**. Detailed water quality study will also be undertaken again as part of the Environmental impact assessment process also.

The studies undertaken as part of the NATPAC DPR (2018) has brought out high nutrient content at most of the studied stations in Cochin back water. They have related this high nutrient condition to available under water vegetation in the region. Assimilative capacity of inshore waters of Cochin was also assessed using data on hydrography and averaged for a period of three years. Results have revealed that in the estuary, total suspended sediments and cadmium have reached critical level while copper and lead concentration has attained level of caution.

The pH value in the samples were observed within the limits of BIS water quality standards for surface water sources. High values of pH at Market canal were observed due to stagnant water and discharge of market waste into the canal. The fish market liquid and solid waste are directly discharged into the canal resulted the maximum concentration of TDS at Thevara bridge sample. The maximum and minimum concentration of turbidity was recorded at NH road bridge of Edappally canal and Thevara bridge of Thevara canal. The concentration of conductivity, total hardness, chloride, sulphate, nitrate, calcium, and magnesium are well within the limit specified in the BIS standards. The concentration of conductivity, total hardness, chloride, sulphate, nitrate, calcium, and magnesium were maximum at Thevara bridge sample of Thevara canal.

Due to the absence of tidal movement the canal is heavily silted and discharge from fish market right bank of the canal results the higher concentration of above pollutants. It is observed that the iron concentration at all sections of the canals are well beyond the permissible limit. E- Coli index at all samples are well beyond the permissible limit for drinking water standards and it is not fit for drinking purpose at any cause.

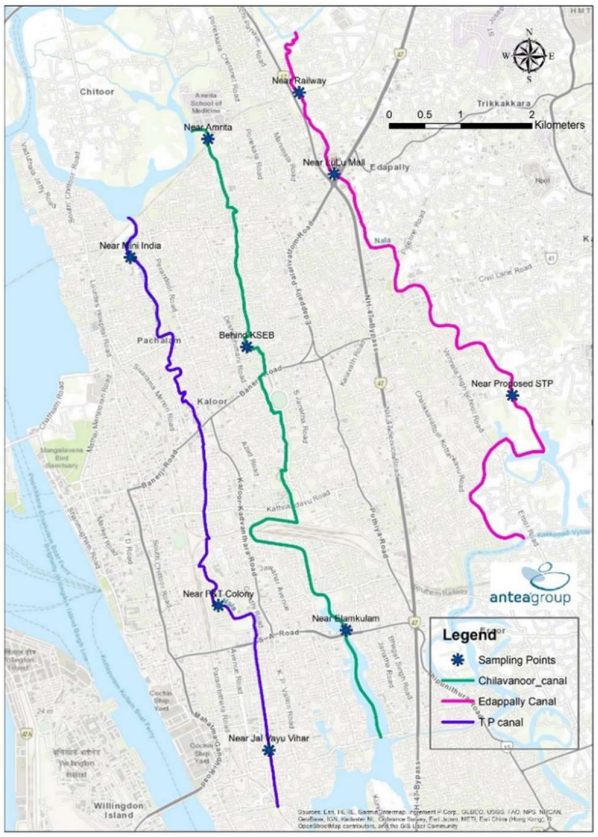


Figure 15: Water sampling locations in IURWTS canals

6. Sewage Treatment Plant (16.5 MLD SBR) at Muttar

As a component of sewerage system of IURWTS Project, originally Muttar STP was proposed for 7 MLD capacity for treating North Catchment of Chilavanoor Canal and Edappally Canal. When the DPR submitted for vetting by CUBE IIT, they strictly instructed to fix the sewer load and treatment capacity of individual STP based on projected population for 30 years from a base year of 2025 and the data should be sourced from an authenticated agency.

Based on several discussions and meetings with KMRL, CUBE IIT , the vetting agency and KWA the nodal agency for Sewerage schemes in Kerala, the treatment capacity of Sewage Treatment Plant at Muttar was finalized as 16.5MLD. The calculated sewer load from IURWTS project catchment area (which includes zone 2 and zone 4 Edappally and Chilavanoor canal north catchment) is 14.03 MLD.. The left-out potions proposed to convey to Muttar under KWA generating a sewer load of 2.10MLD. The total treatment capacity of Muttar is thus estimated as 16.50 MLD. Hence the DPR for Muttar sewer is being revised according to the directions of CUBE and KWA for the above mentioned sewer load. The land area of 1.23 Hectares is proposed for the construction of STP and its other ancillary components, green belt etc.

This DPR includes the construction of 16.5 MLD STP at Muttar and Sewer network of IURWTS Project area in north catchment areas of Edappally canal and Chilavanoor canal. Blocks are regrouped and designed. The STP is designed for ultimate sewer load in the year 2055. The civil structures are designed for 30 years of design period and electromechanical items were designed for 15 years for economy and for proper functioning of sewerage system.

The site for Sewage Treatment Plant is located at Muttar at the tail end of Edappally Canal It lies at 10°2’31.66” N and 76°18’5.25” E. The land is having plane topography and the ground water table is at a higher level. The bearing capacity of the soil strata is very poor. The location being a part Ernakulam District experiences more or less uniform temperature throughout the year. The major rainfall is from Southwest monsoon which contributes 63% of the annual rainfall. The site has an extent of 1.23hectares. The existing corporation road River side Road in the northern side of STP site is the access to the proposed plant site.

The technology option selected based on parametric analysis of different technologies is SBR based STP which is an emerging technology is gaining acceptance among various water and wastewater

authorities of different states. The physical and financial advantages of this technology are detailed in previous chapter.

In Kochi, the land cost is very high and location of STP shall be that it shall not cause any unhealthy conditions to the inhabitants of the surrounding area. In view of this for minimising the land area and the standard effluent characteristics SBR technology is found most suitable. The system adopted has much fewer moving parts inside the bioreactor. This gives the advantage of continuously running the bio-reactor system, under widely fluctuating conditions. It is also to be mentioned that required pumps / blowers and centrifuges are manufactured in India only, and hence there is no problem of availability of spares. All the maintenance on the mechanical systems can be done with normal skilled mechanics available.

The system is unique in operation, such that, only inlet and outlet parameters (i.e. raw sewage BOD / COD / TSS and treated sewage BOD / COD / TSS etc.) need to be analysed. The outlet BOD of the reactor system being very low (in other words, hardly any food is available to the E-coli), most of the coli forms are killed in the reactor itself. Remaining coli form is killed by nominal chlorine dosing. The treated sewage outlet coli form count will conform to WHO standards, with such low chlorine doses. This will also ensure that there is not much residual chlorine. This makes the system more suitable for the disposal in to surface waters without any detrimental effect on aquatic life. The generated sludge volume, fully stabilized, is reported to be much lesser than that form other technologies.

6.1 Design Scheme Capacity

The object of sewage treatment is to stabilise decomposable organic matter present in sewage so as to produce an effluent and sludge which can be disposed off in the environment without causing health hazards or nuisance. Hence for designing a sewage treatment plant, it is essential to analyse the sewage quantity and raw sewage characteristics and desired quality of the effluent.

The design of a Sewage Treatment Plant is based on the coverage area population raw sewage characteristics, Treated effluent standards etc.

6.2 Covered area

The proposed STP at Muttar is for sewage treatment of areas of Zone 2 (Edappally north catchment), Zone 3 (Chilavanoor north catchment) which includes catchment area of 8.92 sq.km.

The sewer network for Edappally north catchment starts from NH544 near Lulu mall and ends at Muttar and having a flow direction in the South-North. The left bank of Edappally north catchment includes a portion of Kochi corporation comprising an area of 1.492 sq.km. East bank of the canal includes a portion of Kalamassery municipality, having an area of 2.529 Sq.km. The sewer network caters to 3 Divisions (37,35,36) of Kochi Corporation and 8 wards (40,39,38,41,36,34,35,37) of Kalamassery Municipality. As per 2011 census the population of Edappally north catchment is 30463 and as per 2055 census the projected population is 41362. The estimated sewer load for Edappally north catchment is 7.49 MLD. Provision for Household sewer connection for 6241 is also included.

The sewer network for Chilavanoor canal north catchment starts from Kaloor JLN stadium and ends at Puthukkalavattom and having a flow direction towards South -North. The left and right bank of Chilavanoor north catchment includes a portion of Kochi corporation comprising an area of 4.92 sq.km The sewer network caters to 7 Divisions (33,34,35,36,39,70,71,72) of Kochi Corporation. The total sewer network area for the Zone 4 is 4.92 sq. km. As per 2011 census the population census of Chilavanoor north catchment is 27954nos. and as per 2055 census the projected population is 36173nos. and the density of population as per 2011 is about 6775 persons/sq.km. The estimated sewer load for Chilavanoor north sub-catchment is 6.54 MLD. Provision for 6540 household sewer connections is included.

A portion of Puthukkalavattom (Division 34) under Perandoor zone-5 and Zone 3 (Chilavanoor) is having a population of 2620 as per census 2011 included in KWA area. The ultimate load of this area is 0.62 MLD for the projected year of 2055. It is proposed to convey to Muttar STP and hence is included in treatment capacity of Muttar STP. Also the left out portion of IURWTS project command in Kunnumpuram ward generating a sewer load 1.48MLD in the projected year of 2055 is also taken into account, while finalising the Muttar STP capacity.

There is no existing sewerage scheme in Zone 2 or Zone3 of IURWTS Project. Hence a new sewerage scheme is proposed to cover the catchment area which comprises sewer network, Manholes, lifting manholes, and a sewage treatment plant of sufficient capacity, location of which is identified at Muttar at the northern tail end of Edappally Canal.

Actual treatment capacity of Muttar is 16.5MLD including sewer load in the left out portions of IURWTS project area, which is included in KWA area.

6.3 LiDAR survey

LiDAR survey was undertaken in an Area of Interest (125m on either side from the centreline of the canal) and the control points were established through topographical survey using RTK DGPS at regular interval along the corridor in the catchment. The STP site at Perandoor falls in this corridor. The contours generated at 0.25m interval is as given in **Figure 16**.

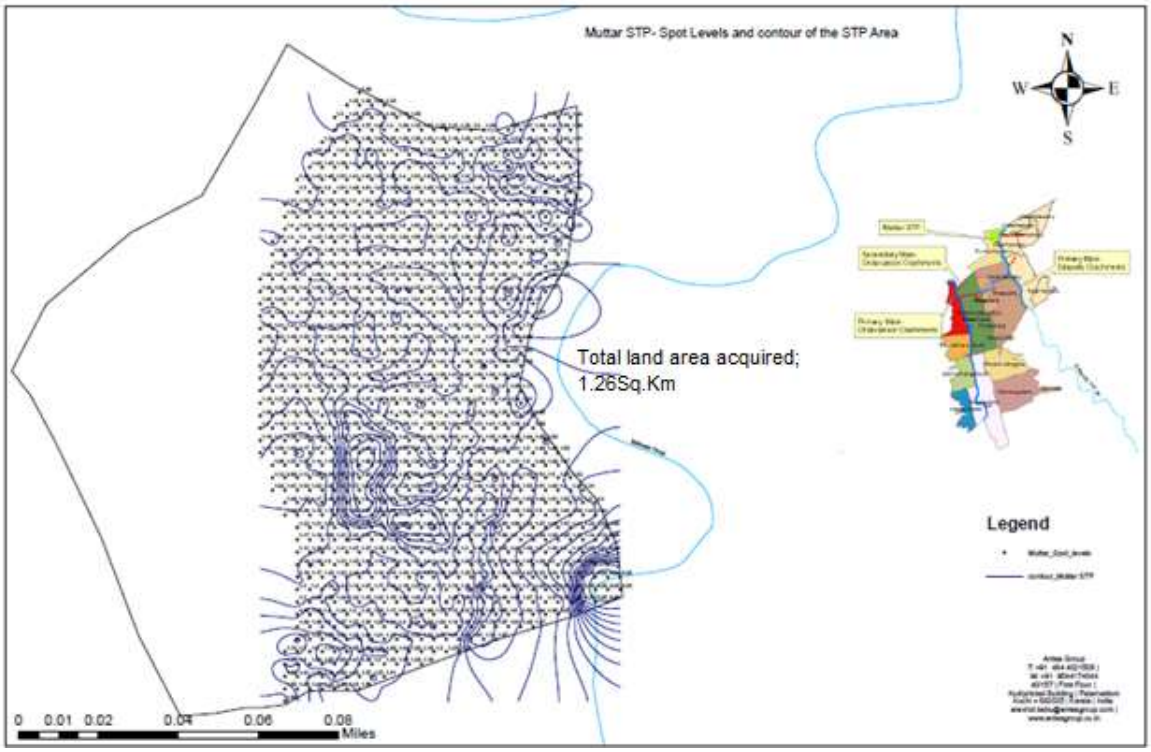


Figure 16: LiDAR survey showing the contours at Muttar STP location

6.4 Sullage water Quality

Sullage water samples from the all the canals were taken and parameters like BOD, COD, TSS, Total nitrogen etc were analysed. The water quality test results is given as **Annexure 2.**

6.5 Ground water table and its seasonal variation

The ground water levels were procured from the State Ground Water department in 2020 for both open wells and tube wells and the water level details are as given in **Annexure 3**. The water level ranges from 1-13m.

6.6 Geotechnical investigation

Geotechnical investigation was undertaken at the Muttar STP site, and the bore log details summary is given as **Table 13** and is detailed in **Annexure 4**. The foundation for the STP site was designed based on the bore log details and also the safe bearing capacity and other soil parameters estimated.

Table 13: Geotechnical Investigation at Muttar STP location

SL NO	BOREHOLE LOCATION	COORDINATES		LHS / RHS	LBH/MBH
		LATITUDE	LONGITUDE		
1	Muttar Bridge	10° 2'36.61"N	76°18'11.54"E	RHS	LBH
2	Muttar STP	10° 2'35.62"N	76°18'3.74"E	RHS	LBH
3	Indiraji Bridge	10° 2'22.56"N	76°18'7.24"E	RHS	LBH

6.7 Design Period

The design criteria to be followed for design of sewage collection, transportation and treatment system for the project are based on the recommendations laid down in the CPHEEO Manual of Sewerage and Sewage Treatment (Ministry of Urban Development, Government of India, 2013) and as per provisions laid down in the relevant I.S. codes and Consultants' past experience in related field.

Sewerage treatment plant, like Sewerage Scheme is normally designed to meet the future requirement of a stipulated design period. This period, with regard to certain components of the project, depend on their useful life or the facility for carrying out extensions whenever required, so that expenditure far ahead of its utilization is avoided and capital expenditure incurred on the project does not remain idle due to underutilization of these facilities. For the purpose of designing this system, a 30 year project period has been considered as given in **Table 14**.

Table 14: Recommended design period for sewage components

Sl. No	Component	Recommended Design Period (in years)	Remarks/ Clarification
1	Sewer Network (Gravity Collection System)	**30**	The system will be designed for the prospective population of 30 years, as its replacement is not possible during its use.

Sl. No	Component	Recommended Design Period (in years)	Remarks/ Clarification
2	Pumping Stations (Civil Works)	**30**	Duplicating machinery within the Pumping Station would be easier/ cost of Civil Works would be economical if executed once for full design period.
3	Pumping Machinery	**15**	Life of Pumping Machinery is considered as 15 years as per practice/ guidelines
4	Conveyance System	**30**	Provision will be kept for the entire design period, as its' phasing/ replacement is not possible during its use
5	Sewage Treatment Plant	**30**	The plant will be designed in modules for immediate stage and ultimate phase
6	Effluent disposal system	**30**	
7	Land Acquisition	**30**	Land requirement will be worked out for the ultimate stage

In this project, the sewerage scheme is designed for a period of 30 years from the base year. Hence the population is projected to the year 2055 based on the census population 2011 with the base year 2025 and the sewage load generated for the intermediate year of 2040 (after 15 years) and the ultimate year of 2055 (after 30 years) is analysed for the design of STP.

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6.8 Population Projection and sewer load calculation

The design population should be estimated by paying attention to all the factors governing the future growth and development of the project area in the industrial, commercial, educational, social, and administration spheres.

6.8.1 Population Projection for Muttar sewer covered area

Different methods are available in manuals to forecast the population of the catchment in order to assess the Sewer load catering to a specific STP. They include,

1. Arithmetic progression method
2. Geometric projection method
3. Incremental increase method
4. Growth method
5. Graphical methods

The population data as per KWA certified master plan has been used for the sewer load estimation.

6.8.1.1 Arithmetic progression method

This method is on the assumption that the population increases at a constant rate

$$dP/dt = \text{constant} = k$$

$$P_t = P_o + kt$$

Applicability

- This method is applicable to large and established cities
- It will give lower population estimates that actual values if used for small, average, and comparatively new cities.
- In this method the average increase in population per decade is calculated from the past census record. This increase is added to the present population to find out the population of the next decade.

6.8.1.2 Incremental Increase Method

This method assumes that the growth rate is progressively increasing or decreasing.

$$P_t = P_0 + kt + \{t(t+1))/2\} * I$$

Where ,

P_t= Projected population

P_0=Present population

K= Average increase of the decades chosen

t = time period chosen for projection

I is the incremental increase

This method is suitable,

1. To cities of moderate size and age
2. The population for a future decade is worked out by adding the mean arithmetic increase to the last known population as in the arithmetic increase method, and to this is added the average of incremental increase.

6.8.1.3 Geometric projection method

In this method, the percentage increase is assumed as the rate of growth and the average of the percentage increase is used to determine the increment in future population. This method gives a much higher value and is applicable to growing towns and cities having a vast scope of expansion.

6.8.1.4 Growth method

In this method, it is assumed that the rate of percentage increase decreases, and the average decrease in the rate of growth is calculated. The percentage increase is modified by deducting the decrease in the rate of growth. This method is applicable only to those cases where the rate of growth of population shows a downward trend.

6.8.1.5 Graphical methods

There are two methods: in the first method, only the city in question is considered; and in the second method, other similar cities are taken into account.

6.8.1.5.1 Graphical method based on single city

In this method, the population curve of the city (i.e., the population vs. past decades) is smoothly extended for obtaining values for the future. The curve should be extended carefully; this requires vast experience and good judgement. The line of best fit may be obtained by the method of least squares.

6.8.1.5.2 Graphical method based on cities with similar growth pattern

In this method, the city in question is compared with other cities that have already undergone the same phases of development, which the city in question is likely to undergo. Based on this comparison, a graph of populations versus decades is plotted and extrapolated.

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Population projection for IURWTS Project command

Population projection for Corporation/Municipal catchment coming under this project is based on Kochi Master Plan of KWA and is attached as Annexure 1. In this, the projection done by Geometric projection method. The base year is taken as 2025.

The ward wise Sewage load Population for Muttar zone of IURWTS project was found out based on the population calculations in **Annexure 1** and is given in **Table 15.**

Table 15: Ward wise population and sewer load for Muttar Sewer zone (IURWTS Project)

DIVISION / WARD	NAME	Census Population 2011	Present population 2021	Anticipated population 2025	Projected population 2040	Projected Population 2055	Sewer Load 2055 in MLD
KOCHI CORPORATION							
33	ELAMAKARA NORTH	3675	3897	3990	4356	4756	0.87
34	PUTHUKKALAVATTOM	4246	4502	4609	5032	5494	1.01
35	PONEKKARA	8757	9285	9505	10379	11332	2.08
36	KUNNUMPURAM	1366	1448	1483	1619	1768	0.32

DIVISION / WARD	NAME	Census Population 2011	Present population 2021	Anticipated population 2025	Projected population 2040	Projected Population 2055	Sewer Load 2055 in MLD
37	EDAPPILLY	9183	9737	9968	10883	11883	2.18
38	DEVANKULANGARA	2159	2289	2343	2558	2793	0.51
39	KARUKAPPILLY	5408	5734	5870	6409	6998	1.28
40	MAMANGALAM	1869	1982	2029	2216	2419	0.44
70	KALOOR NORTH	2544	2697	2761	3015	3292	0.60
71	ELAMAKKARA SOUTH	4550	4825	4939	5393	5888	1.08
72	POTTAKKUZHY	3503	3714	3802	4151	4533	0.83
	Subtotal	47259	50110	51298	56011	61155	11.230
KALAMASSERY MUNICIPALITY							
34	TOLLGATE	1786	1949	2018	2300	2622	0.449
35	KOONAMTHAI	1397	1524	1579	1799	2051	0.351
36	MUSIUM	1412	1541	1596	1819	2073	0.355
37	MUNICIPAL	1227	1339	1386	1580	1801	0.308
38	K B PARK	1743	1902	1970	2245	2559	0.438
39	VATTEKUNNAM	1515	1653	1712	1951	2224	0.381
40	MUTTAR	1004	1096	1134	1293	1474	0.252
41	INDUSTRIAL ESTATE	1073	1171	1212	1382	1575	0.270
	Subtotal	11157	12175	12607	14369	16379	2.800
	TOTAL	58416	62285	63905	70380	77534	14.03

6.9 Design Criteria for STP

We need an STPs that achieve,

- the desired results on a consistent and sustained basis.
- Is robust and reliable and lasts for at least 10-15 years without major repairs.
- Needs minimum amounts of money, energy, and chemicals to achieve the desired treated water quality.
- Is easy to operate and maintain.

Table 16 illustrates the quality of water obtainable from a well-designed, engineered, and operated STP at very affordable treatment costs.

Table 16: Parametric standards generally followed for effluent water from STP

Parameters	In raw sewage	After treatment	What it means
pH	6.5-7.5	6.5-7.5	The acidity/alkalinity balance is not affected/altered.
BOD	200- 250 mg/L	< 10 mg/L	Normally, the biodegradable material in the sewage consumes oxygen when it degrades. If this sewage is released in lakes/rivers, it would draw naturally dissolved oxygen from water, depleting the oxygen in the lake/river. This causes death of fish and plants. But the STP provides enough oxygen to digest the biodegradable material in sewage. The treated sewage does not need oxygen any longer. Thus it does not affect the aquatic life in lakes and rivers
Turbidity	Not specified	< 10 NTU	The outgoing treated sewage has low turbidity (suspended particles that cloud the water). In other words, we get "clear" water. This prevents the pipelines from getting clogged by settled sediments. If cloudy water can reach the lakes and rivers, it blocks the sunlight from reaching the bottom of the water body. This stops the photosynthesis process of the aquatic plants, killing them. That in turns stops generation of oxygen as a by-product of the photosynthesis process. Depletion of dissolved oxygen in water kills all fish. Thus low turbidity in discharge water ultimately sustains aquatic life in lakes and rivers.
E. Coli	Not specified	NIL	The STP removes the harmful bacteria completely.

The objective of sewage treatment is to reduce the polluting substances to (a) the standards laid down by the Ministry of Environment and Forests (MoEF&CC) of the Government of India (GOI) and these cannot be relaxed by the State Pollution Control Boards (PCB), but they can prescribe more stringent standards specific to the discharge environment.

6.10 Muttar STP (16.5 MLD)

The sewer from wards in Edappally and Chilavanoor canal catchment area of IURWTS Project lies in the northern side of NH 544 Kochi metro route along Banerji Road , has a total shape area 8.92 sq.km.

The ward/Area/Density for the Corporation and municipality area coming under the Muttar Sewer network is given in **Table 14.** The catchment area including the sub catchments of Muttar STP covered area is as shown in **Figure 17.**

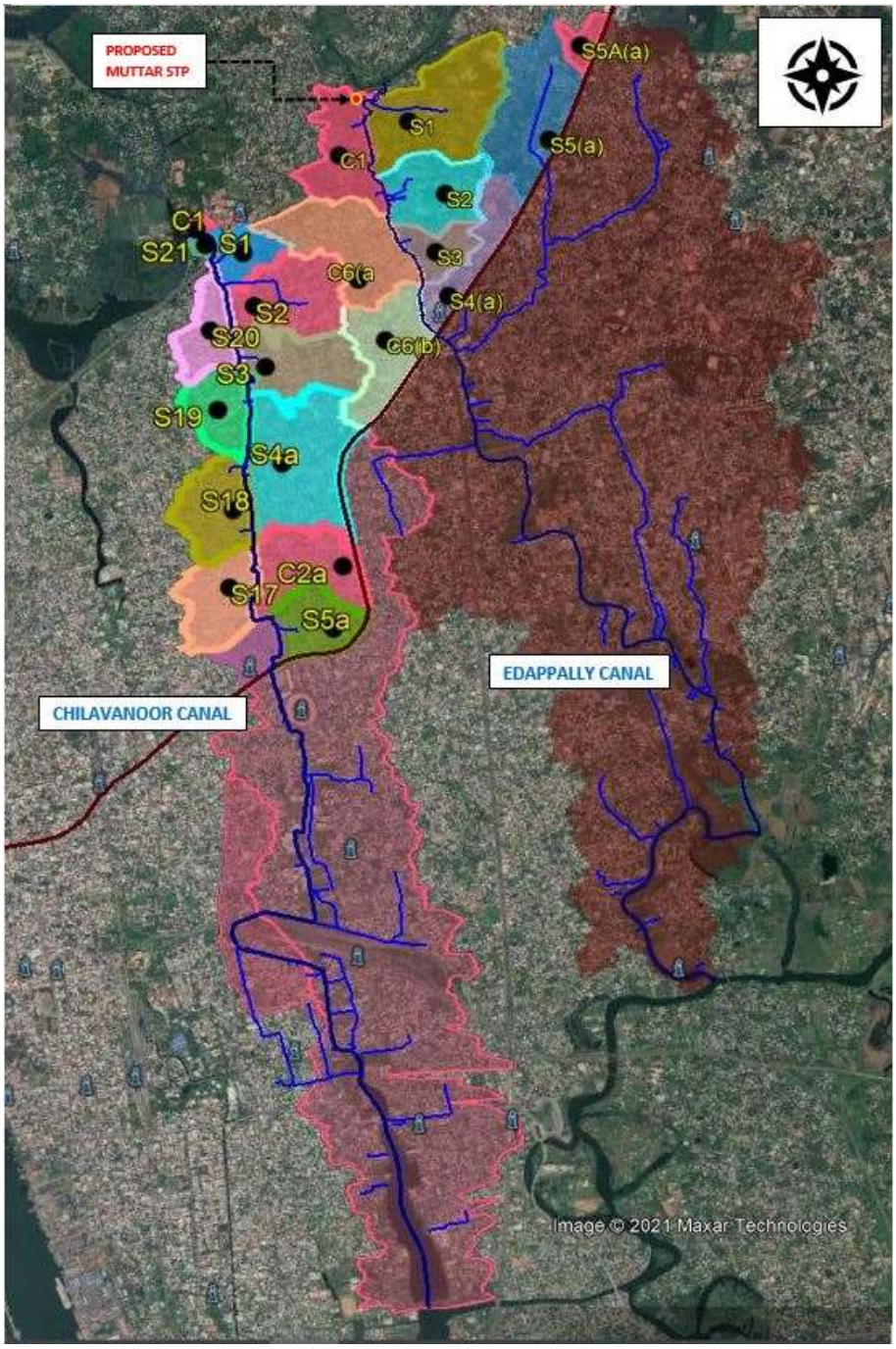

Figure 17: Muttar STP catchment

6.10.1 Per Capita Sewage Flow

CPHEEO Manual on Sewerage and Sewage Treatment (2013) recommends a sewage generation of 80 - 90% of water supply.

The present per capita supply of water in the project area is for domestic demand is taken as 150 lpcd. Floating population is also taken into account for calculating sewer loads. For Kochi floating population considered as 55% of the total population and for Kalamassery floating population is considered as 20% of the total Kalamassery population. So, the per capita sewage flow for floating population is taken as 70 lpcd. Sewer load for nondomestic / Flat complexes demand is also calculated.

6.10.2 Peak Factor

The peak factor, i.e. the ratio of maximum to average hourly flow, depends on the water use habit of the population of the project area and the contributing population. The quantity of water used in a day varies during the hours of the day due to habits of people.

Though the sewerage system will receive flow throughout the day, there will be some duration in which maximum sewage will be generated.

Peak factors for domestic flow as per guidelines given in the CPHEEO Manual are as follows:

Contributing Population	Peak Factor
Up to 20,000	3.00
From 20,000 to 50,000	2.50
50,000 – 750,000	2.25
Above 750,000	2.00

The peak factor for this project sewerage system is taken as 2.25 based on the Kochi city and Kalamassery population.

6.10.3 Infiltration

The infiltration into sewerage system shall be considered during flow estimation. Estimation of the flow in sanitary sewer includes flows due to infiltration of water through the joints of pipes and through manholes. The quantity is contingent on the workmanship in laying of sewers and the depth of ground water table in the area. Sewers are designed for the peak discharges and provision for

ground water infiltration is to be made for worst condition and conservative design. With better standards of workmanship and availability of watertight joints for pipes, these values may be kept at minimum.

During most periods in the year, no ground infiltration is expected due to the absence of rains. Furthermore, due to the use of better pipe materials and construction techniques, the infiltration will be minimal. Provision for infiltration shall be made in the designs of sewer network in the scheme as per recommendations of CPHEEO manual, **Table 17**.

Table 17: Recommended Infiltration rate

Norm	Minimum	Maximum
Liters/ha/day	5,000	50,000
Liters/km of sewer/day	500	5,000
Liters/day/manhole	250	500

The infiltration into sewer may occur through pipes, pipe joints, and manholes. With improved construction practices, the rate of infiltration will tend to be on the minimum, rather than on the maximum. The water table in Kochi is relatively high ((Source: Soil Investigation Report, 2009): it varies from 1.5 to 3 meters.

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For the purpose of this project, an infiltration rate of 4500 litres per km sewer line per day as suggested by CPHEEO has been adopted in the design.

Sewer load has been calculated for the projected population and is given in **Annexure 1.**

a) Based on the above factors the scheme capacity is calculated as follows.

Sewer load generated in the project area @ 85% of domestic water demand of 150lpcd per capita sewage flow	=	9.89 MLD
Sewer load for floating population and other institutions such as hospitals, hotels, commercial buildings, industries etc.	=	3.74 MLD
Ground water infiltration @ 4500liters/km/day	=	0.40 MLD
Total sewer load	=	**14.03 MLD**

It was proposed to convey sewer load of 2.10 MLD generated in left-out portions of project catchment area which Is included in KWA area to Muttar STP and hence the treatment capacity of Muttar STP is 16.5 MLD.

6.11 Process Description

The test results showing raw sewage quality in Kochi city is attached separately. It is observed that due to high infiltration, being a waterlogged area, the BOD concentration is less than the estimated BOD. However, the worst condition has to be taken into account for design purpose.

The object of sewage treatment is to stabilize decomposable organic matter present in the sewage so as to produce an effluent and sludge which can be disposed off in the environment without causing health hazards.

The treatment units & accessories consist of:

1. Inlet chamber
2. a) Mechanical Coarse screen arrangement & channel
   b) Manual screen in the bypass channel
3. Mechanical Fine Screen arrangement & channel
4. Grit Chamber (Detritus Tank)
5. SBR Basins
6. Chlorine Contact Tank
7. Sludge Sump and Pump
8. Polyelectrolyte Dosing tank
9. Transformer Yard
10. DG Set house
11. Metering Room
12. SBR Air blower Room
13. MCC & Control Room
14. Laboratory
15. Office Building
16. Chlorination cum Chlorine tonner House
17. Centrifuge feed Pumphouse
18. Centrifuge House
19. Raw Sewage Pumphouse
20. Security Cabin

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The treatment process comprises of the primary treatment, Secondary treatment, and tertiary treatment. The STP of this project is designed for treatment using SBR technology for secondary treatment.

1. Primary treatment comprises of screening and grit removal,
2. Secondary or biological treatment comprises of Sequential Batch Reactors followed by dewatering and sludge thickening etc.
3. Tertiary treatment – GC has obtained the consent to establish STP at Perandoor from Kerala State Pollution Control Board (ref. **Annexure 9**). The Board informed that the effluent should be adhere to the standards before discharging into the water bodies.
4. The effluent after SBR process will meet the standards. Hence there is no need for additional filtering units. Disinfection unit is added to the components for chlorination of the treated effluent which more than any other additional tertiary treatment which is approved by KSPCB. Hence this project didn't provide any tertiary treatment other than chlorination.

6.11.1 Process Flow Diagram

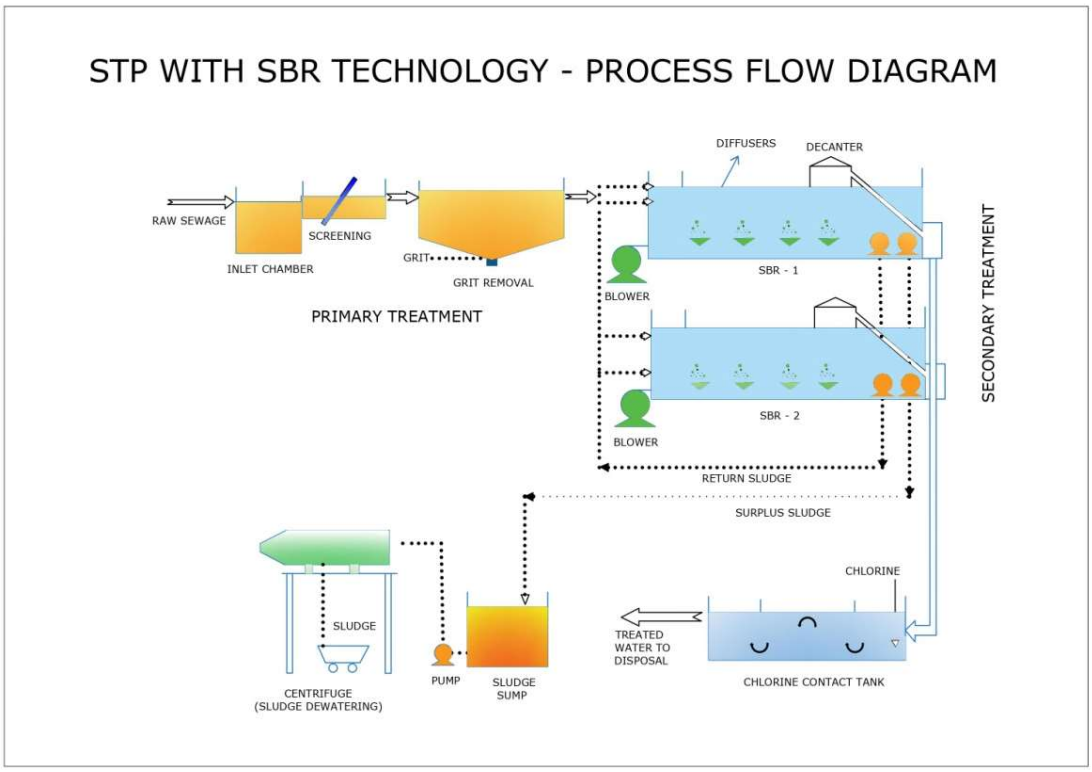

Figure 18: SBR Technology: Process Flow Diagram

6.11.2 Primary Treatment units

The proposed primary treatment units consist of the receiving chamber, raw sewage sump (wet well) cum pumphouse, coarse screen and fine screen channels and grit chambers.

6.11.2.1 Receiving Chamber

The sewage collected through the primary sewers laid along the canal banks will collect into a receiving chamber from where it will be taken into downstream coarse screens.

6.11.2.2 Coarse screen Channel

Adequate numbers of mechanical along with manual (Stand by) coarse screens shall be provided upstream of the wet well for removal of the floating and oversized materials more than 15mm size coming with the sewage. The coarse screen shall screen out almost all of medium and large floating and oversized material such as plastic rags, debris, weeds, paper, cloth rags etc which could clog the wastewater pump impellers. The coarse screen shall be inclined bar screen pf stainless steel flats and shall be sturdy design to take care of all sorts of materials envisaged in the gravity sewer. The screenings shall be dropped on a conveyor provided above the top of the screen channel. The screening materials as collected will drop automatically into a wheelbarrow for its disposal.

6.11.2.3 Raw sewage Pumping stations

Screened sewage after coarse screening enters wet well of the pumping station. The capacity of the wet well is such that adequate detention time is available during average and peak flow conditions. The effective liquid volume shall be provided below the invert level of the incoming sewer after leaving provision for free board. Also, an additional depression shall be provided to ensure adequate submergence of pumps. Pumping station shall have a room adequate for installing electrical panels. Suitable arrangement shall be provided for lifting of pumps.

Suitable combinations of submersible pumps shall be provided to cater the pumping requirements at average and peak flow conditions. Based on incoming flow conditions adequate no of pumps shall start/stop automatically as per the pumping requirements.

The pumped flow from the pumping station shall be taken to the elevated headworks, inlet chamber of the plant where sewerage will gravitate to the grit chamber.

6.11.2.4 Stilling chamber and fine screen channels

The raw sewage is pumped from Raw water pump house collected in the Stilling Chamber shall n quiescent flow conditions. Raw Sewage then follows through Bar Screens for removal of floating matter less than 15mm and greater than 6mm. Removal of such fine particles is also required because it can also otherwise choke pipelines / pumps etc and hinders the normal operation of the treatment plant. The mechanical screen is made of steel bars and shall be of approved design, placed at equal intervals. The inclination of bars is kept such that raking becomes easy.

A manual standby screen is also provided. The screenings are conveyed through the conveyors up to the suitable loading point from where it can be transported using trolley by client. The screened sewage is now made to pass through the grit chamber.

6.11.2.5 Grit chamber

The grit present in the raw sewage may consist of sand / dirt collected during transportation the sewerage collection system. The grit removal tank removes grit and small inorganic particulate matter of specific gravity above 2.65 and particle size above 150 microns. The tank shall be RCC construction complete with mechanical internals and rectangular in shape. As the sewage is made to pass through this system the grit settles on the floor. The settled grit shall be loaded in a trolley to be provided.

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6.11.3 Secondary treatment units

The main pollutants in the raw sewage are represented in the form of Bio-chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). The bacterial ability to synthesize the organic matter to harmless end products like carbon di-oxide and water molecules is utilized to treat the raw sewage.

6.11.3.1 SBR Process

A sequential Batch Reactor (SBR) is a fill- and draw activated sludge treatment system. As such SBRs are capable of handling all waste waters commonly treated by conventional activated sludge plants. Municipal and industrial waste waters have both been successfully treated in SBR systems. The unit processes involved in the SBR, and conventional Activated sludge systems are identical. Aeration and sedimentation /clarification are carried out in both systems. However, the important difference is that in conventional plants the processes are carried out simultaneously in separate tanks whereas in SBR the processes are carried out sequentially in the same tank.

6.11.3.2 Process Description

A treatment plant utilising SBR concept has only one type of process unit, the batch reactor tank. It is possible and even preferable in many cases to link several identical reactors in a multiple tank configuration to limit the size of individual units and increased flexibility. There are no units dedicated to a single process, such as equalising basins, aeration chambers, and clarifiers, as in continuous flow systems. In its simplest form a batch reactor consists of a single tank equipped with an inlet for raw wastewater, air diffusers, with associated compressors and piping for aeration; a sludge draw-off mechanism at the bottom of waste sludge; a decant mechanism to remove the supernatant after settling; and a control mechanism to time and sequence the processes. Various suppliers of SBR systems include different modifications to the basic system such as installation of a baffle near the inlet to provide a pre react chamber operated from the aerated portion of the basin.

Many decant structures are marketed with features designed to limit the discharge of floating solids and settled sludge. Air diffuser design and construction also varies among suppliers, but many SBR use jet aerators or mechanical aeration to accomplish aeration and/or mixing with a single device. The heart of the SBR system is the control unit and the automatic switches and valves that sequence and time the different operations. The advent of reliable microprocessors at reasonable cost used in conjunction with modem limit /level switches and automatic valves has been a major factor in the recent development of SBR technology. The ability to control the processes in time rather than space is crucial in SBR concept.

6.11.3.3 SBR Cycle

In SBR operations the cycle processes FILL-REACT, REACT, SETTLE, DRAW are controlled by time to achieve the objectives of the operation. Each process is associated with particular reactor conditions (turbulent / quiescent, Aerobic/Anaerobic) that promote selected changes in the chemical and physical nature of wastewater. These changes lead ultimately to a fully treated effluent.

6.11.3.4 Fill or Fill-react

The purpose of FILL-REACT operation is to add substrate (Raw Wastewater) to the reactor. The addition of substrate can be controlled either by limit switches to a set volume or by a timer or a set time period. If controlled by volume, the FILL-REACT process typically allows the liquid level in the reactor to rise from 50 -80% to 100%. If controlled by time the FILL-REACT process normally lasts approximately 25% to 50% of the full cycle time.

Period of aeration and/or mixing during FILL are critical to the development of organisms with good settling characteristics and to biological nutrient removal (Nitrogen (N), Phosphorus(P)). An advantage of SBR system of time control is its ability to modify the reactor conditions during the phases to achieve the treatment goals. This phase is ended when the liquid level in the tank reaches a predetermined level. The filling can be done in a continuous mode also.

6.11.3.5 Settle

The purpose of SETTLE is to allow solids separation to occur, providing supernatant to be discharged as effluent. In an SBR this process is normally efficient than in a continuous flow system because in the SETTLE mode the reactor contents are completely quiescent. The SETTLE process is controlled by time and is usually fixed between ½ to 1 hour so that the sludge blanket remains below the withdrawal mechanism during the next phase.

6.11.3.6 Decant/Discharge

The purpose of decant is to remove the clarified treated water from the reactor. Many types of decant mechanisms are in current use with the most popular being electromechanical moving weir type. When operated during the decant phase of the cycle the decanter travels from down at an initial fast speed. Interaction with the liquid level is detected by a level indicator float switch which then causes the decanter to proceed at its rate of travel producing a constant rate of discharge of treated effluent from the basin. On reaching designated bottom water level, the decanter is reversed to travel back to its rest position at the initial fast speed.

Sludge wasting is another important step in SBR operation that greatly affects process performance. It is not includes ass one of the three basin processes because there is no set time period within the cycle dedicated to wasting. The amount and frequency of sludge wasting is determined by process requirements, as with conventional continuous flow systems. In an SBR operation, sludge wasting usually occurs during the SETTLE or DECANT phases.

A unique feature of the SBR system is that there is no need for a return activated sludge (RAS) system. Since the aeration and settling occurs in the same tank, no sludge is lost in reaction phase, and none has to be returned from clarifier to maintain sludge content in the aeration tank. This eliminates the need for the hardware and controls associated with the conventional RAS system. The sludge volume and thus sludge age in the reactor of an SBR system is controlled by sludge wasting only.

6.11.3.7 BOD, Nitrogen and Phosphorous Removal Mechanism

Organic matter Removal

More than 95 % removal of BOD is noted in SBR. An important advantage of SBR system is the control the operator can maintain over microorganism selection. Within a complete treatment cycle the microorganism selection pressures are highly variable and severe. These pressures include Oxygen availability which ranges from anaerobic through anoxic to high DO conditions, and substrate availability which ranges from famine to feast conditions. While of certain of these selection pressures can occur in some conventional continuous flow systems, the SBR system provides the ability to easily select and extend or limit preferred conditions through time, allowing the preferential growth of desirable microorganisms.

Two observations have been documented that illustrates the beneficial effects of this control ability. The first is that the RNA content of microorganisms produced in the conventional continuous flow systems. The growth rate of microorganisms has been directly linked to the RNA content of the cells. This means that in an SBR system more microorganisms are capable of processing a greater quantity of substrate at a greater rate than in a conventional system. Secondly it has been reported that a properly selected aeration strategy can result in the minimizing of the growth of filamentous microorganisms as is true in continuous flow systems. These microorganisms whose presence in quantity leads to problems with sludge bulking and foaming are undesirable in the activated sludge floc in excessive numbers and their control is an asset to system performance.

Nitrogen Removal

Nitrogen removal can be achieved in the SBR system without additional equipment or chemicals. Nitrogen enters the system in the raw wastewater in the form of organic Nitrogen and Ammonia (NH4). It is removed from the system in the form of organic Nitrogen gas (N2). The process by which ammonia nitrogen is converted to nitrogen gas involves three steps. First is the conversion (nitrification) of Ammonia Nitrogen to Nitrite (NO2). Second is the conversion of nitrite to Nitrate (NO3). Third is the conversion of (denitrification) of nitrate nitrogen to nitrogen gas. All of these steps are accomplished by microbiological action.

However different nature of reactions oxidising or reducing, demands different microorganisms and reactor conditions. Nitrification, the process of converting ammonia- nitrogen through nitrite–nitrogen can only occur under conditions of adequate DO. In the SBR system nitrification takes place during REACT and any periods of aerated FILL. If the nitrification process is to be effective, the

combined aeration time during FILL and REACT must be sufficiently long and the DO sufficiently high (greater than 1mg/l) to allow both the development of nitrifiers (those microbes performing the nitrification) in the system and the completion of Ammonia-nitrogen oxidation.

Denitrification (step3), the process of converting nitrite nitrogen to nitrogen gas, only occurs in the absence of DO. In an SBR system, denitrification can occur during the unaerated potion of FILL-REACT and during the later stages of SETTLE & DECANT after the DO content has dropped off. Recirculation of the MLSS to the selector also causes denitrification. As with nitrification, these conditions must last sufficiently long to allow the desired nitrogen reduction to take place. Nitrogen removal in SBR system can be considerably greater in efficiency than conventional continuous flow systems. The advantage of SBR system is that the conditions necessary to achieve the nitrogen removal can be created by simple changes to the plant operation (modification to periodicity and duration of aeration, providing internal recirculation) rather than by major modification of the physical plant discharge.

A selector zone is also proposed in the STP units for effective nitrogen removal.

Phosphorus Removal

Phosphorus removal by microbiological methods in SBR systems is well documented. The addition of chemical coagulant to the reactor that precipitates phosphorus into the sludge is a common phosphorus removal process applicable to both conventional continuous flow and SBR systems. The microbiological removal of phosphorus first requires an anaerobic period (The absence of dissolved oxygen and Oxidised nitrogen) during which substrate (raw waste) is present. This period should be followed by an aerobic period (high DO) that promotes the uptake of excess phosphorous by the sludge mass. Excess sludge should be removed from the reactor in suitable quantities before the onset of next anaerobic period. In term of SBR operation anaerobic conditions and aeration must be available during FILL- REACT period for phosphorous release and uptake by biomass. These conditions can also be available in selector by recirculation of sludge. The flexibility of SBR system is again shown by its ability to achieve these conditions with simple operational modifications.

6.11.3.8 Design requirement

SBR plants typically consist of a minimum two (2) reactors in a plant. When one unit of reactors is in the fill mode, the other reactor (s) may be in the stage, the oxygen supplied to the system within the

time frame of reaction cycle. This generally requires higher oxygen capacity than a continuous flow system.

In the decant stage, there shall be sufficient time to allow for mixed liquor suspended solids (MLSS) to settle before decanting begins. Due to the fact that decanting time is much shorter than fill time, the effluent flow rate will also be much higher than influent flow rate. The design of decanting weir shall be able to handle high overflow rate without affecting scouring of settled sludge. Furthermore, there shall be sufficient allowance of clear water depth from sludge blanket to minimize sludge carry over. The volume of water decanted shall be limited to prevent scouring of solids.

All SBR plants must be designed to cater for peak flows. A minimum of two (2) system is required. Proven control system in the form of Programmable Logic Controller with complete instruction is provided. All SBR systems must be preceded with complete preliminary works. **Table 18** highlights the key design requirements of an SBR plant.

Table 18: Key Design requirement of an SBR Plant

Parameter	Unit Values	
F/M Ratio	0.08 – 0.15	per day
Sludge Age	15-25	Days
Sludge Yield	0.6-0.8	Kg Sludge /Kg BOD Load
MLSS (End of Decant)	3000-5000	mg/L
Cycle Time	3- 8	Hours
DO (Reactor)	0 -6.5	Mg/L
Oxygen Requirement	(Cycle time/Aeration time) x (1.2-2 KgO2/Kg BOD5 Load) = KgO2/KgBOD5Load	
Minimum settling time (Before start of Decant)	>0.6 Hr. for decant from TWL download	
Decant Depth	1.5 m Max.	
Decant Volume	Not more than 30% of volume of Reactor at TWL	
WAS	Total solids in System/ Sludge Age Kg Sludge /d	

6.11.3.9 Operation and Maintenance

The SBR typically eliminates the need for separate primary and secondary clarifiers in most municipal systems, which reduces operations and maintenance requirements. In addition, RAS pumps are not required. In conventional biological nutrient removal systems, anoxic basins, anoxic zone mixers, toxic basins, toxic basin aeration equipment, and internal MLSS nitrate-nitrogen recirculation pump may be necessary.

With the SBR, this can be accomplished in one reactor using aeration/ mixing equipment, which will minimize operation and maintenance requirements otherwise be needed for clarifiers and pumps. Since the heart of the SBR system is the controls, automatic valves, and automatic switches, these systems may require more maintenance than a conventional activated sludge system. An increased level of sophistication usually equates to more items that can fall or require maintenance. The level of sophistication may be very advanced in larger SBR wastewater treatment plants requiring a higher level of maintenance on the automatic valves and switches.

6.11.3.10 Performance

The performance of SBRs is typically better to conventional activated sludge systems and depends on system design and site-specific criteria. Depending on their mode of operation, SBRs can achieve good BOD and nutrient removal. For SBRs, the BOD removal efficiency is generally 85 to 95%. SBR manufacturers will typically provide a process guarantee to produce an effluent of less than:

- 5 mg/L BOD
- 10 mg/L TSS
- 5-8 mg/L TN
- 1 mg/L TP

6.11.3.11 Sludge Handling System

The Sludge from the SBR process basin is withdrawn through sludge withdrawal system and collected in a sludge sump/ gravity thickener. 24 hours hold up time is provided for the tank. The sludge shall then be pumped to solid bowl centrifuge for dewatering of sludge. Centrifuge pumps shall be of positive displacement type screw pumps. Dewatering polymer shall be dosed online prior to centrifuge feed. Sludge drying beds of 3days capacity is provided as standby type.

6.11.3.12 Interconnecting Piping and Valves

All interconnecting Piping, Gates, Valves, Specials and other appurtenances, auxiliaries and accessories required as per Process Design and Scope of Work. In case of Rising Mains, thrust blocks shall be provided wherever required. In case of buried Pipes, warning tapes shall be provided of the appropriate colours.

The material of construction for major interconnecting Piping area as follows.

Piping: Guideline for Velocity

Sl. No.	Service	Design Velocity m/s	Limitations
1	Gravity Lines for Sewage & Water	0.6 – 1.2 Designed as pipeline flowing full.	Min. Velocity shall not be less than 0.3m/sec. Max. Velocity up to 1.2 m/sec is allowable at Peak Flow.
2	Pressure Lines for Sewage & Water	0.6 – 2.5	Min. Velocity shall not be less than 0.6 m/sec. Max. Velocity up to 2.5 m/sec is allowable at Peak Flow.
3	Air (Pressurized Lines)	18 – 22	Max. Velocity shall not be more than 25 m/sec in any section.
4	Scum & Sludge Lines	0.6 – 1.5	Irrespective of flow, Diameter shall not be less than 150 mm for Gravity Lines.
5	Chemical Feed Lines	0.6 – 1.5	Irrespective of flow, Diameter shall not less than 20 mm.

Generally, the Material of Construction is selected based on the following guidelines.

Piping: Guidelines for MOC

Sl. No.	Service	Type of Flow	MOC
1	Wastewater / Sludge	Gravity	RCC NP-3 Class /DWC/PE
2	Wastewater / Sludge	Pressurized	CI Class "LA" / DI K-9
3	Service Water	Gravity / Pressurized	GI "C" Class
4	Air Lines: Headers, Vertical Downcomers	Pressurized	**Above Water:** MS Sand/Shot Blasted, Epoxy Painted **Under Water:** SS 304
5a	Air Grid Piping: Aeration Zone	Pressurized	UPVC Schedule 40
5b	Air Grid Piping: Selector Zone	Pressurized	SS 304
6	Chemicals	Gravity / Pressurized	SS 304 except Chlorine & FeCl3
7	Chlorine & $FeCl_3$	Gravity / Pressurized	Schedule 40 UPVC

Valve: Guideline

Sr. No.	Service	Type	MOC	End Connection
A	**Sewage / Sludge**			
1	Gravity / Pressurized	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
B	**Service Water**			
1	Gravity / Pressurized	Ball	CS Body & SS 304 Internals	Flanged/ Screwed
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Butterfly	CI Body & SS 304 Internals	Wafer
C	**Air**			
1	Pressurized	Ball	CS Body & SS 304 Internals	Flanged/ Screwed
2	Delivery of Blower	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Blower	Butterfly	CI Body & SS 304 Internals	Flanged
D	**Chemicals**			
1a	Gravity / Pressurized	Ball	As per Chemical Compatibility Chart	Flanged
1b	Gravity / Pressurized	Diaphragm	As per Chemical Compatibility Chart	Flanged
1c	Gravity / Pressurized	Plug	As per Chemical Compatibility Chart	Flanged

6.11.3.13 Electrical & Instrumentation Works

Adequate incoming HT power from Kerala state Electricity Board (KSEB) based on the maximum demand load. Two nos. of Transformers (1W+1SB) for full load of the plant with 10% overload in accordance with IS 2062/1962 shall be provided for STP. Suitable cable boxes for H.T. and bus ducting for L.T. side are also to be provided.

- Substation includes 2-Pole Structure, Metering Kiosk, HT Panel, Transformers, Power Control Centre, Motor Control Centres, Earthing for Electrical equipment as well as Instruments. External Lighting etc.

The STP is proposed with provision for a fully automated system Plant including Primary Treatment Units, Biological Treatment Units based on SBR technology, Chlorination Tank and Sludge Dewatering Units through a one Programmable Logic Centre (PLC) and Supervisory Control and Data Acquisition

(SCADA) with Man-Machine Interface (MMI). Provision shall also be made to operate each Unit of the Plant manually, if required.

6.11.3.14 PLC/PC/SCADA Based Automation System for Entire Plant

The complete Plant is proposed to be designed for automatic operation through Programmable Logic Control (PLC) and Supervisory Control and Data Acquisition (SCADA). This can be achieved by either individual equipment PLCs with SCADA/HMI or single PLC and SCADA for entire Sewage Treatment Plant. These shall be located at control room of the STP.

The plant shall have provision for operations in following modes for Automatic – Auto operation through PLC/digital controller and Manual – Operator intervention through SCADA/HMI.

Audio visual alarms shall be initiated under emergency or equipment trip conditions, other than usual service alarms.

The process system must have pre-configured software packages which can be adapted to the process by parameterization. Suitable measures is preferred by means of the installation of surge voltage arresters or surge voltage filters, to ensure that internal and external surge voltages do not impair the function of this parts of the system.

The process system (PLC, HMI/SCADA) shall be protected against power failure by an uninterruptible power supply (UPS). When the critical charge state of the UPS is reached, the process system is automatically shut down.

Mode selector switch

A mode selector switch is to be installed on the MCC or distribution board. It serves for pre-selection between Automatic mode and Manual/Local mode.

The following switching functions must be provided:

Automatic – Manual/Local

- Automatic: In this position, only automatic operation is possible; the local switches have no function (Except emergency stop).
- Local: Automatic mode cannot be started. The drives can be operated individually without interlock with the local switches.

Local switches (LPBS)

Each drive must be equipped with a local switch positioned in such a location that the corresponding machine or conveyor can be switched on in Manual/Local mode and can be monitored visually at all times. The local switch must have the following switching functions:

START – STOP (for drives with one direction of rotation) or

FORWARD – STOP - REVERSE (for reversible drives)

- If a unit has several drives (e.g., conveyor belt drive and travel drive), the local switches should be installed if possible, in one switch box or at least installed next to one another.
- Each local switch must be adequately labeled in plain text so that no operator errors can occur.

PLC

The automatic start-up of the whole system, sequential operations and the automatic shutdown, allowing for external control influences, e.g., EMERGENCY STOP, etc., is performed by programmable logic controller (PLC). This performs not only the control of the system, but also the display of the operating state in the HMI/SCADA. The interlocks of the individual process groups and their signalling must be performed by the PLC. A system must be selected which is sufficiently protected against external interference in the supply, control and signalling lines. The aim is that the program can continue to run without fault signals in the event of transient earth faults in the supply grid. In the event of prolonged power failures, on the other hand, a controlled restart must be triggered (under-voltage trip of the non-automatic circuit breaker).

HMI/SCADA system

The HMI system shall be designed as a minimum 6”, colour, touchscreen on the panel. Whereas SCADA system must be computer based, which includes all necessary functional units for parametric monitoring during Operating mode, start up and shutdown times etc. The entire system including STP, and Sewer network shall be under the SCADA system of STP.

6.11.3.15 Buildings

An administrative building will be constructed near the treatment plant to cater to all the activities pertaining to the maintenance and monitor proper functioning of the plant. A well-equipped laboratory for testing all parameters as per CPHEEO standards is proposed in the STP site in the same administrative block. Moreover, there are private and public testing facilities including Pollution Control Board laboratories are existing within the city. The Electrical HT substation to house HT

Components comprising Metering Kiosk, HT Panel, Transformers and Power Control Centres are also proposed in the site itself. Provision for Diesel Generator to run the complete plant on full load capacity is also included in this project. Security cabin of minimum area is also proposed which is found essential for the site protection.

There is an existing access to the site at Muttar STP site. Provision for construction of Compound wall around the STP site with gate is also included in the project.

6.11.3.16 Foundations

Geotechnical investigation has been done for assessing the soil strata. The field and laboratory test data incorporated have been obtained and processed using procedures specified in various codes of practices, good engineering norms and conventions. The field and laboratory test results and records reported here are relevant for the test locations and time at which the tests have been conducted.

The foundation shall be designed to withstand the worst combination of loads and forces evaluated in accordance with the provisions of IS 2911. Piles transmit the load of a structure to competent subsurface strata by the resistance developed from the bearing at the toe or skin friction along the surface or both. The piles may be required to carry uplift and lateral loads besides direct vertical load. The design and construction of pile foundations may follow the guidelines provided in IS 2911. The assumption is made implicitly in the methods of analysis that are presented that high quality control and excellent construction procedures will be employed in the field. Initial, routine pile load test and other quality control during pile installation shall be carried out as per the specification presented in IS 2911 (Part 1) and / or project specifications. Reference to sub-surface soil profiles, the skin friction for the soil layers having SPT value less than 10 is not considered in total pile capacities. It is assumed that the filled material is in place for long enough and self-compaction (consolidation) is complete. The bulk density of 15kN/m3 and angle of internal friction of 28° of filled up soil has been assumed in analysing the capacity of piles. Chances of pile squeezing due to high ground water table and sand should be considered and Integrity test to confirm the uniformity of pile diameter shall be conducted.

The type of foundation to the various plant component structures and buildings are proposed as pile foundations of adequate size and length and provision for the same is included in the estimate.

6.11.4 General Features of STP

6.11.4.1 Location and Topography

The site for Sewage Treatment Plant is located at Muttar at the tail end of Edappally Canal It lies at 10°2'31.66" N and 76°18'5.25" E. The land is having plane topography and the ground water table is at a higher level. The bearing capacity of the soil strata is very poor. The location being a part Ernakulam District experiences more or less uniform temperature throughout the year. The major rainfall is from Southwest monsoon which contributes 63% of the annual rainfall. The site has an extent of 1.23 hectares. The existing corporation road River side Road) in the northern side of STP site is the access to the proposed plant site.

The proposed site is covered with thick bushes all over along with trees for firewood. A portion of these has to be cut and cleared for construction of STP. Compensatory afforestation within the premises can be done which will function as a green belt for the STP.

The STP proposed land is in Survey No. 53,54,55 of Edappally North Village located in Muttar in Ernakulam District. The STP is in a non-urbanised area surrounded by vacant land on its three boundaries and the corporation road runs along the northern side. The corporation road has sufficient width which can be used as the permanent access to the Plant site. The residential buildings in the vicinity of the plant site are beyond 55m from the site adhering to the regulatory requirement. The existing Ground Level of the site is +1.4mCD and the Ground water table at a depth of 0.6m below GL. Since the site is a waterlogged area, the siting of STP proposed is such that there will be no hindrance to the flow of water in the waterlogged area. The formation level of the ground shall be +3.0mCD i.e., 1.6m above the existing ground level. The access road to the site will further continue inside the STP site for connectivity to the remaining land reserved for future expansion.

6.11.4.2 Geotechnical Investigation

Geotechnical Investigation has been conducted at 3 locations at the STP site. Average depth to hard rock is 15m from the present ground level. Laboratory tests have been conducted for undisturbed samples collected from Bore Hole No.4 for textural classification, bulk density, water content, liquid limit, compression index etc. Because of the low bearing capacity of the soil & the fact that the site is to be developed by filling 2m to 2.5m height and construction to be started immediately it may be required to provide under reamed compaction piles resting on hard stratum for foundations.

Alternatively, consolidation of the compressible layers may be accelerated by providing stone columns or geotextiles. The detailed report with profiles of bore holes is attached as Annexure 4.

6.11.4.3 Water supply, electricity and sanitation arrangements

Provisions for water tank and plumbing fixtures have been provided in the estimate. It is proposed to take connection from the KWA pipeline available at the nearby road. The same will be collected in a sump and pumped to a reservoir on the service building. Power connection shall be provided by extending 11KV line up to the transformer at the STP site. There will be standby generators for power backup to guard against plant breakdown. Toilets are proposed in the plant area for use of staff & will be treated in the STP.

6.11.4.4 Solar Power Plant at STP site Muttar

In par with the Govt. policy to promote Green Energy and thereby to achieve Carbon Neutral , it is proposed to install 100kW, Rooftop , On -Grid, Solar Powered power plant in the proposed STP at Perandoor. The, 1000sq.m., total area required for installing the Solar Panels are achieved by constructing a skeleton structure over the 5Mtr width Road space and super structure at the Roof Top of the SBR AIR BLOWER/ MCC & CONTROL Building . By installing this solar power plant, it is estimated as 118 Metric Tonnes of Carbon di Oxide emission per year is saved by way of producing 124000kWH units electricity worth INR 7.5 Lakhs, annually , as per the existing Tariff structure.

As per the standards, the minimum safety road clearance required for Fire Truck in India is 4.5m (width) and 5m (height). Baring the Chlorine prone area of the Road at Chlorination Tank premises, a skeleton superstructure having 5.5m width and total 152m. length is constructed over the Road so as to get 840 sq. m area for mounting the Solar Panels. In addition to this, at the Roof Top of the SBR AIR BLOWER / MCC & CONTROL Building having size 16m x 10m (total 160 sq. m) is also proposed for mounting the Solar panels and thus totalling to 1000 sq. m, the very necessary quantity required for the 200kW Solar Project.

6.11.4.5 Statutory Approvals

Application in prescribed format with accompaniments has been submitted to the Pollution control board for their clearance as the works can be commenced only after statutory approval.

6.11.4.6 Land transfer

The land requirement for the STP is 1.23Ha (Edappally canal). Land Acquisition proposals are already processed and can be acquired by the commencement of the work.

6.11.5 Project Implementation & Maintenance

The work of 16.5MLD STP will be arranged on a DBOT mode from design to commissioning & includes a further maintenance over a period of 10 year. The time for period of completion will be 18 months inclusive of monsoon periods. SBR being a new technology, it is better to have a longer Operation and Maintenance period in the contract. The STP shall be designed based on SBR technology and the effluent quality shall be as prescribed for letting the same in the surface waters & shall cause no foul odour, undue noise etc. and shall be eco-friendly. The contractor immediately after commissioning will train the concerned staff of the corporation/KWA in maintenance. It is proposed to commission the plant by August 2024.

6.11.6 Scope

Scope of the work will include all aspects from design to commissioning & further satisfactory maintenance & will include all electrical and mechanical works including work of transformers, generators and allied items in landscaping, construction of compound walls, construction of culverts, construction of approach roads, internal roads, water supply & sanitary arrangements, sludge & effluent disposal systems. Scope also includes maintenance for a period of 10 years after commissioning.

6.11.7 Estimates

The estimate is based on per MLD rate for treatment as directed by the vetting agency, CUBE IIT.

The site for propose STP is at Muttar having an acquired area of 1.23 Ha. The site is vacant plot located in low lying area of Kochi Corporation without any residences /industries / any other commercial buildings in the vicinity of 50m peripheral. The plot is a wetland category which requires SWAK Clearance and the processing for obtaining the same is received from SWAK.

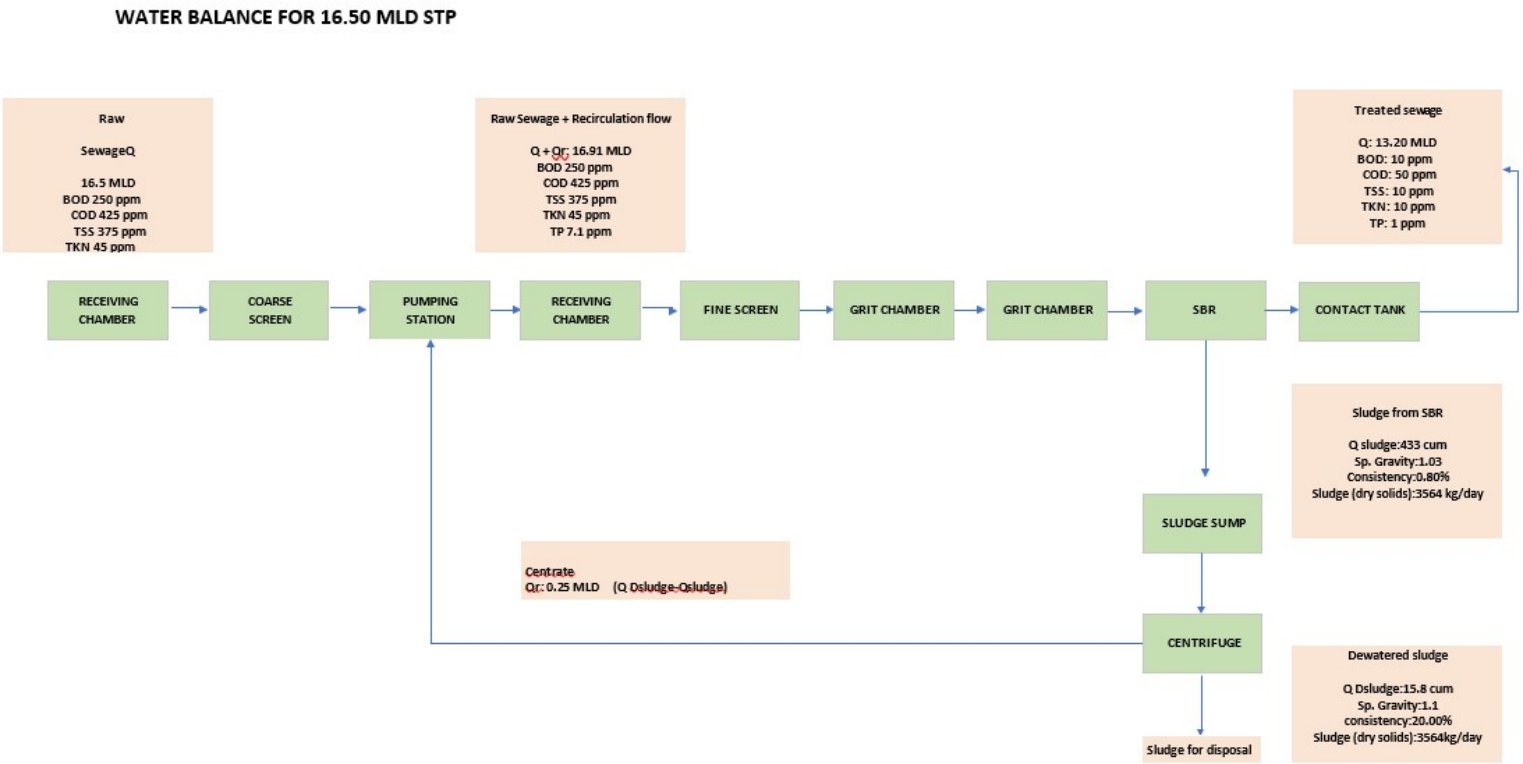
The average existing ground level of the site is +1.4m CD. Since the land is water logged area, the formation level of Sewage Treatment Plant is proposed 1.6m higher than the ground level based on the flood mapping and hydraulic study undertaken. Necessary provisions for interior roads, compound wall around the site with gate is also included in the estimate. The existing KSEB line is to

be extended up to the site with necessary transformer and HT installations as per standard norms and conditions of Electrical Inspectorate.

A lumpsum provision for electro-mechanical and instrumentation installations including PLC/SCADA System is also in included in the estimate. The estimate also includes provision for water supply, electricity, and sanitary arrangements for the administration as well as the pumphouses and substation with all essential electrical installations. Provision for landscaping and green belt development is also included in the estimate. The estimate also envisages the operation and maintenance of all the STP components for a period of 10years from the commissioning of the STP in full form.

The total estimate cost for 16.50MLD STP including all the components mentioned above works out to be **INR 74.15Crores including O&M for 10 Years**. The detailed estimate is attached as **Annexure 5**.

6.12 Mass And Water Balance for 16.5 MLD STP



6.12.1 List Of Major Equipment

6.12.1.1 Mechanical Equipment

Sl. No.	Name of the Unit / Equipment	Qty.	Size and other details
1.	Bar Coarse screen, Mechanical Screen	1 No. 1 No.	Material – SS 304 for wetted parts Clear Opening 20 mm
2.	Fine Screen Mechanical Screen Manual	1 Nos. 1 No	MOC: SS 304 Clear opening 6 mm.
3.	Grit Separator Mechanism	2Nos.	Type - Mechanical, complete with Classifier & organic return pump
5.	Sequential Batch Reactor	Lot	
6.	Air blowers for Bio Reactors	6 Nos. **(4W + 2SB)**	Type: Positive displacement (Twin Lobe type) Turbo Blowers
9.	Polyelectrolyte Dosing Pump	2 Nos. **(1W + 1SB)**	Type: metering with manual stroke adjustment Capacity: 2hp MOC: PVC / SS 316
10	Chlorine dosing system	2 Nos. **(1W + 1SB)**	Type: Gas chlorination, booster pumps, emergency repair kit etc.
11	Centrate Pumps	As reqd.	
12	H.O.T crane 2ton capacity	1 No	
13	Centrifuge Feed Pumps	2 Nos. **(1W + 1SB)**	Capacity :12m3/hr. each Type: Screw MOC: CI IS 210 Gr. FG 260
14	Centrifuge	2 Nos. **(1W + 1SB)**	Qty: 2 nos. Capacity: 11m3/hr. MOC: Wetted parts in SS304
15.	Interconnecting Piping and Valves		

a. Pipes			
Sl. No.	**Service**	**Type of Flow**	**MOC**
1	Wastewater / Sludge	Gravity	RCC NP-3 Class
2	Wastewater / Sludge	Pressurized	CI Class "LA" / DI K-9
3	Service Water	Gravity / Pressurized	GI "C" Class , uPVC cl 6kg/cm2
4	Air Lines: Headers, Vertical Downcomers	Pressurized	**Above Water:** MS Sand/Shot Blasted, Epoxy Painted **Under Water:** SS 304
5a	Air Grid Piping: Aeration Zone	Pressurized	UPVC Schedule 40
5b	Air Grid Piping: Selector Zone	Pressurized	SS 304

a. Pipes			
Sl. No.	**Service**	**Type of Flow**	**MOC**
6	Chemicals	Gravity / Pressurized	SS 304 except Chlorine & FeCl3
7	Chlorine & $FeCl_3$	Gravity / Pressurized	Schedule 40 UPVC

b. Valves				
Sl. No.	**Service**	**Type**	**MOC**	**End Connection**
A	**Sewage / Sludge**			
1	Gravity / Pressurized	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
B	**Service Water**			
1	Gravity / Pressurized	Ball	CS Body & SS 304 Internals	Flanged/ Screwed
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Butterfly	CI Body & SS 304 Internals	Wafer
C	**Air**			
1	Pressurized	Ball	CS Body & SS 304 Internals	Flanged/ Screwed
2	Delivery of Blower	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Blower	Butterfly	CI Body & SS 304 Internals	Flanged
D	**Chemicals**			
1a	Gravity / Pressurized	Ball	As per Chemical Compatibility Chart	Flanged
1b	Gravity / Pressurized	Diaphragm	As per Chemical Compatibility Chart	Flanged
1c	Gravity / Pressurized	Plug	As per Chemical Compatibility Chart	Flanged

6.12.1.2 Electrical Equipment (Major Installations)

1. The Sewage Treatment Plant will be equipped with electrical systems that are easy to maintain and effective. The following items will be provided in Sewage Treatment plant.
    1. 11 KV Switchboard
    2. Transformer
    3. Switchboard cum MCC
    4. Power and control cables
    5. Electric motors
    6. Earthing system
    7. PF Improvement capacitors
    8. DG Set
    9. Illumination System
    10. Area Lighting
    11. Lightning Protection

6.12.1.3 Lab Equipment

Sl. No.	Item Description	Quantity (in Nos.)
1.	Digital pH Meter	1
2.	Turbidity Meter	1
3.	Electric Hot Plate	1
4.	B.O.D Incubator	1
5.	Single Pan Balance	1
6.	Conductivity meter	1
7.	D.O. Meter	1
8.	Refrigerator	1
9.	Incubator	1
10.	Autoclave	1
11.	Centrifuge	1
12.	Microscope	1
13.	T.O.C Analyzer	1
14.	C.O.D. Apparatus	1
15.	Hot air Oven	1
16.	Muffel Furnace	1
17.	Magnetic Stirrer with hot plate	1
18.	Distillation Water Still	1
19.	Heating Mantle	1
20.	Vacuum Pump	1
21.	Hot Water Bath	1
22.	Desiccators	1
23.	Dematerializer K-4 75/it/H	1

Sl. No.	Item Description	Quantity (in Nos.)
24.	Jar Test Apparatus	1
25.	Remi stirrers	1
26.	Physical balance	1
27.	Laboratory Glassware	Lot
28.	Laboratory Consumables	Lot
29.	Residual Chlorine Analyzer	1

6.12.1.4 Instrumentation And Communication

1)	**Pressure Gauges**		
	Purpose	:	For measurement of discharge pressure of pumps & blowers except dosing pumps
	Type	:	Bourdon's tube/ Sealed Diaphragm / Schaffer Diaphragm type as applicable
	Diameter of dial	:	100 / 150 mm.
	Numbers provided	:	Two per set of pumps / blowers
	Casing MOC	:	Die cast Aluminum.
	Mounting	:	½" NPT type.
2)	**Level Controller Switch (for Raw Sewage Sump pumps, Centrifuge Feed Pumps)**		
	Purpose	:	For auto on / off of pumps
	Type	:	Liquid buoyancy (hydrostatic type)
	Contact rating	:	5 A, 230 V, AC.
	No. of contacts	:	Two
	Length of SS rope	:	As required
	No. of floats	:	As required
	Numbers provided	:	As required
3)	**Air Flow meter**		
	Purpose	:	For measurement of air flow going to SBR
	Type	:	Bypass type Rota meter, glass tube type with orifice plate.
	MOC	:	Body in MS.
4)	Dissolved Oxygen Meter	:	Immersion Type
5)	Variable frequency Dive	:	For Blowers For Decanters
6)	Soft Starter	:	For Blowers

7)	Decanter Level Sensor, Level Switch	:	Capacitive Type
8)	Decanter Position Sensor	:	Magnetic Limit Switch
9)	Level Transmitter, Flow transmitter	:	Ultrasonic Type
10)	Communication System (Internal Communication)	:	Suitable as required

6.12.2 Operational Requirements

6.12.2.1 Operation & Controls

The plant will be of manual with auto-interlocks through relay-based panel.

- The ON-OFF Operation of Pumps will be based on Level Transmitter/ Level switch.
- Chemical dosing rate adjustment will be by manual stroke adjustment for Dosing Pumps.
- Chlorination dosage will be adjusted manually.
- The sludge will be drained periodically by timer based operated Motorized valves.
- The ON-OFF operation of Air blowers, Sludge Centrifuge, Mixers will be manual through LPBS.

6.12.2.2 Mechanical

1	Piping	:	DI/CI/HDPE/RCC/uPVC as per relevant IS code of practice.
2	Fittings	:	These shall be fabricated from the parent pipes.
3	Flanges	:	These shall be slip-on, Class #150 FF, plate type made from IS 2062 / IS 226 plates drilled to ANSI B 16.5 Class. /BS 10 Table D
4	Fasteners	:	These shall be as per IS 1367.
5	Valves	:	Valves except for chemical service will be CI Sluice valves
6	Check valves	:	These shall be SS for wetted parts and hot dipped galvanized steel for other parts.

6.12.2.3 Electrical

Specifications and requirements of Electrical works for STP

Only superior quality Equipment, Instruments and Materials shall be used for the work and the labours/technicians employed shall have the highest quality workmanship. All relevant clauses in Indian Electricity Rules & Electricity act shall be strictly followed wherever required. The regulations and guidelines of Power Supply Licensee/KSE Board and Kerala state Electrical Inspectorate shall be strictly followed. All Electrical works shall be got executed by a licensed Electrical contractor of relevant grade (license issued by the Kerala state Electrical Licensing Authority).

Availing Power from Power supply licensee's (KSEB) Mains

Since the power requirement is more than 100 KVA power at 11,000 Volts is to be availed. But the proposed site is near the existing 11 KV line and hence approximately 500mts of 11 KV line is to be provided for the STP. It is expected that the power at 11 KV will be made available by the Licensee up to the DP structure. The two-pole structure shall be with D.O type HT Isolator, fuses and Lightning Arrestors. Power shall then be transmitted through cables buried underground and terminated to the indoor 11 KV Switchgear Board located in substation. The 11 KV switch gear shall comprise of Vacuum Circuit Breakers and feed two transformers installed outdoor and connected to the Main 415 V LT panel.

Metering equipment

All the metering equipment's shall be got approved by the Power supply licensee. The contractor shall arrange and be responsible for getting them tested by the Power Supply Licensee. Contractor shall submit the detailed specifications, make/model, literature (brochure) and drawings of the metering equipment's to the consultants/clients for approval before procuring the same. The material test certificate and manufacturer's test certificate for pump, motor, Starter, control panel & capacitor should be submitted to the client/consultants for clearance before despatch

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Electrical Installations

All the electrical Installations shall be provided in line with IS codes

Motors proposed to be totally enclosed, fan cooled, squirrel cage induction type with class F insulation (with temperature limited to class B insulation), suitable for required output when line voltage variation is ±10% and frequency variation of ±3% in any combination of this voltage and frequency variation, rated for 415 Volts LT 3 phase 50 Hz. The motor shall be capable of providing the required output at an ambient air temperature of 45 degree centigrade. Provision shall be given to earth the body of motor at two distinct points. Suitable thermistors shall be embedded in the motor winding for over temperature protection.

Control Panel -Among other things the MCC/Control panel shall have the following.

- One four pole draw out type ACB of suitable capacity as incomer (with Overcurrent/ Short-circuit and earth fault protection) to receive and isolate the incoming supply to the panel
- One TPN Electrolytic quality Copper or Aluminium Bus bar rated for 415 Volts, 50KA for 1 sec.

- Feeder compartments with Starter (with associated contactors). (DOL starter is permitted only up to 10 HP motors. From10 to 25 HP, star delta starter and beyond 25 HP Soft starters shall be provided)
- Motor protection relays with thermal overload release for each motor.
- On/Off indication lamps, control supply failed indication lamps & Hour-run meter for all motors.
- Audio visual indication with Annunciations for motor tripped, low level, high level, pump dry running (wherever applicable) and 4 numbers of spare windows.
- Control for starting 1st duty pump, 2nd duty pump, and standby pump in case duty pumps fail to start.
- Interlock to prevent 2 or more motors starting at a time.
- Interlocks to prevent main and standby motors running at a time.
- Any other interlock required for the proper operation of the plant.
- 230 V AC space heater with thermostat and 1 No. SPN MCB with contactor

An auto manual selector switch shall be provided in the control panel for each motor for selecting the mode of operation. An interlock shall be provided for the following.

A duty selection switch shall be provided in the control panel for selecting the duty of the motors as 1st duty/2nd duty & standby. An alarm & indication shall also be displayed in the panel to indicate the standby motor started and the duty motor (1st/2nd) failed to start.

Running of motor/pump without discharge of liquid shall be detected as dry running of pump and this shall be indicated in the control panel. In such a situation the motor shall be stopped after a predetermined time delay and the standby pump started automatically.

The wiring of panel shall be 660/1100 voltage grade copper wires of suitable capacity.

One no suitable required capacity Transformer is also included in the Project cost.

Rating	:	As per the power requirement
Voltage Ration & Phase	:	11000/433V, 3 phase, 4 wire earthed
Frequency	:	50 Hz
Vector Group	:	DY n11
Tapings on 11 V	:	5% to –10% in steps of 2.5% for HV
Cooling	:	Air cooled

Winding Temperature rise	:	90^0 C over and above an ambient
Tap changer	:	Off load – and by changing taps on HV side with a tapping of + 5% to –
Windings	:	Copper wound
Insulation	:	Epoxy Class F

The transformer supplied shall also confirm to the specifications approved by the Kerala State Electrical Inspectorate and the Kerala State Electricity Board. This work includes supply of HT and LT XLPE insulated PVC sheathed power cable of different sizes and voltage class as required, laying & testing them as per standards and commissioning the same.

Diesel Generator Sets

A Diesel Generator Set of reputed make shall be provided for full back up power. The capacity of the set shall be so selected for starting the highest capacity motor/equipment when all other motors/equipment (except standby motors/equipment) are in service/running. An AMF panel suitable to change over the power from mains to DG set shall be included in the supply of DG sets. System earthing shall be generally as per IS: 3043.

6.13 Conclusion

Design Parameters of STP

Description	Design Parameters
Design period	The sewerage system is designed for a period of 30 years. Outfall sewer is proposed to meet the sewage flows expected in the year 2055. Hence the proposed treatment plant has also been designed to meet the requirements of year 2055.
Sewage Contribution	85% water supply including Kitchen waste
Population Forecast	Based on 2011 population census data projected to year 2055
Quantity of sewage flow	Proposed 16.50MLD STP
Design base of STP	"MANUAL ON SEWERAGE AND SEWAGE TREATMENT Published by Central Public Health Engineering and Environment Organization, Ministry of Urban Development, New Delhi has been followed.
Peak to average flow ratio	1:1.5:2.25 (Min:Avg:Peak), i.e. at peak flow the quantity arriving at Muttar STP shall be 16.5 MLD minimum 24.75MLD average and 37.125MLD peak flow.
Average Flow	24750 M^3/day

<table>
<tr><th>Description</th><th>Design Parameters</th></tr>
<tr><td>Sewage Characteristic</td><td>
<table>
<tr><td>Design parameter</td><td>Value for design purpose</td></tr>
<tr><td>5 days BOD at 20 degree C temp</td><td>250 mg/lit</td></tr>
<tr><td>COD</td><td>425 mg/lit</td></tr>
<tr><td>TSS</td><td>375 mg/lit</td></tr>
<tr><td>pH</td><td>6-9</td></tr>
<tr><td>TKN(as N)</td><td>45 mg/lit</td></tr>
<tr><td>TP</td><td>7.1 mg/lit</td></tr>
<tr><td>Flow</td><td>16.5 MLD Min. flow and Peak flow- 37.125MLD</td></tr>
</table>
</td></tr>
<tr><td>Process of Sewage Treatment Plant</td><td>Sequential Batch Reactor Process Technology</td></tr>
<tr><td>Line of Treatment</td><td>Method of treatment of sewage is fairly standardized and the CPHEEO Manual describes various processes and their design criteria that may be adopted while designing SBR STP. Accordingly, the treatment process may be divided in to three parts.
Primary Treatment Screens: – Coarse and fine screens, grit separator to remove suspended particulate matter.
Primary settling Tanks to reduce the load on secondary treatment.
Secondary Treatment Consisting of Sequential batch reactor (SBR).
Sludge Treatment in SBR process the raw sewage is directly taken in SBR reactor for treatment.
Provision of primary tanks has been taken to remove primary sludge. Digested sludge from primary settling tank and secondary sludge will be digested in digester.
Digested excess sludge will be dried /thickened on filter press. The dried/ thickened sludge may be utilized as manure otherwise may be disposed of in land fill site</td></tr>
<tr><td>Treated Effluent Water Quality</td><td>The treated effluent from the STP must conform to effluent quality standards as detailed below:
<table>
<tr><td>Parameter</td><td>Maximum Allowed Concentration (MAC)</td></tr>
<tr><td>COD</td><td><=50 mg/l</td></tr>
<tr><td>BOD</td><td><= 5 mg/l</td></tr>
<tr><td>TSS</td><td><=10 mg/l</td></tr>
<tr><td>Fecal Coliform</td><td>230 MPN/100 ml</td></tr>
<tr><td>Total Nitrogen as N</td><td><=10 mg/l</td></tr>
<tr><td>Ammonia Nitrogen as N</td><td>2 mg/l</td></tr>
<tr><td>Total Phosphorus as P</td><td><=1 mg/l</td></tr>
</table>
</td></tr>
</table>

Description	Design Parameters
Other Facilities to be provided at STP	• Programmable Logical Controller (PLC) • Laboratory • Security room • PMCC room • Control room • Rest room • Workshop cum store • Open store yard • Covered vehicle park • Land- Scaping • Road network and street lighting • Electrical works including Diesel generator and Transformer • Pantry and facilities • Drinking water through water authority connection.
O&M	It has been proposed for 10 years of Operation and Maintenance to be included in the tender documents.
Completion period	18 months from the award of contract

SECTION III

DESIGN OF SEWER NETWORK FOR MUTTAR SEWER AREA

7. Selection of appropriate Sewer network technology and distribution network

A sewerage system, or wastewater collection system, is a network of pipes, pumping stations, and appurtenances that convey sewage from its points of origin to a point of treatment and disposal.

7.1 Types of Sewer systems

The major types of sewer line networks systems include 1. Gravity sewer network. 2. Pressurised sewer network and 3) Vacuum based network.

7.1.1 Conventional gravity sewers

Conventional gravity sewers are large networks of underground pipes that convey blackwater, greywater using gravity (and pumps when necessary). As pumps may be necessary if the landscape is very flat, they are mostly found in urban areas.

The conventional gravity sewer system is designed with many branches. Typically, the network is subdivided into primary (main sewer lines), secondary and tertiary networks (networks at the neighbourhood and household level). This system is mostly found in urban areas. All sewer pipes are laid out in straight lines whenever possible and generally meet at right angles although the connection may be curved to ease the flow.

7.1.2 Pressurized sewers

Pressurized sewers or pressure sewers differ from conventional gravity collection systems because they use pumps instead of gravity to transport wastewater. The primary effluent is delivered to the collection tank by traditional gravity drainage methods where it is grinded before being transported into the pressurized system by pumps. As for central network, no gravity is required; the system can be built with only shallow trenches and relatively small-diameter pipes. It is an effective solution where conventional systems are impractical such as in rocky, hilly or densely populated areas or areas with a high groundwater table.

A typical arrangement for a network of pressurized sewers is for each connection (or small cluster of connections) to have a tank that receives wastewater by gravity. The unit is installed in a property in consultation with the owner. A small diameter discharge pipe goes from the unit to the pressure sewer pipe. When the tank fills to a set point, a pump within the basin injects the wastewater further into the sewer. This transfer of wastewater pressurizes the sewer as given in **Figure 25**. A small box

(boundary kit) is installed just inside the property on the discharge pipe. A non-return valve (to prevent backflow from the pressure sewer) and isolation valve is housed in this kit. The unit is wired to the household power supply and controlled by a small panel located near the unit (control panel), either on a wall, fence, or pole. *A prefabricated pressure sewer unit made out of plastic for outside placement* is given in **Figure 20**. As various pumps along the length of the sewer inject sewage into the line, the wastewater is progressively moved to the treatment facility.

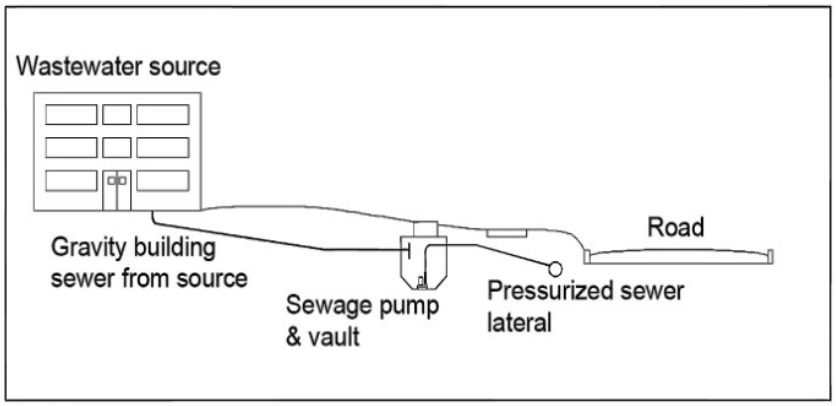

Figure 19: Schematic design of a pressurized sewer system

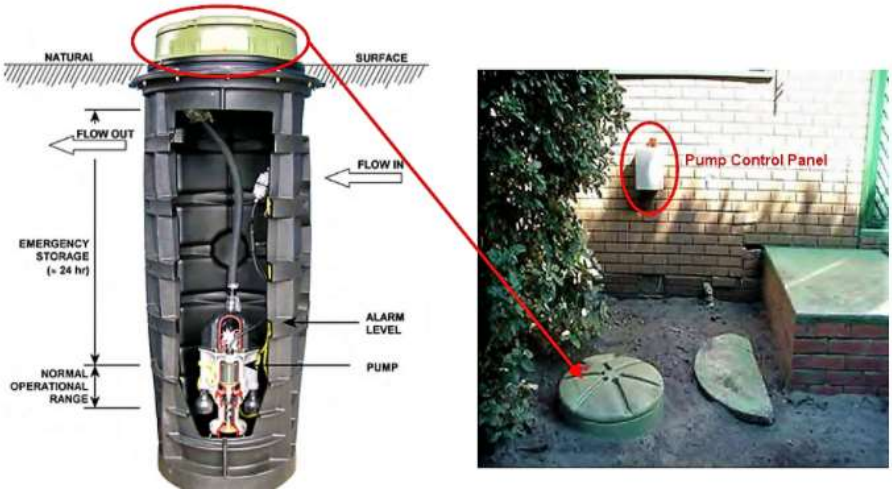

Figure 20: A prefabricated pressure sewer unit made out of plastic for outside placement

Operation and maintenance: Regular service is important for all system components to ensure best long-term performance to protect public health and the environment. Electricity needs to be available all the time, the pumps should be checked regularly, and the pipe connections should be controlled for leakages.

7.1.3 Vacuum sewerage systems

Vacuum sewage systems consist of a vacuum station, where the vacuum is generated, the vacuum pipeline system, collection chambers with collection tanks and interface valve units forms part of it. The permanent pressure within the vacuum system is maintained below atmospheric pressure. vacuum sewers use differential air pressure (negative pressure (approximate -0.6 bar).) to move the sewage. A central source of power to operate vacuum pumps is required to maintain vacuum (negative pressure) on the collection system. The system requires a normally closed vacuum/gravity interface valve at each entry point to seal the lines so that vacuum can be maintained. These valves, located in valve pits, open when a predetermined amount of sewage accumulates in collecting sumps. The resulting differential pressure between atmosphere and vacuum becomes the driving force that propels the sewage towards the vacuum station. The hierarchy of pipes in a vacuum sewer system is given in **Figure 22** and Overview of a vacuum sewer system is given in **Figure 23**.

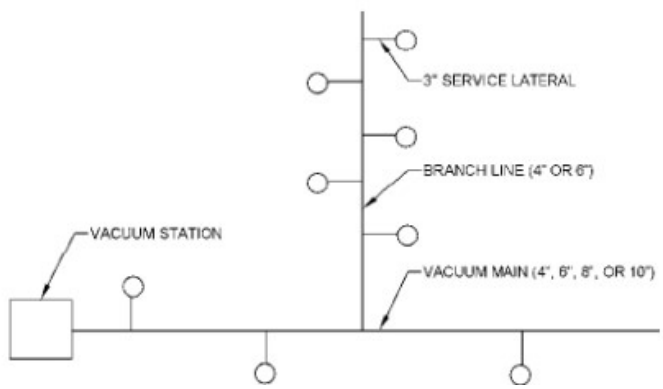

Figure 21: Hierarchy of pipes within a vacuum sewer system

Vacuum station: All the vacuum sewers are connected to the vacuum collection vessel installed at the central vacuum station, where vacuum pumps create the required negative pressure (approximate -0.6 bar). The vacuum vessel can be placed inside or buried outside the vacuum station. Transfer pumps convey the wastewater from the vessel to the wastewater treatment plant or to an existing sewer. The capacity and dimensions of the vacuum station are dictated by the particular requirements of the sewer system. Operation of the vacuum and transfer pumps is controlled by a software (ROEDIGER 2007). **Table 19** gives the relation between the Pipe diameters and the relation to maximum flow per minute and maximum number of served households.

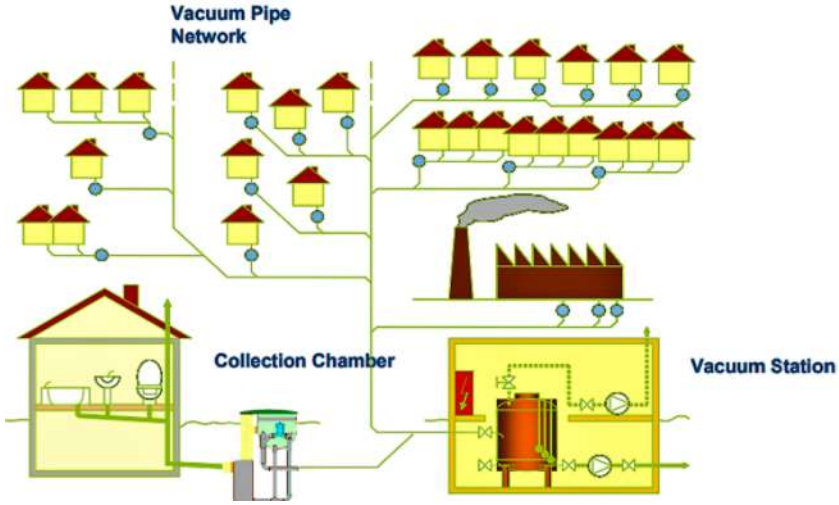

Figure 22: Overview of a vacuum sewer system.

Table 19: Relation between pipe diameter and number of households served

Pipe diameter		Max flow		Max number of houses served
Inch	**Mm**	**GPM**	**L/min**	**#**
4	101.6	55	208	70
6	152.4	150	577	260
8	203.2	305	1.155	570
10	254	545	2.063	1,050

7.2 Advantages and Disadvantages of sewer systems

The advantages and disadvantages of popular sewer systems have been documented from published literature and is detailed in the below **Table 20**.

Table 20: Advantages and Disadvantages of sewer systems

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	**Disadvantage**	**Advantage**	**Disadvantage**	**Advantage**	**Disadvantage**
1	Gravity flow: No pumps required	Requires deep excavations	Sewer lines laid at lesser depth	Needs expert design	Vacuum source to convey sewage from individual households to a central collection station	As it is a high-tech system, it is costly
2	Less maintenance compared to solids-free sewers	Very high capital costs	No constraints on the land topography	Grinder pumps: permanent energy source required	Pipe dimensions smaller and installation cheaper as piping is independent of topography	Increase in cost due to constant energy requirement for the permanent vacuum generation
3	Can be used a s a combined sewer	A minimum velocity to prevent the deposition of solids in the sewer	Pipe size and depth requirements are reduced, and many small pumps are cheaper than a single large pump	A proper recycling of nutrients is not possible as all kinds of wastes gets mixed by grinding	Smaller depths of trench work can be done by local workers and no heavy machinery is required	The system needs specialized trained workers for maintenance and operation works
4	Can handle grit and other solids, and large volumes of flow	uniform viscosity of sewer load cannot be maintained	Requires little water only for transporting the excreta	Higher capital cost	Large amount of flushing water can be saved which is economical.	Total manhole cost in gravity system is 33percent cheaper than the total cost of the similar components in vacuum system

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
5	Land acquisition for pumping systems not required	Difficult and costly to extend as a community changes and grows	PSS offers controlled transfer of sewage in a far more efficient footprint than conventional sewage systems	Unsuitability for self-help, requires skilled engineers & operators	The risk of clogging is low and there is almost no cleaning/emptying work to do.	Additional cost for vacuum valves and vacuum station
6	Lesser skilled engineers and operators compared to pressurised system	Requires expert design, construction, and maintenance	reliability and the potential to be expanded as the demand for sewage handling increases.	Leakages may lead to contaminations.	Field changes can easily be made as unforeseen underground obstacles can be avoided by going over, under or around them	Design guidelines and operation and maintenance are not well known in developing countries
7	No restrictions on connections	Leakages pose a risk of wastewater exfiltration and groundwater infiltration and are difficult to identify	Possible to install a network in rocky, hilly, coastal, or other difficult areas, such as those with high water tables where conventional gravity-fed sewers would be too costly	Land acquisition involved and land area required in individual house holds	Suitable where rock layers, running sand or a high groundwater table is encountered where deep excavation difficult	Number of system providers limited in India

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
8	No risk of overflows in the neighbourhood and odour control is better.	Requires manholes to be placed at set distances and at every pipe-turn. These manholes are potential entry points for infiltration/inflow. Higher infiltration/ inflow complicates treatment and increases operating and maintenance costs.	Eliminates the opportunity for any sewage or contaminated liquid to leak into the surrounding area. Odour issues are therefore dramatically reduced	Grinder pumps require power at each unit. The panel is usually installed on the side of the house and power paid by the homeowner. Existing houses may need to upgrade electrical mains and power board.	Areas short of water supply or poor communities that must pay for and cannot afford great amounts of water necessary for operation of gravity systems.	Faults at individual valves can affect the entire system
9		Gravity systems require a significant upfront investment in excavation and piping before connecting any homes to the system	Operator's advantage: ability to monitor the performance of the network performance, often remotely via the web, and capture performance data allows various parameters to be managed so that the system operates at peak efficiency	One pump is required per house. If the house is large or commercial flows anticipated, then a larger capacity pump may be required.	Areas that are ecologically sensitive, Areas where flooding can occur	System components are not readily available everywhere.

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
10		Large-diameter, long-distance gravity mains can be a source of gas generation and odour	Operating periods can be programmed and staggered so that peak loads on the wider network are reduced. This feature can also help reduce or eliminate the emergency storage capacity which the network's sewage pump station might otherwise require to cope with input surges	As all pipework is under pressure then a break in the pipe will lead to large exfiltration. Not suitable in environmentally sensitive areas.	Trench filling materials cost, labour cost, dewatering and safety measure costs are also less in vacuum system compared to the similar costs for the gravity system	Due to lower transport velocities vacuum mains which have a large pipe diameter are more prone to scaling and precipitation from compounds contained in the wastewater and reduction in life span
11		Electricity required only at the Pump Station, and a number of pump stations may be required to service a single Catchment.	Remote monitoring capability also allows for the early detection of problems in the network, so that immediate action can be taken before matters escalate, thus reducing maintenance costs and network disruption	As all pipework is under pressure then a break in the pipe will lead to large exfiltration. Not suitable in environmentally sensitive areas	Overall, vacuum system is around 30 % less expensive than gravity system.	As with any sewer system, pipe cracking may occur due to land subsidence or landslide resulting in the loss of vacuum in the system

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
12		A broken pipe will go unnoticed for many months and the depth of the gravity lines will make detection difficult and expensive to repair	Control network and two-way telemetry features allow multiple individual units to be linked and managed from a centralized network point	Access is difficult as all equipment is on the homeowner's property for maintenance		The time periods for the replacement of deteriorated parts and the preventive inspections are determined by the equipment manufacturer and the authorities have no control over it.
13		Broken pipe can go unrepaired for long periods allowing stormwater to enter the system. This increases Treatment costs and power use.	Offers completely 'clean' access to the motor which sits in a dry well, as opposed to being submersed in sewage in the conventional manner. This keeps the motor and electrical systems separate from the fluid being pumped, and so makes maintenance a far quicker, safer, and more pleasant process.	Operation and maintenance of pump stations, skilled workers, power usage and carbon footprint is more	Contrast to conventional gravity flow or pressured sewer systems vacuum sewers use differential air pressure to transport wastewater which is generated by vacuum pumps located at the vacuum station, a centralized unit and in most designs the only point of electricity consumption	The availability of components needs to be checked and ensured when choosing a vacuum sewer system. In the event of system failure or material wear individual parts need to be available to ensure quick recovery of the sewer function

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
14		Limiting pump station compared to pressurised sewer systems reduces land cost	Smart safeguards which greatly reduce the possibility of people and pets coming into contact with the individual grinding and pumping unit.	Long term cost of a pressurised system is higher than the gravity system based on cost benefit analysis undertaken	Flood-proof – Vacuum systems can prevent flood waters entering the sewer system meaning that the sewers still operate if the area is flooded.	sufficient stock and long-term material supply need to be assured making the initial cost of construction higher.
15			Pressure sewers offer freedom from infiltration/inflow because the systems are sealed. With residential pressure sewers, the only extraneous water entry points in the system between the homes and the treatment plant are the homes.	Pump stations have multiple pumps, they have backup generators, and this makes O&M higher,	Minimum maintenance at vacuum valves and collection chamber	Operation and maintenance costs can vary significantly on how well the system is designed and how repair of the system failures is managed.
16			Pressure sewer systems control odour more effectively than gravity systems		No infiltration of stormwater or groundwater due to tight system	Vacuum stations use one vacuum pump and one sewage pump, and both have a spare one in case of failure or service

Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
17			As it is a pressurized system infiltration cannot occur		No manholes required	The number of vacuum stations required for a large system is very high and the land cost for installation depends on site specific conditions.
18					Vacuum sewer systems are the only systems allowed to be installed in ecologically sensitive areas a	[9]Studies in Germany bring out electricity consumption of vacuum sewers is about 15-30kWh/person/Year and 0.2 – 0.7 kWh / m^3 wastewater
19					Minimum impact to the environment from construction	[10] Vacuum systems are also called alternate connection systems (ACS). communities of 3,500-10,000 population can likely provide a sustainable and effective management program for any ACS technology

Recommendation

Based on the advantages and disadvantages analysed a combination of gravity system and pressurised system for primary network has been adopted for IURWTS catchment. As far as possible gravity system was adopted with one or two trunk mains for conveying and collection the sewer load to the receiving chamber of STP. This concept minimized the pumping stations and thereby reducing the Land Acquisition cost. The topography is conducive for a gravity system inside the catchment and no land acquisition is required as the alignment follows the road networks. Vacuum sewer system is not recommended considering the shortage of skilled and trained workers for the operation and maintenance, land cost involved for setting up vacuum stations, Continuous energy requirement, Number of system providers limited in India Faults at individual valves can affect the entire system, deteriorated parts and the preventive inspections are determined by the equipment manufacturer and the authorities have no control over the time for replacement.

Based on the advantages and disadvantages analysed a combination of gravity system and pressurised system for primary network has been adopted for IURWTS catchment.

7.3 Network Patterns of collecting system

7.3.1 Perpendicular pattern

In this pattern sewers carrying storm water are laid in such a way as to seek the shortest possible path to the natural water courses. The shortest possible path to the natural water courses can be obtained if the sewers are laid perpendicular to them. This pattern is suitable for separate system and partially separate system in which storm water can be directly disposed of without any treatment as given in **Figure 24**. It is not suitable for combined system, because firstly it is very difficult to treat the sewage due to large number of outlets and secondly it pollutes the water of natural courses.

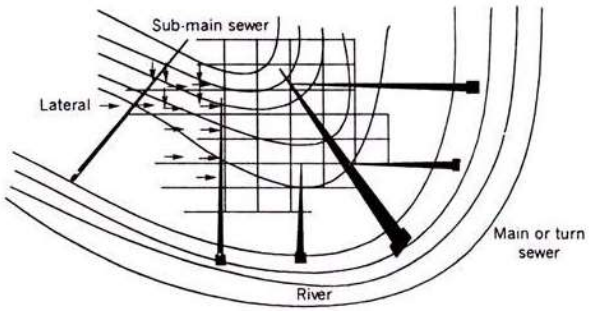

Figure 23: Perpendicular pattern

7.3.2 Interceptor pattern

This pattern is an improvement over the perpendicular pattern. In this pattern sewers are intercepted by a large size sewer, which is laid all along the water carrying sewage to a common point, where it can be disposed of with or without treatment. If the quantity of storm water is very large, overflows should be provided as shown in **Figure 25**. allowing the excessive sewage to spill over into natural water courses through outlets, which were existing before the interception.

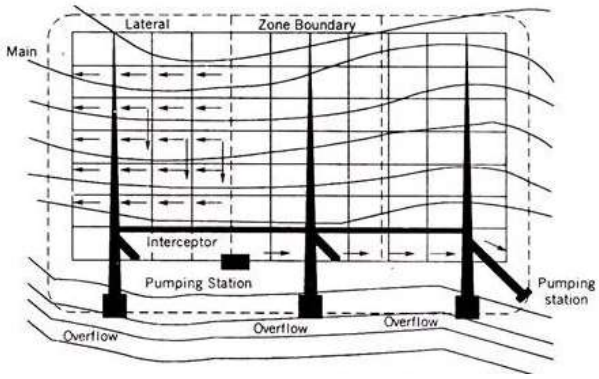

Figure 24: Interceptor pattern

7.3.3 Radial pattern

This type of pattern can be employed if the sewage is to be disposed off on land around the town. In this pattern large number of outlets are provided. The sewers are laid radially outwards from the centre of the city; therefore, this is called as radial pattern as given in **Figure 26**. In this pattern the suburbs can be served by relatively small and short lines of sewers which make it economical. The main disadvantage of this system being large number of disposal works.

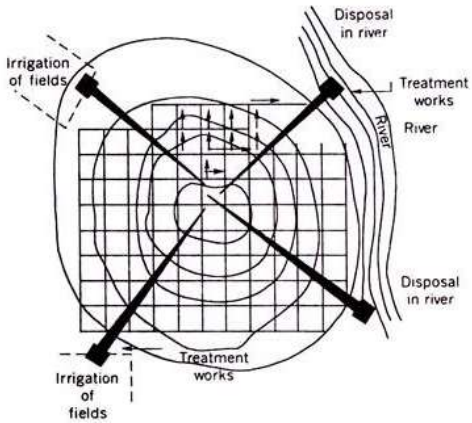

Figure 25: Radial pattern

7.3.4 Fan Pattern

If the city is situated near the river, which is on one side of it only, the sewer can be laid in such a way that the whole sewage flows to a common point where one treatment plant is located and is given in **Figure 27**. In this pattern number of converging main sewers are laid, which form a fanlike shape, from which it derives its name.

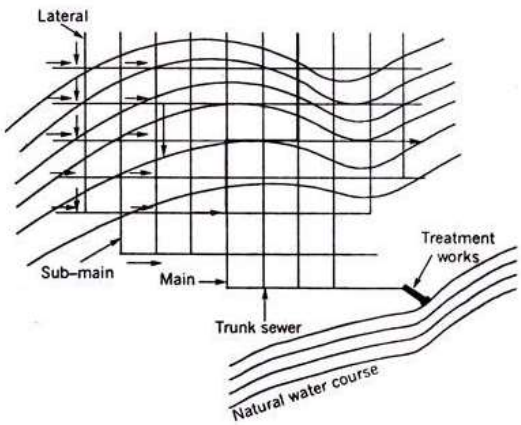

Figure 26: Fan Pattern

7.3.5 Zone pattern

In the interceptor pattern only one single large size intercepting sewer is used to collect and convey the entire sewage, due to which it is over-loaded. This over-loading can be removed by providing more number of interceptors of each zone as shown in **Figure 28**. This type of pattern is most suited to sloppy areas as hills than flat areas.

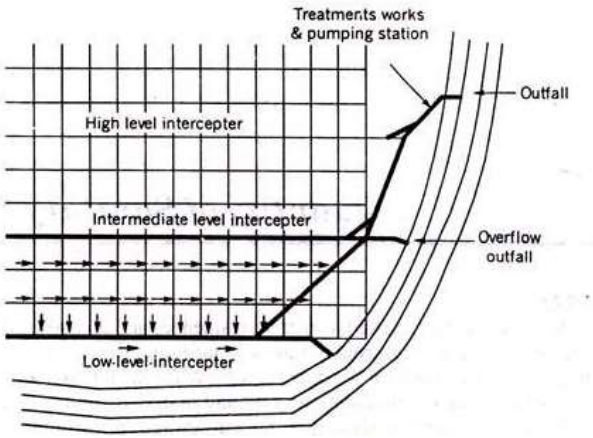

Figure 27: Zone pattern

The pattern adopted for IURWTS catchment is a fan pattern as the flow from the catchment flows by gravity system to a common trunk main up to the STP site Sewerage plan for IURWTS Muttar sewer area.

The pattern adopted for IURWTS catchment is a fan pattern as the flow from the catchment flows by gravity system to a common trunk main up to the Collection well/STP site Sewerage plan for IURWTS Edappally and Chilavanoor canal North Catchment.

Sewerage scheme for Muttar Sewer area is designed for DWF (Dry Weather Flow) i.e. designed as separate system and not as combined system for Techno- economic reasons. The CPHEEO guidelines manual on Sewerage and Sewage Treatment published by the Ministry of Urban affairs as practiced in India id followed. There is no existing sewerage system or treatment plant in Muttar sewer area.

Stages involved in planning a sewerage system

There are four stages in the entire sewerage system as follows.

a) Collection of Sewage (Sewers & Sewage Pumping Stations)
b) Transportation of Sewage
c) Treatment of Sewage – Sewage Treatment Plant
d) Effluent Disposal System

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The proposed project aims to provide a comprehensive wastewater collection, treatment & disposal system using laterals, branches and trunk mains including sewage treatment plant North catchments of Edappally and Chilavanoor Canal with STP located at Muttar, with minimum disturbance to the urban fabric of the catchment.

7.3.6 Planning Strategy for laying of sewerage network

The Topography of Edappally north catchment slopes from east to west direction in the Municipal areas falling on the east side of Edappally canal. On the western side the Kochi corporation area of Edappally north catchment is situated and the slope is very mild from west to east towards the main canal. Hence the natural slope of Edappally north catchment has been followed to avoid pumping stations inside the catchment and planning has been undertaken by a gravity-based system with manholes and lifting stations were essential. Two pumping stations are found unavoidable to collect and covey about 3.91MLD and 13 MLD of the sewer load generated in the blocks 2 ,3A and 3B as shown in the Figure 29.

This DPR deals with household sewer network connectivity of the sewer area of Muttar which consists of north catchment areas of Edappally canal and Chilavanoor Canal. The treatment of sewage load generated is proposed at the STP at Muttar as explained in previous sections of this report.

As regard to the tertiary network most of the roads are narrow and the sewer lines proposed is through the centre of the road and where the roads are wide the tertiary and secondary sewer lines are proposed on the berm sides of the road network, so as to help in connecting houses on both sides of the road to the tertiary networks. The sewer load from network of roads is proposed to collect and convey by an appropriate trunk main which is then conveyed to a collection well /STP. Load collected in the well is pumped to STP.

The areal details and population served is as given in **Table 21**.

Table 21: Areal details and population served for Muttar STP (IURWTS)

Sl. No.	Corporation/Municipalities	Covered Area Sq.km	Population (nos.) 2011	Population (nos.) 2055	Household served @ 5 persons /Household units
CHILAVANOOR CATCHMENT					
1	Kochi Corporation	4.92	30123	38981	6540
EDAPPALLY CATCHMENT					
1	Kochi Corporation	1.47	17136	22174	3720
2	Kalamassery	2.53	11157	16379	2521
	TOTAL	**8.92**	**58416**	**77534**	**12781**

7.3.6.1 Design Software adopted

Computer aided MS Excel sheet as per CPHEEO manual procedure has been used for Sewer network design. Considering the topography of IURWTS South Catchment and the limited flexibility in use of Sewer CAD, only validation works have been undertaken for selected pockets using Sewer CAD/SWMM.

7.3.6.1 Block wise demarcation of Corporation/Municipal area

The Kochi Corporation area coming under Muttar sewer area is divided into five blocks and is as given in **Figure 29**. Kalamassery Municipality, the east side of Edappally Cana; is the fifth block.

This network design of Muttar sewer is a revised one of the earlier submitted DPR in which Muttar sewer Consists of Block 2, Block 3 and Block 4. All the blocks of IURWTS project sewer system is uniquely numbered and hence for this revised design which increased the number of blocks, it has been named as Block 2, Block 3A, Block 3B, Block 3C and Block 4.

Block 2- The southern end of Chilavanoor canal north catchment area up to a chainage of 2000m is resized as Block 2 and the network has been rerouted to convey the sewer load to a collection well (WW1) at BTS bridge at Chainage 2300m of Chilavanoor canal. The sewer load collected in the well is proposed to be pumped Wet well WW2 at chainage of 900m of Chilavanoor Canal and then to STP chamber though a pumping main of suitable diameter and length.

Block 3A consists of balance catchment area of Chilavanoor Canal on either side, eastern side as well as western, other than taken in Block 2 in the west side and Block 3B in the east side. The sewer load generated in the entire block is directed to a collection well proposed at a chainage of 900m of Chilavanoor Canal Sewer collected in this well is then pumping to STP through an adequate pumping main.

Block 3B Consists of southern portion of north catchment area of Chilavanoor canal up to a chainage of 1800m of Chilavanoor canal east side. The sewer load generated in this block is directed to the newly proposed collection well WW1 to which load from Block 2 Is also collected.

Block 3C Consists of the west side of Chilavanoor canal Catchment. A small portion of east side (Kalamassery which is not feasible to convey to Block 4) is also included in this block. The sewer load in this block is collected and conveyed through a trunk main of suitable size to the newly proposed collection well at STP site.

Block 4 consists of the east side of Edappally North catchment area which included Kalamassery Municipality alone. The sewer load from this block area is also conveys through a trunk main to the newly proposed collection well at STP site.

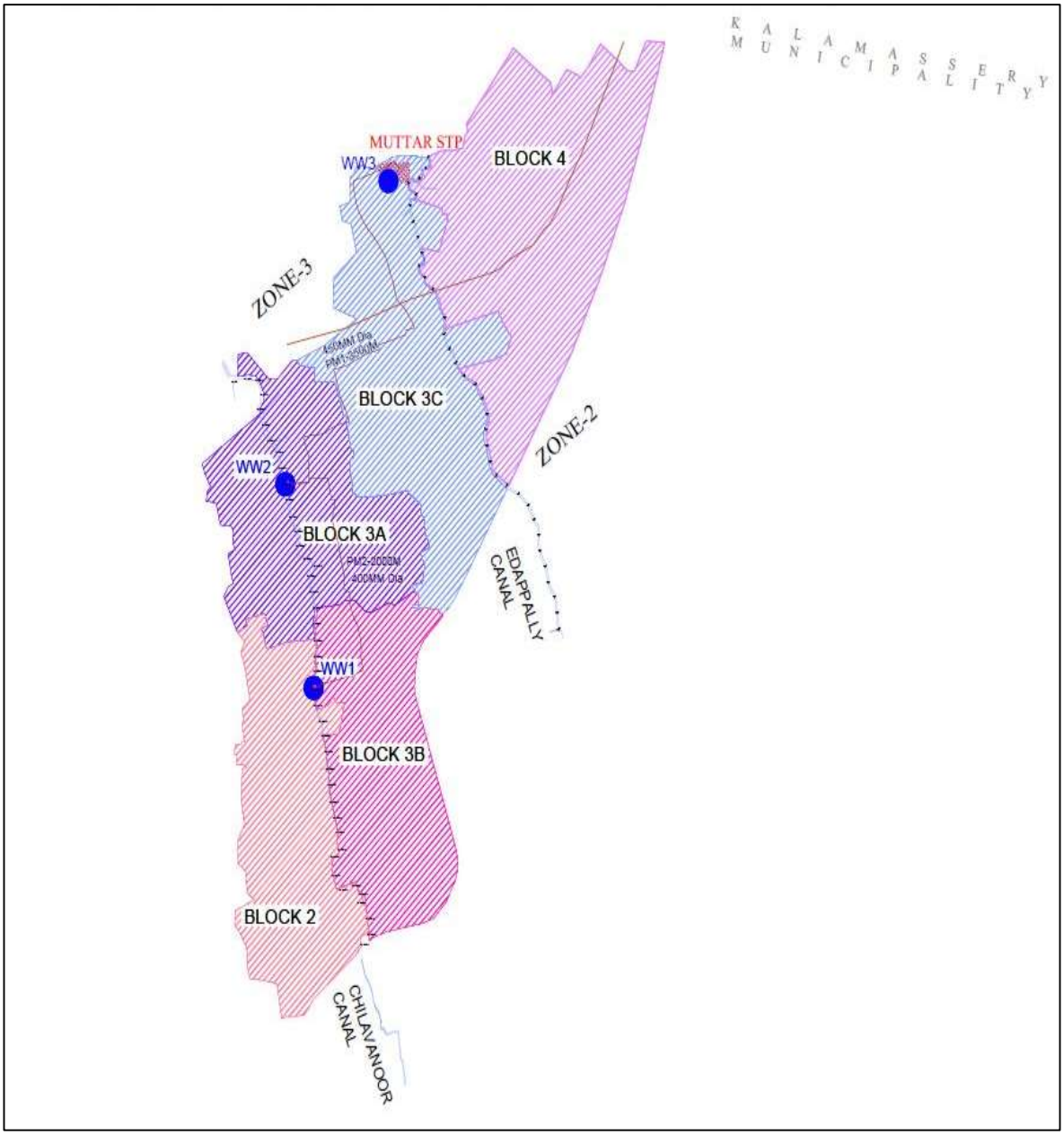

Figure 28: Muttar catchment Sewer network Appurtenant structures

7.3.7 Population Projection

The population projection and sewer load calculations were based on Kochi Master Plan of KWA and is attached as **Annexure 1**.

7.4 Design Criteria

The sewage system consists of Sewer network for household connections with suitable pipes, manholes and lifting manholes/lifting stations, pumping stations with wet wells and designed pumps and motors, pumping mains.

For proper design of sewer system, the project area proposed to cover, Population in the area Design period, location of manholes, type of sewer lines, pumping stations if required etc are to be analysed.

7.4.1 Coverage area

Out of the 6 sewer zones divided for the implementation of IURWTS sewerage system, Zone 2 and Zone 3 North catchment areas of Chilavanoor and Edappally canals is the coverage area for treatment in the newly proposed STP at Muttar. Muttar Sewer area consists of 11 divisions of Kochi Corporation and 9 divisions of Kalamassery Municipality. The area starts from chainage 3800 near Kaloor Metro station and ends at Chainage 0 beginning edge of Muttar. The total covered area is 8.92 Sq.km (IURWTS) for sewage treatment. **Table 22** gives the details of blocks, road networks, manholes, lifting stations and Sewage pumping stations.

Table 22: Abstract of appurtenant structures for sewer network

Description	Blocks	Road network length in km	No of Manhole	No of Lifting stations	No of Pumping stations
Kochi Corporation	5	104	4430	20	2

It is also noticed that this area has not any existing sewage treatment facilities.

7.4.2 Estimation of design Sewage Flow

The design flow is based on the design period, population, Floating population, Ground water Infiltration and per capita sewage flow. The flow in sewers varies from hour to hour and also seasonally. But for the purpose of hydraulic design estimated peak flows are adopted. A peak factor of 2.25 is considered as per the norms of CPHEO Manual.

7.4.2.1 Design Period

The design period for this sewer system is taken as 30years. For pumps and motors, the design period is taken as 15 years for reducing the capital cost. The pumps are designed for intermediate

sewage load and ultimate sewer load for a period of 30 years from the implementation year. The sewer load for zone I is calculated for the projected year of 2055.

7.4.2.2 Population

The population of the catchment area is projected to 2055 based on the census population as per 2011. Floating population is taken as 55% of the projected population for Kochi Corporation and 20% for Kalamassery Municipality. Institutional sewer load is also considered in the design load calculation. In this project population projection and sewer load calculations are based Kochi Master Plan of KWA.

7.4.2.3 Per capita sewage flow

As per the CPHEEO manual, per capita flow /Dry weather flow is taken as 85% of the current water supply of 150 litres per capita per day. 85% of the proportionate quantity of Floating population @ 70 lpcd 0f 55% of the total Kochi population and 20% for Kalamassery Municipality population and non-domestic demand of the Kochi corporation are included in calculating the total sewer load. Ground water Infiltration at the rate of 4500liters/km road length /day is also taken into account for finalising the sewer load.

Total sewer Load for Zone 2 and Zone 3 is calculated based on the above flow rate and is estimated as 14.03 MLD for IURWTS project and is designed with a peak factor of 2.25. .

7.4.3 Design of the network

Before designing, the following points are to be kept in mind.

7.4.3.1 Shape of the Sewer lines

Circular sewer sections are ideal from load bearing point of view as the hydraulic properties are better for varying flows.

7.4.3.2 Size of the Sewer lines

Minimum diameter for public sewer shall not be less than 150 mm (internal) except for sharply falling gradients. The minimum diameter in public roads shall be 150 mm and that for house sewer connections to public sewers shall be 100 mm. However, depending on growth potential in certain areas even 150 mm diameter can also be considered. However, in towns having present / base year population of less than 1 lakh, the minimum diameter of 150 mm shall be adopted.

For this project area, minimum size of sewer line is fixed as 200mm diameter in discussion with M/s. CUBE IIT and KWA.

7.4.3.3 Carrying capacity of sewer lines

All sewers will be designed to flow up to a maximum depth of 0.80 times (i.e., 80 %) the internal diameter of sewer at ultimate peak flow (As per the CPHEEO Sewerage Manual) in order to ensure proper ventilation in sewers. However, such provision will be simultaneously checked for self-cleansing velocity in present peak flow condition.

7.4.3.4 Velocity of Sewer

It is required to maintain minimum velocity through the sewer to ensure that suspended solids do not deposit and cause choking. Hence, it is mandatory to maintain "self-cleansing velocity" in sewer lines. As per Govt. of India stipulations: The minimum self-cleansing velocity required is 0.6 m/sec at present peak flow to prevent 0.09 mm sand particles of sp. gr. 2.65 from settling. The maximum scouring velocity is limited to less than 3.0 m/sec to safeguard the sewer against abrasion and erosion by sand and other gritty material and also against possible sulphide corrosion (as a result of release of hydrogen sulphide gas due to turbulence).

At certain stretches, viz. the tail ends of laterals, branches and even on the main sewer, minimum velocity for design flow is likely to be less than minimum self-cleansing velocity. At certain stretches, where velocity corresponding to peak flow condition is high, manholes and sewers will be flushed out during peak flow in removing silt, which got deposited during minimum flow period, especially during night hours. Adopting lower values of velocities through lesser gradients will help in avoiding deep excavations for sewer laying. In developing a particular sewer collection network, this point shall be given due consideration prior to design of sewers.

As per the directions from the vetting agency, M/s. CUBE IIT the minimum velocity at the initial stretches have been taken as 0.3 m/sec . The necessary flushing units of suitable capacity are also proposed , for the area.

Recommendation from CUBE IIT for Velocity criteria.

- Optimization of sewer network based on the design interventions made by CUBE with reducing the minimum velocity criteria to 0.3 m/s as against 0.6 m/s in light of the guidelines

in **Chapter 3, Sec:3.29** of CPHEEO Manual under Flushing Manholes will help to evolve pragmatic strategy.

- Where it is not possible to obtain self-cleansing velocities due to flatness of the gradient especially at the top ends of branch sewers, which receive very little flow, it is essential that some form of flushing device be incorporated in the system.
- A more practical and relatively safer method is to deploy the modern jet rodding machines at head manholes and use the treated sewage from the STP, but then, the cost of the machine is involved.

7.4.3.5 Sewer transition

Sewer transition is defined as an event or point at which there is change in diameter of sewer or its alignment, junction of two or more sewer lines, etc. These changes can occur singly or as a combination of two or more factors. The preparation of hydraulic design of sewers has to take into account the changes in hydraulic profile of sewers due to such transitions. Usually, the diameter of the sewer increases progressively. For design purposes, it is assumed that energy losses and changes in depth, velocity and invert elevation occur at the centre of transition and afterwards these changes are distributed throughout the length of transition. Minimum slope of sanitary sewers is given in **Table 23**.

anteagroup

Table 23: Minimum slopes of sanitary sewers

Sewer Size (mm)	Minimum Slope		Sewer Size (mm)	Minimum Slope	
	As percent	As 1 in		As percent	As 1 in
150	0.60	170	375	0.15	670
200	0.40	250	450	0.12	830
250	0.28	360	≥ 525	0.10	1000
300	0.22	450			

Manholes shall be located at all such transitions and a drop shall be provided where the sewer is intercepted at a higher elevation (if vertical drop in elevations is more than 60 cm). If the vertical drop in elevations is less than 60 cm, it can be avoided by adjusting the slope in the channel and in the manhole connecting the two inverts. Transition from larger to smaller diameters shall not be made.

The crowns of sewers are always kept continuous. In no case, the hydraulic flow line in the large sewers shall be higher than the incoming one. To avoid backing up, the crown of the outgoing sewer shall not be higher than the crown of incoming sewer.

A junction occurs where one or more branch sewers enter a main sewer. Well-rounded junctions are required to prevent deposition. Vertical pipe drops are used frequently at junctions for which main sewer lines well below the branch sewers. These pipe drops are designed with an entrance angle of 30 degrees with the main sewer.

An inverted siphon can be provided to carry the sewer under the obstruction and regain as much elevation as possible after the obstruction is passed. They shall be resorted to only where other means of passing the obstruction are not feasible as they require considerable attention in maintenance.

7.4.3.6 Hydraulic Design Formula

Manning's formula is used for designing slopes and diameter of the sewer line to carry the design flow at stated velocity.

7.4.3.7 Manning's Formulae

The flow in the sewer lines is calculated using Manning's formula.

$$V = [(1/n)] \times [R^{2/3}\, S^{1/2})$$

For Circular Conduits,

$$V = (1/n)\,(3.968 \times 10^{-3})\, D^{2/3}\, S^{1/2}$$

and

$$Q = (1/n)(3.118 \times 10^{-6})\, D^{2.67}\, S^{1/2}$$

Where,

Q- Discharge in l/s	S= Slope of hydraulic gradient	D- internal diameter of pipe in mm
R- Hydraulic radius in m	V- Velocity in m/s	n- Manning's coefficient of roughness

(The value of Manning's co-efficient ('n' value) for uPVC / HDPE pipe is 0.011, for DI pipe (cement mortar lined) is 0.011, for RCC pipe is 0.011 (for rubber gasket jointed pipes) and for stoneware pipe is 0.012.)

7.4.3.8 Design Depth of Flow

The sewers shall not run full as otherwise the pressure will rise above or fall below the atmospheric pressure and condition of open channel flow will cease to exist. Moreover, from consideration of ventilation, sewers should not be designed to run full. In case of circular sewers, the Manning's formula reveals that,

- The velocity at 0.8 depth of flow is 1.14 times the velocity at full depth of flow.
- The discharge at 0.8 depth of flow is 0.98 times the discharge at full depth of flow.

Accordingly, the maximum depth of flow in design shall be limited to 0.8 of the diameter at ultimate peak flow.

For hydraulic design of the network, in order to facilitate the calculations easily, the hydraulic properties at various depths of flow are compiled and is added below **Table 24**. (Ref Table 3.12 of CPHEEO manual Chapter 3).

Table 24: Hydraulic properties of circular sections for Manning's formula

Qa/Qf	d/D	Va/Vf
0.0000	0.0700	0.3000
0.0100	0.0700	0.3000
0.0200	0.1000	0.4000
0.0300	0.1300	0.4600
0.0400	0.1500	0.5100
0.0500	0.1600	0.5300
0.0600	0.1700	0.5500
0.0700	0.1900	0.5900
0.0800	0.2000	0.6100
0.0900	0.2100	0.6300
0.1000	0.2200	0.6500
0.1100	0.2300	0.6700
0.1200	0.2400	0.6900
0.1300	0.2500	0.7000
0.1400	0.2600	0.7100
0.1500	0.2700	0.7300
0.1600	0.2800	0.7400
0.1700	0.2900	0.7500
0.1800	0.3000	0.7600
0.1900	0.3000	0.7700
0.2000	0.3100	0.7800
0.2100	0.3200	0.7900
0.2200	0.3300	0.8000
0.2300	0.3300	0.8100
0.2400	0.3400	0.8300
0.2500	0.3500	0.8400
0.2600	0.3500	0.8400
0.2700	0.3600	0.8500
0.2800	0.3700	0.8600
0.2900	0.3800	0.8700
0.3000	0.3800	0.8800

Qa/Qf	d/D	Va/Vf
0.3100	0.3900	0.8800
0.3200	0.4000	0.8900
0.3300	0.4000	0.9000
0.3400	0.4100	0.9100
0.3500	0.4100	0.9200
0.3600	0.4200	0.9200
0.3700	0.4300	0.9300
0.3800	0.4300	0.9300
0.3900	0.4400	0.9400
0.4000	0.4400	0.9400
0.4100	0.4500	0.9500
0.4200	0.4500	0.9600
0.4300	0.4600	0.9700
0.4400	0.4700	0.9800
0.4500	0.4700	0.9800
0.4600	0.4800	0.9800
0.4700	0.4800	0.9900
0.4800	0.4900	0.9900
0.4900	0.4900	0.9900
0.5000	0.5000	1.0000
0.5100	0.5100	1.0100
0.5200	0.5200	1.0100
0.5300	0.5200	1.0200
0.5400	0.5300	1.0200
0.5500	0.5300	1.0200
0.5600	0.5400	1.0300
0.5700	0.5400	1.0300
0.5800	0.5500	1.0300
0.5900	0.5600	1.0400
0.6000	0.5600	1.0400
0.6100	0.5700	1.0500
0.6200	0.5700	1.0500
0.6300	0.5800	1.0500
0.6400	0.5900	1.0600
0.6500	0.5900	1.0600
0.6600	0.6000	1.0700
0.6700	0.6000	1.0700
0.6800	0.6100	1.0700
0.6900	0.6100	1.0800
0.7000	0.6200	1.0800
0.7100	0.6300	1.0800
0.7200	0.6300	1.0900
0.7300	0.6400	1.0900
0.7400	0.6400	1.0900

Qa/Qf	d/D	Va/Vf
0.7500	0.6500	1.1000
0.7600	0.6500	1.1000
0.7700	0.6600	1.1000
0.7800	0.6700	1.1000
0.7900	0.6700	1.1000
0.8000	0.6800	1.1100
0.8100	0.6800	1.1100
0.8200	0.6900	1.1100
0.8300	0.7000	1.1200
0.8400	0.7000	1.1200
0.8500	0.7100	1.1200
0.8600	0.7200	1.1200
0.8700	0.7200	1.1200
0.8800	0.7300	1.1300
0.8900	0.7400	1.1300
0.9000	0.7400	1.1300
0.9100	0.7500	1.1300
0.9200	0.7600	1.1400
0.9300	0.7700	1.1400
0.9400	0.7700	1.1400
0.9500	0.7800	1.1400
0.9600	0.7900	1.1400
0.9700	0.8000	1.1400
0.9800	0.8000	1.1400
0.9900	0.8100	1.1400
1.0000	0.8200	1.1400

7.4.3.9 Manholes

Sewer transitions occur wherever conduits of different characteristics are connected. The difference may be in flow, size, grade and alignment, material of conduit, with a combination of one or all characteristics. Manholes have been located at all such transitions with CI/PVC footrest for access. As per CPHEEO Manual. Diameters of circular manholes for stated depths of sewers are in **Table 25**.

Table 25: Diameters of circular manholes for stated depths of sewers

No.	Range of Depths, m	Internal Diameter
1.	Above 0.90 m and up to 1.65 m	0.9 m
2.	Above 1.65 m and up to 2.30 m, 1200 mm	1.2 m
3.	Above 2.30 m and up to 9.0 m	1.5 m
4.	Above 9.0 m and up to 14.0 m	1.8 m

Ref CPHEEO Manual1990

The size of the access cover should be of 560 mm clear opening. Since the manholes are to be located on roads with trucks plying on them, steel fibre reinforced concrete covers (SFRC) of heavy-duty HD-35 designation and conforming to IS: 12592 have been proposed.

For straight sections, the interval at manholes on sewers, which are to be cleaned manually and cannot be entered for cleaning or inspection, the maximum distance between manholes should be kept at 30m. However, for economical consideration a manhole spacing of 50 m C/C shall be provided for all trunk sewers having diameter more than 600 mm.

For this project 1.2 m diameter circular manholes up to a depth of 2.5m depth of cutting and 1.5m diameter circular manholes for depth of cutting up to 4.5m depth of cutting are included for designing. For restricting the depth of cutting lift manholes are provided with automated functioning.

7.4.3.10 Lift Manholes

There are cases where high water table conditions or rocky strata pose considerable difficulties in the design and provision of conventional gravity sewerage system in that excavations amidst sub soil water or rocky terrain is not only difficult but also is frowned upon by the public when the works drag on and on in the middle of the road. Such situations can be easily got over by restricting the depth of sewers to a practicable limit and diverting the flow into a pavement submersible pump station with a lockable control panel there itself. In such situations, it is advantageous to opt for intermediate lift stations, which are like “on line”. In general, these are submersible pump stations, which are interposed in the gravity sewer network. The procedure is to sink a wet-well on the road shoulder or an acquired plot beyond the shoulder and divert the incoming deeper sewer to it and the submersible pump set therein will lift the sewage and discharge it to the next on line shallow sewer.

As the sewer progresses, any number of such lifts can be inserted based on the location as given in **Figure 30**. This is similar to the pillar boxes of the electricity board and the delivery main can lift the flow to the downstream manhole at the conventional 0.9 m depth to invert. With the availability of quite a few manufacturers of sewage-submersible pump sets in the country it should be possible to implement this instead of struggling with deep sewers in such areas for years together and more importantly compounding the problems of O&M and the repairs at these depths perpetually. These submersible pump stations can be operated by mercury float switches and powered by dedicated feeder lines from the local electrical authority similar to the lines given to the hospitals, etc. These

pump sets can also be connected to solar panels. The pump pit can be covered with pedestrian grade walkway slabs, which are of RCC and with adequate lifting arrangements to permit the lowering and lifting the submersible pump sets.

These shall be connected to dedicated electricity feeders as installation and O&M of standby diesel pump sets etc., are not feasible in such locations.

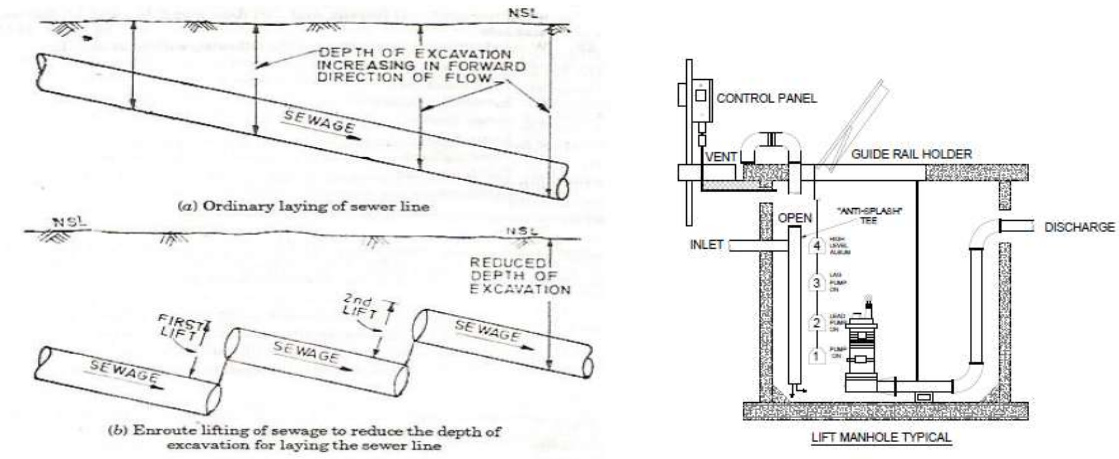

Figure 29: Enroute lifting of sewerage and a typical lift manhole

In this IURWTS Project the high-water table and the topography of the catchment area of the canals, the depth of cutting shall be limited to 4.5m and hence the lifting stations are proposed to lift the sewage at certain intervals. In Kalamassery Municipality, the topography is very uneven and the level difference between continuous manholes varies from 1m 17m and it is found very difficult to align the sewer line with required slope. The depth of cutting is thus increased up to 5.5m.

7.4.4 Pumping Stations and Pumping Mains

The pumping stations are proposed in the three zones along the banks of the canal at two locations , at chainage of 0+900 and 2+300 of Chilavanoor canal. The pumping stations which are pumping to the other wells other than directly to Raw sewage sump of STP shall include minimum components such as coarse and screen, wet well, pumping platform, motor, panel board and sufficient ventilation.

The pumping main from the newly proposed pumping station at Ch 2300m up to the Collection well proposed at chainage 900m is proposed to align through suitable road and is found about 2000m long. A

total quantity of 5.8 MLD sewer load collecting in the wet well is proposed to convey through the pumping main up to the Wetwell2 . Ductile Iron pipe of 400mm diameter Class K9 is proposed as pumping main. HDPE pipe of equivalent diameter with high strength is not available for sewerage pumping mains. The pumping mains are checked for water hammer also.

The second pumping main is proposed from the Wet well 2 to STP. The size of the pumping main is 450 mm of Ductile Iron Class K9 and the length of the main is 3500 m.

7.4.5 Pipelaying works across canal/railway/National Highway

The sewer network area in Edappally catchment consist of sewer laying across railway /NH. Trenchless method by Push through / HDD method is proposed for crossing works. Two railways crossing in Edappally catchment, one crossing in Kalamassery Municipal area and the other railway crossing in Kochi Corporation. The NH crossing in Corporation area is also proposed by means of HDD method. Adequate size of suitable material pipes as per the site conditions are to be laid and provision is included in the estimate.

7.4.6 Typical hydraulic Design of the sewer network

The next step is the design of the network and is the most important component of the sewer system. Computer aided design using excel software is being done for the design of Zone 1 sewer area. Block wise covered area and the Projected population for individual blocks for the design period are calculated and tabulated in **Table 15**. The design sheets (excel) provided as **Annexure 6**.

Computer Aided Design using Excel software (CPHEEO Manual)

The design consists of the following steps.

Step 1 Input data for computation of sewage Flow

Data 1- The projected population of the block for the year 2055

Data 2 – Floating Population – proportionate number of 55% of the projected population

Data 3 – Ground Water Infiltration – 4500 litres/Ha/day

The input data for individual blocks is prepared and is given in **Table 26**.

Table 26: Input data for individual blocks

Sl. No.	Description	Year	Quantity BLOCK 5
1	Projected population	2055	12742
	Domestic Demand @150LPCD		1.911
2	Floating population		7008
	Floating Demand @ 70 LPCD		0.491
	Nondomestic demand		0.295
3	Wastewater generated		85%
4	Quantity of wastewater generated		2.293
			2292590.864
	GWI @4500liters per kilometer sewer length		90000

As per the input data design calculations is as follows. From the layout and profile of the block under designing, the total sewer length proposed for conveying sewer load in tertiary as well as secondary sewers is to be entered, Sewer generation, Groundwater Infiltration, Unauthorised storm water drain connection per meter length is calculated by Excel programmed sheet.

Design Calculations for Muttar STP catchment

BLOCK	Total Population as per 2055 (Ultimate)	Total Pipe Length (m)	Sewage Generation/m length (cum/day)
Block 2	30415	23040.86	0.153
Block 3B		23166	0.126
Block 3A	25099	17828	0.126
Block 3C	6493	21289	0.126
Block 4	15527	18294.75	0.141

Then the sewer lines From Manhole ID to Manhole ID, sewer length, Existing GL of From and To Manholes are entered in the already programmed Excel sheet. In addition, Peak factor, the Manning's constant, Manhole drop and proposed slope for attaining gravity flow with self-cleaning velocity are also to be entered. This excels sheet automatically calculates the sewage flow, size of the pipe required. Type of the Manhole such as start, junction, continuous are also defined in this programme so that cumulative flow(q1) for each manhole appears in the respective cells.

As per CPHEEO Norms minimum size of the pipe shall be 200mm . Design also fix the material of the sewer line. Here, DWC pipe for size up to300mm ID and HDPE pipe for more than 200mm ID is proposed. Clear cover of the pipe from the ground level is assigned as 0.90m. Slope for the minimum size of 200mm ID and DWC material maximum discharge (Q) is calculated using Manning's Formulae.

For the ratio q1/Q, using table for Hydraulic properties of Manning's formula, Velocity ratio V_{actual} (va0/ v maximum (vf) and Depth ratio (depth to diameter) d/D is determined. From these two values, d/D can be checked whether <0.80 and actual velocity for the entered slope, size and load of the sewer line is a minimum of 0.6m/Sec.

By knowing the slope and length of the sewer between two manholes, the fall will be getting. Invert levels of Start Manhole and End Manhole are then calculated, which gives the depth of cutting for each pipe length. The depth of cutting for the area is restricted to 4.5m due to the topography of the site the depth of cutting goes up to 8m. Hence Lifting stations are proposed at manholes where the depth of cutting exceeds 4.5m. Minimum depth of cutting is 1.06m.

The design process is repeated for each stretch until minimum self-cleaning velocity with minimum dia. of pipe in conjunction with minimum slope or within the range in CPHEEO manual and the depth of cutting is achieved.

Fixing pipe size and material

Ads per the recommendations from CUBE IIT and in discussion with KWA the design incorporates with following criteria for fixing pipe size and material.

- Minimum size of pipes for Gravity sewers in Kochi Corporation / potential areas prone to higher population growth) shall be upgraded to 200 mm
- DWC pipes for gravity sewer lines up to 300mm diameter and HDPE pipes for gravity sewer above 300 mm diameter
- For pumping mains KWA recommends HDPE / DI pipes of designed size and class

Based on these recommendations, the pipe size requirement for the total sewer network length of 103.62 km, is as given in **Table 27**.

Table 27: Sewer network pipe requirements

Type and size of Sewer pipes	Length in metres
200mm DWC pipe	92144
250mm DWC pipe	4752
300mm DWC pipe	1741
400mm HDPE pipe	3671
450mm HDPE pipe	1311

By designing each block network, the end sewer line is directed to the receiving chamber or to collection well from which is pumping to collection chamber of STP.

7.4.7 Estimates

The estimate for the entire block is prepared on PRICE using DSR 2018. The estimate includes dismantling Bitumen/CC/Paved roads and restoration of the dismantled roads after execution, laying of sewer lines, Manholes, Lifting manholes and household connections. The total estimate cost is **INR 226.18 Crores**. The estimate details are given is annexed as **Annexure 5**.

7.5 Conclusion

Design Parameters for Proposed Sewer line works

Description	Design Parameters
Design period	30 Years as per CPHEEO Manual
Sewage Contribution	85 % water supply including Kitchen waste 150 LPCD
Population Forecast	Based on 2011 population census data projected to year 2055
Ground Water Infiltration	a minimum infiltration flow i.e. 10% of flow has been considered in the design 4500litres per km sewer length
Hydraulic Formula	Manning's formula has been adopted in design. It is suggested by Manual & is best for gravity flow in channels/pipes
Peak Factor	PF as per manual is followed.
Depth of Flow in pipes	Not exceeding 0.8 full at ultimate peak flow
Self-Cleaning Velocity	Not less than 0.3 m/sec for peak flow but in initial stretches the minimum velocity cannot be achieved in design. Therefore, flushing system as CPHEEO Manual has been proposed in initial reaches, where velocity is less than desired.
Maximum Scouring Velocity	Restricted to 3 m/sec

Description	Design Parameters
House Sewer Connection	Provision of house connection for collection of wastewaters has been proposed from property line to manhole by uPVC/ HDPF/ DWC pipe.
Design calculation	On Excel computer sheet as per CPHEEO manual procedure, and validation by SEWER CAD for selected pockets
Selection of Sewer Slopes	Guideline of CPHEEO Manuals, has been followed
Manholes	The provisions of manholes have been proposed as per guidelines given in CPHEEO Manual
Drop Arrangement	Drop arrangement is proposed where the laterals join the manholes of main sewer and difference between invert levels of incoming and outgoing pipe is greater than 600 mm.
Manholes Construction	Precast concrete manholes with a combination of Brick masonry cm (1:4) and plastered from both sides in 1:3 CM for greater heights. PE manholes are also proposed for waterlogged areas.
Lift Manhole	Considering the topography and the water table conditions, the depth of cutting has been limited to 4.5m for Kochi city All the lift stations for each block will be regulated by the respective receiving pumping stations by providing dedicated electrical feeder line. Automation and integration with STP is also proposed
Covers and Frames	The covers for circular manholes shall be with clear opening not less than 500mm. The manhole covers of Steel Fibre Reinforced Concrete (SFRC) are suitable to withstand heavy traffic loads as per IS standard.
Pumping Stations and Pumping Mains	No pumping stations/pumping mains proposed in this sewerage scheme.
Selection of Minimum Pipe Size	Sizes of the pipe are between 200mm (OD) to 450mm (OD). Looking to the smaller size where in-lining is difficult and also corrosive nature of sewage the material of pipelines has been adopted DWC/HDPE class pipe and minimum pipe size considered is 200mm dia.
Pipe Material	DWC/HDPE SN-8 class pipes for sewer lines is proposed. From 200mm, 250mm, 350mm & 450mm,500mm,560mm size, DWC/HDPE pipe has been proposed up to 300mm dia gravity sewer lines. For pipes greater than 300mm sewer line has been proposed with HDPE PE-100 PN-8 class pipes.

Description	Design Parameters
Structural Design of Sewers	The structural design of sewers will be done in accordance with the guideline provided in the manual of sewerage and sewage treatment and in accordance with IS Code 4127- 1967, 783-1959. The load over pipe will be calculated of refilling material both under trench and culvert condition. If the load calculated by use of trench formula is more than the load calculated by the culvert formula, the latter will be taken as the load on the pipe in trench due to filling material. Load imposed where necessary, on the pipe due to surface load has been considered, depending upon the class of wheel load. Care will be taken to see that the field loads on the pipe leave a factor of safety of 1.5 over its corresponding supporting strength. If the worst combination of a field loading on the pipe is achieved, then it is assumed that the supporting strength of the pipe shall leave a factor of safety of 1.5. DWC/HDPE/uPVC will be selected as suggested in the above criteria
Construction of sewer	Construction of sewer is proposed as per Manual.
Geology of the project area	The average water table is between Kochi Corporation : 1.2m - 1.5m bgl
Maintenance of sewer network	The sewer network proposed to be laid shall be maintained by the contractor for 10 years including 2 year defect liability period.
Schedule of Rates	KIIFB PWD PRICE 2018 with cost index
EIRR/FIRR for the whole IURWTS project	26.41 / 5.24

8. Environmental Impact Assessment for Sewerage System

8.1 Introduction

In Kochi city and the surrounding areas, wastewater disposal into the drains and canals is the main environmental issue that has created unsanitary conditions, odour, mosquito problems within the city, and affecting the health of the inhabitants. This is due to lack of appropriate O&M by the authorities to clean the onsite sanitation facilities resulting in overflow of the septic tanks. The 4.45MLD Sewage Treatment Plant at Elamkulam owned by KWA (commissioned 65 years back) is running at an efficiency of less than 3.5MLD. Another STP under AMRUT scheme of Govt. of India is in the implementation stage which is conceived for covering the same area as that of the existing old STP at Elamkulam.

The Environmental Impact Assessment (EIA) Study undertaken by the General consultant (GC)(Antea Nederland), was to examine the environmental issues that will be encountered during the construction and operation phase of the project activities and their likely impact. Further, to reduce the potentially significant adverse impacts to acceptable levels, feasible and cost-effective measures are brought out in Environment Management Action Plan prepared GC for the IURWTS project. To bring the same into actions, the mitigation measures proposed will be incorporated into the contract conditions of the bid documents. This will help the contractors to take cognizance and implement them during construction and operation phase in accordance with statuary requirement of funding agency, (Kerala Infrastructure Investment Fund Board (KIIFB)). The study conducted also in lines with the KIIFB guidelines adhering to the of environmental and social considerations of the project. The main objectives of this study are as follows.

- To assess the existing status of air (including climate), noise, water and land environment, natural resources, quarries, natural (biological/ecological) environment, aquatic animals in project influenced areas and, socio-economic components of the environment including parameters of human interest sat the project site.
- To identify potential significant impacts on the above environmental components due to proposed project activities, including impacts due to discharge of effluent from the sewage treatment plant.
- To predict significant qualitative and quantitative impacts on the major environmental components

- Prepare an environmental impact statement based on identification, prediction, and evaluation of impacts.
- To prepare an Environmental Management Action Plan (EMAP) outlining preventive and control strategies for minimizing adverse impacts due to proposed activities.
- To formulate environmental quality monitoring program to be pursued by GC as per requirement of KMRL/KIIFB.

The selected sites for the STPs are such that there are no thick vegetations and aged trees. Certain bushes are seen spread in the site. Coconut trees and palm trees found in some areas. It has been ensured that the effluent disposal into the adjacent water bodies adhering to the regulatory standards will not pause any problem to the nearby locality. It is also envisaged to undertake landscaping and planting trees inside the STP site so as to provide a natural green belt and to act as a buffer zone. There are no mangroves in the proposed location and there are no drinking water resources in the vicinity of any of the STP sites.

8.2 Scope of EIA

Preparation of environmental impact assessment report incorporating baseline data along with an environmental impact statement based on field studies, identification, prediction and evaluation of impacts of the proposed activities related implementation of sewerage scheme under to IURWTS Project. Preparation of an Environment Action Plan (EMP) outlining preventive and control strategies for minimizing adverse impacts due to proposed activities along with their cost and time schedule for implementation. Incorporations of Environmental considerations into the project planning and design have been taken as an integral part of project preparation. Public hearing also forms part of this project to understand the opinion and apprehension of the public for the activities undertaken as part of the IURWTS project.

8.3 Environmental Impact Assessment and Environmental Management Plans

The EIA preparation led to identification of potential environmental impacts and their feasible remedial measures (including avoidance, mitigation, and enhancements), which have been included as environmental management plan.

This report of EIA studies is as per the requirements of Environmental Impact Assessment Notification of Ministry of Environment and Forests (MoEF&CC) under the Environment Protection Act, 1986 and Guidelines issued by KIIFB.

8.4 Brief description of Project size, the Process and Location

IURWTS project proposes four sewage treatment Plants at locations Vennala, Muttar, Perandoor and Elamkulam for treatment of the sewage generated in the catchment areas of project canals. The STP at Elamkulam is an upgradation scheme of the existing STP. The other three STP locations are at the tail ends of the canals and not in populated areas. The locations are such that it is away from the urban fabric and there are no residential buildings in a radial distance of 50m from the STP site. Cent percent sewer network connectivity is proposed, and the sewage load will be collected from the households will be conveyed by gravity through the tertiary networks. Where subdrains are available in the catchment secondary lines will collect the load from the tertiary network at various locations along the subdrain. Further the sewage load will be conveyed by gravity to the primary network running parallel to the main canals. Pressurized flow will convey the sewage load in the primary line to the sewage treatment plant.

The SBR wastewater treatment technology is proposed considering the improved regulatory requirements achieved by the process. This STP will consist of a Collection well, Screen chamber, Grit chamber, Aerator, Centrifuge, Chlorinating chamber, and Pump houses. The wastewater flows initially by force and then by gravitationally which treated by the action of aerobic bacteria with specific maintenance and electric power use. Activated Sludge process with SBR technology provides secondary level treatment to wastewater. It significantly reduces the BOD, nitrogen, phosphorous, toxic substances, and other pollutants found in the wastewater.

The treated wastewater from the aeration tank will be disinfected using chlorine gas before its disposal for use of watering plants for maintaining the green belt of STP. The level of treatment will comply with the standards of the Central Public health and Environmental Engineering Organization (CPHEEO), MoEF&CC and the World Health Organisation (WHO) regulatory standards. This makes it safe for irrigation, or discharge in the water bodies..

8.4.1 Importance of Sewer network & STP to the Local community

Wastewater disposal is the pressing environmental issue for the inhabitants of Kochi city as well as adjoining municipal areas forming part of IURWTS catchment. Currently households discharge their

wastewater in septic tanks, which often overflow especially during the monsoon months due to lack of timely cleaning and maintenance and create unhealthy conditions in the IURWTS project area. It has already created nuisance and social problems among the inhabitants. Clean environment will improve the health standards of the local people, and with the implementation of cent percent sewer network and STPs in IURWTS catchment which help to have an environmentally sound solution to their wastewater disposal problem. This will help to eliminate the spread of diseases, prevent risks of contamination of their surface and groundwater resources and contribute to the preservation of the quality of environment, The corporation council has given a no objection clearance for implementation of the project and the residents of the project area have welcomed the project proposal for cent percent sewer network coverage to the house holds of IURWTS catchment.

8.4.2 Environmental concerns of the Project

The Sewer network and STP of IURWTS project aims at environmentally safe disposal of its wastewater, for upgrading the sanitary and health standards of the inhabitants.

The Long-term concerns include:

- Prevent the spread of diseases, including the limitation of the mosquito population,
- Prevent the prevalence of conditions offensive to sight and smell.
- Control the contamination of water sources.
- Prevent and control soil and groundwater pollution.

The specific concerns of the project are to:

- Establish cent percent household connectivity through sewer networks and STPs suitable for the catchment as a whole, which will adopt advanced technology, be cost effective, and requires the minimum maintenance.
- Manage the pathogenic risk inherent in wastewater to meet the effluent discharge standards set by the CPHEEO, Ministry of Urban, Government of India and World Health Organization.
- Manage the safe disposal of sludge.

8.4.3 Description of the Surrounding Environment of the Project

IURWTS project has four STPs for treating the sewage generated in the catchment areas of the canals proposed for rejuvenation. The canals under project scope are Edappally Canal, Chilavanoor Canal,

Thevara Perandoor Canal, Thevara Canal and Market Canal. Though the canals flow amidst the heartland of Kochi city, the STP locations are selected at tail ends of the canals since the sewer lines are proposed along the sides of canal banks.

There are no notable industrial activities in the project area. Farming activities near the site are absent. There is no fruit farms located near the site. Households of the project area get their fresh water from KWA's piped supply, and its treatment plant is located 25km away and its source 'Periyar River' is passing 25km away from the city. The climate of the project area is humid and is influenced by the South-West and North east monsoon for nearly 6 months (June-Nov) of the year. The prevailing wind direction in the area is from West to East. The average annual decadal rainfall in the area recorded as 2800mm.The project area, including the proposed sites, has a less biodiversity, coconut trees, mango trees, jackfruit trees, plantain trees and small house gardens including vegetable gardens are seen in the project area. No notable animals and birds are seen living in the area.

8.4.4 Subjects caused under Environmental Impact Study

By way of undertaking the STP and sewer networks in the IURWTS catchment it is expected that there will not be any permanent negative or adverse environmental or social impacts. The temporary impacts expected on water quality, air quality (impact on health), traffic blockages and safety hazards for pedestrians, possible damage to private property, possible interruption in commercial activity and accidental breakage of other public infrastructure such as water pipes etc.

Major constructions activities concerned with EIA include

- Earth work and laying Sewer lines.
- Construction of manholes
- Route of Sewer primary mains (Gravity)
- Route of Sewage Pumping Mains
- Construction of Sewage Treatment Plant
- Construction of materials including the filter materials.
- Wastewater and Sludge disposal
- Chemicals used for Tertiary treatment.
- Sheltering of construction workers.

The Water and Air (prevention and Control of Pollution) Acts: The Water (Prevention and Control of Pollution) Act, 1974 resulted in the establishment of the Central and State level Pollution Control Boards (CPCB and SPCB) whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities similarly. The Air (Prevention and Control of Pollution) Act, 1981, empowers the SPCBs to enforce air quality standards set by the CPCB. With limited possibility, the provisions of the Hazardous Wastes (Management and Handling) Rules, 1989 and the chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 would also apply during the construction and the operation periods. The applicability of Acts and Rules to the JNNURM Sewerage Scheme to Kochi has been considered.

8.5 Odour Control Measures

The general objectives of the Odour Control Plan for sewer network and STP is,

- Provide an overview of odor issues associated with the wastewater collection system.
- Document and evaluate the current odor control program in vogue.
- Document the effort to characterize odors and identify their causes within the collection system.
- Provide control measures to effectively manage odors in the collection system.
- Provide a proactive systematic approach to odor prevention and control through.
  - Monitoring the wastewater collection system and respond to odor complaints.
  - Improving the design of the sewer system and ensure hydrogen sulfide levels and air pressure in sewers to determine the quantity and quality of sewer venting gas.
  - Collect and test samples to determine the characteristics of the sewage.
  - Installing/building odor-control units/facilities and analyzing all data and information collected and determine the causes of the odors.
  - Dosing selected pipelines with chemicals to eliminate components that lead to odors and.
  - Investigating new technologies to identify better materials or processes to control manage, mitigate, or eliminate odors.

- Special purpose Vehicle formed for IURWTS project keeping the community informed through public outreach efforts such as attending community meetings and distributing informative literature.
- Implement the recommendations through the operation and maintenance program.

8.5.1 Odor Control Measures proposed

Various measures proposed to reduce the generation and release of odours from the sewer system. They include:

- odor complaint response and investigation.
- routine sewer maintenance.
- chemical addition.
- air withdrawal and treatment from the collection system.
- Monitoring of sewer air pressure and odor concentration.

8.6 Mandatory Clearance

The project would need the clearance from GOK, KSPCB. and final EIA and CRZ clearance from MoEF&CC. Govt of India. Clearance from the Kerala State Pollution Control Board under the Air Act, the Water Act and CESS Act, if stipulated by the State Pollution Control Board (PCB) while giving the NOC. Kerala Water Authority has already obtained the sanction for setting up the sewerage plant and permission for discharging the treated effluent into the nearby water body adhering to the water quality standards prescribed by PCB. The clearance obtained is enclosed as **Annexure 7**.

9. Implementation schedule

IMPLEMENTATION SCHEDULE FOR CONSTRUCTION OF MUTTAR STP AND SEWER NETWORK

Sl No	Description	Task Duration (in days)	Start Date	End Date	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24
1	Tendering process	30	01-11-2022	30-11-2022																												
2	Award of work	30	01-12-2022	31-12-2022																												
3	Mobilization for STP and Sewer network	30	01-01-2023	31-01-2023																												
4	Detailed Design Phase	90	01-01-2023	01-04-2023																												
5	Validation of Design by GC	120	01-02-2023	31-05-2023																												
6	Construction of Sewer lines	365	03-03-2023	01-03-2024																												
7	Construction of Man holes and Lifting Stations	365	03-03-2023	01-03-2024																												
8	Household connections	120	01-02-2024	31-05-2024																												
9	Construction of STP civil structues	300	01-02-2023	28-11-2023																												
10	MEP installations for STP and SCADA systems	240	01-11-2023	28-06-2024																												
11	Final checking and rectification of the defects	60	29-06-2024	28-08-2024																												
12	Commissioning of STP and Sewer net	60	30-06-2024	29-08-2024																												

Note: O&M period will be 10 years from the completion of work.

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ANNEXURE 1

POPULATION PROJECTION
(CERTIFIED BY KWA / KMRL)

EXPECTED SEWER LOAD CALCULATION FOR KOCHI CORPORATION

Return ratio	0.85						
Infiltration of ground water	4500				Litres/km/day		
Storm water flow	(accounted in return ratio)						
Sewer load in year end	**2020**	**2021**	**2025**	**2035**	**2040**	**2053**	**2055**
Sewer load in Western Kochi	52.96	53.23	54.30	57.09	58.55	60.28	63.19
Sewer load in Mainland	73.20	73.57	75.05	80.92	80.92	86.18	87.33
Total	126.17	126.80	129.35	138.01	139.47	146.46	150.52

VENNALA ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
	38 (75%)	75%	42%	33%	DEVANKULANGARA	1.29	0.72	0.57	1.30	0.73	0.57	1.32	0.74	0.58	1.39	0.78	0.61	1.43	0.80	0.63	1.52	0.85	0.67	1.54	0.86	0.68
6	40 (73%)	73%	40%	33%	MAMANGALAM	1.01	0.55	0.46	1.01	0.55	0.46	1.03	0.57	0.47	1.08	0.59	0.49	1.11	0.61	0.50	1.19	0.65	0.54	1.20	0.66	0.54
1	41 (100%)	100%	79%	21%	PADIVATTOM	1.45	1.14	0.30	1.46	1.15	0.31	1.49	1.17	0.31	1.56	1.23	0.33	1.60	1.27	0.34	1.71	1.35	0.36	1.73	1.37	0.36
2	42 (100%)	100%	95.5%	4.5%	VENNALA	1.92	1.84	0.09	1.93	1.84	0.09	1.97	1.88	0.09	2.07	1.98	0.09	2.12	2.03	0.10	2.26	2.16	0.10	2.29	2.19	0.10
3	46 (100%)	100%	43%	57%	CHAKKARAPARAMBU	1.98	0.85	1.13	1.99	0.86	1.13	2.03	0.87	1.16	2.13	0.92	1.22	2.19	0.94	1.25	2.33	1.00	1.33	2.36	1.02	1.35
4	47 (100%)	100%	61%	39%	CHALIKKAVATTOM	1.31	0.80	0.51	1.31	0.80	0.51	1.34	0.82	0.52	1.41	0.86	0.55	1.44	0.88	0.56	1.54	0.94	0.60	1.56	0.95	0.61
5	48 (75%)	75%		75%	PONNURUNNI EAST	0.89	0.00	0.89	0.89	0.00	0.89	0.91	0.00	0.91	0.96	0.00	0.96	0.98	0.00	0.98	1.04	0.00	1.04	1.06	0.00	1.06
					TOTAL	**9.84**	**5.90**	**3.94**	**9.89**	**5.93**	**3.96**	**10.09**	**6.05**	**4.04**	**10.61**	**6.36**	**4.24**	**10.88**	**6.52**	**4.35**	**11.58**	**6.95**	**4.64**	**11.74**	**7.04**	**4.70**

MUTTAR ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
2	33 (43%)	43%	43%		ELAMAKARA NORTH	0.73	0.73	0.00	0.74	0.74	0.00	0.75	0.75	0.00	0.79	0.79	0.00	0.81	0.81	0.00	0.86	0.86	0.00	0.87	0.87	0.00
3	34 (47%)	47%	47%		PUTHUKKALAVATTOM	0.85	0.85	0.00	0.85	0.85	0.00	0.87	0.87	0.00	0.91	0.91	0.00	0.93	0.93	0.00	1.00	1.00	0.00	1.01	1.01	0.00
1	35 (100%)	100%	100%		PONEKKARA	1.74	1.74	0.00	1.75	1.75	0.00	1.79	1.79	0.00	1.88	1.88	0.00	1.93	1.93	0.00	2.05	2.05	0.00	2.08	2.08	0.00
2	36 (100%)	100%	18%	82%	KUNNUMPURAM	1.51	0.27	1.24	1.52	0.27	1.25	1.55	0.28	1.27	1.63	0.29	1.34	1.67	0.30	1.37	1.78	0.32	1.46	1.80	0.32	1.48
3	37 (100%)	100%	100%		EDAPPILLY	1.83	1.83	0.00	1.84	1.84	0.00	1.87	1.87	0.00	1.97	1.97	0.00	2.02	2.02	0.00	2.15	2.15	0.00	2.18	2.18	0.00
4	38 (25%)	25%	25%		DEVANKULANGARA	0.43	0.43	0.00	0.43	0.43	0.00	0.44	0.44	0.00	0.46	0.46	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.51	0.51	0.00
5	39 (59%)	59%	59%		KARUKAPPILLY	1.08	1.08	0.00	1.08	1.08	0.00	1.10	1.10	0.00	1.16	1.16	0.00	1.19	1.19	0.00	1.27	1.27	0.00	1.28	1.28	0.00
6	40 (27%)	27%	27%		MAMANGALAM	0.37	0.37	0.00	0.37	0.37	0.00	0.38	0.38	0.00	0.40	0.40	0.00	0.41	0.41	0.00	0.44	0.44	0.00	0.44	0.44	0.00
6	70 (25%)	25%	25%		KALOOR NORTH	0.51	0.51	0.00	0.51	0.51	0.00	0.52	0.52	0.00	0.55	0.55	0.00	0.56	0.56	0.00	0.60	0.60	0.00	0.60	0.60	0.00
7	71 (53%)	53%	53%		ELAMAKKARA SOUTH	0.91	0.91	0.00	0.91	0.91	0.00	0.93	0.93	0.00	0.98	0.98	0.00	1.00	1.00	0.00	1.07	1.07	0.00	1.08	1.08	0.00
8	72 (49%)	49%	49%		POTTAKKUZHY	0.70	0.70	0.00	0.70	0.70	0.00	0.72	0.72	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.82	0.82	0.00	0.83	0.83	0.00
					TOTAL	**10.65**	**9.41**	**1.24**	**10.70**	**9.46**	**1.25**	**10.92**	**9.65**	**1.27**	**11.48**	**10.14**	**1.34**	**11.77**	**10.40**	**1.37**	**12.54**	**11.08**	**1.46**	**12.71**	**11.23**	**1.48**

PERANDOOR ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
1	32 (28%)	28%	28%		VADUTHALA EAST	0.43	0.43	0.00	0.44	0.44	0.00	0.45	0.45	0.00	0.47	0.47	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.52	0.52	0.00
2	33 (57%)	57%	57%		ELAMAKARA NORTH	0.97	0.97	0.00	0.98	0.98	0.00	0.99	0.99	0.00	1.05	1.05	0.00	1.07	1.07	0.00	1.14	1.14	0.00	1.16	1.16	0.00
3	34 (53%)	53%	24%	29%	PUTHUKKALAVATTOM	0.95	0.43	0.52	0.96	0.43	0.52	0.98	0.44	0.53	1.03	0.47	0.56	1.05	0.48	0.58	1.12	0.51	0.61	1.14	0.52	0.62
4	65 (15%)	15%	15%		KALOOR SOUTH	0.24	0.24	0.00	0.24	0.24	0.00	0.24	0.24	0.00	0.25	0.25	0.00	0.26	0.26	0.00	0.28	0.28	0.00	0.28	0.28	0.00
5	69 (46%)	46%	46%		THRIKKANARVATTOM	0.83	0.83	0.00	0.83	0.83	0.00	0.85	0.85	0.00	0.89	0.89	0.00	0.91	0.91	0.00	0.97	0.97	0.00	0.99	0.99	0.00
6	70 (75%)	75%	75%		KALOOR NORTH	1.52	1.52	0.00	1.53	1.53	0.00	1.56	1.56	0.00	1.64	1.64	0.00	1.68	1.68	0.00	1.79	1.79	0.00	1.81	1.81	0.00
7	71 (47%)	47%	47%		ELAMAKKARA SOUTH	0.80	0.80	0.00	0.81	0.81	0.00	0.82	0.82	0.00	0.87	0.87	0.00	0.89	0.89	0.00	0.95	0.95	0.00	0.96	0.96	0.00
8	72 (51%)	51%	51%		POTTAKKUZHY	0.73	0.73	0.00	0.73	0.73	0.00	0.74	0.74	0.00	0.78	0.78	0.00	0.80	0.80	0.00	0.85	0.85	0.00	0.87	0.87	0.00
9	73 (88%)	88%	88%		PACHALAM	1.80	1.80	0.00	1.81	1.81	0.00	1.84	1.84	0.00	1.94	1.94	0.00	1.99	1.99	0.00	2.12	2.12	0.00	2.15	2.15	0.00
					TOTAL	**8.27**	**7.75**	**0.52**	**8.31**	**7.78**	**0.52**	**8.48**	**7.94**	**0.53**	**8.91**	**8.35**	**0.56**	**9.14**	**8.56**	**0.58**	**9.73**	**9.12**	**0.61**	**9.87**	**9.24**	**0.62**

VADUTHALA ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL		KWA		TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA
SL NO.	DIVISION				NAME																					
1	31 (100%)	100%			VADUTHALA WEST	1.80		1.80	1.81		1.81	1.84		1.84	1.94		1.94	1.99		1.99	2.12		2.12	2.14		2.14
2	32 (72%)	72%			VADUTHALA EAST	1.12		1.12	1.12		1.12	1.15		1.15	1.20		1.20	1.24		1.24	1.32		1.32	1.33		1.33
3	67 (40%)	40%			ERNAKULAM NORTH	0.47		0.47	0.47		0.47	0.48		0.48	0.50		0.50	0.52		0.52	0.55		0.55	0.56		0.56
4	68 (100%)	100%			AYYAPPANKAV	1.19		1.19	1.19		1.19	1.22		1.22	1.28		1.28	1.31		1.31	1.40		1.40	1.42		1.42
5	69 (54%)	54%			THRIKKANARVATTOM	0.97		0.97	0.97		0.97	0.99		0.99	1.05		1.05	1.07		1.07	1.14		1.14	1.16		1.16
6	73 (12%)	12%			PACHALAM	0.25		0.25	0.25		0.25	0.25		0.25	0.26		0.26	0.27		0.27	0.29		0.29	0.29		0.29
7	74 (100%)	100%			THATTAZHAM	2.00		2.00	2.01		2.01	2.05		2.05	2.17		2.17	2.22		2.22	2.36		2.36	2.40		2.40
					TOTAL	**7.79**		**7.79**	**7.83**		**7.83**	**7.99**		**7.99**	**8.40**		**8.40**	**8.62**		**8.62**	**9.18**		**9.18**	**9.30**		**9.30**

SEPTAGE ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL		KWA		TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA
SL NO.	DIVISION				NAME																					
1	50 (100%)	100%			CHAMBAKARA	1.41		1.41	1.42		1.42	1.45		1.45	1.52		1.52	1.56		1.56	1.66		1.66	1.68		1.68
2	51 (60%)	60%			POONITHURA	0.90		0.90	0.90		0.90	0.92		0.92	0.97		0.97	0.99		0.99	1.06		1.06	1.07		1.07
					TOTAL	2.31		2.31	2.32		2.32	2.37		2.37	2.49		2.49	2.55		2.55	2.72		2.72	2.76		2.76

ELAMKULAM ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
1	39 (41%)	41%	41%		KARUKAPPILLY	0.75	0.75	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.81	0.81	0.00	0.83	0.83	0.00	0.88	0.88	0.00	0.89	0.89	0.00
2	43 (100%)	100%		100%	PALARIVATTOM	1.93	0.00	1.93	1.94	0.00	1.94	1.98	0.00	1.98	2.08	0.00	2.08	2.14	0.00	2.14	2.28	0.00	2.28	2.31	0.00	2.31
3	44 (100%)	100%	53%	47%	KARANAKKODAM	1.86	0.99	0.88	1.87	0.99	0.88	1.91	1.01	0.90	2.01	1.06	0.94	2.06	1.09	0.97	2.19	1.16	1.03	2.22	1.18	1.04
4	45 (100%)	100%	24%	76%	THAMMANAM	1.71	0.41	1.30	1.72	0.41	1.31	1.75	0.42	1.33	1.84	0.44	1.40	1.89	0.45	1.44	2.01	0.48	1.53	2.04	0.49	1.55
5	48 (25%)	25%		25%	PONNURUNNI EAST	0.30	0.00	0.30	0.30	0.00	0.30	0.30	0.00	0.30	0.32	0.00	0.32	0.33	0.00	0.33	0.35	0.00	0.35	0.35	0.00	0.35
6	49 (100%)	100%		100%	VYTTILA	1.28	0.00	1.28	1.29	0.00	1.29	1.31	0.00	1.31	1.38	0.00	1.38	1.42	0.00	1.42	1.51	0.00	1.51	1.53	0.00	1.53
7	51 (40%)	40%		40%	POONITHURA	0.60	0.00	0.60	0.60	0.00	0.60	0.61	0.00	0.61	0.65	0.00	0.65	0.66	0.00	0.66	0.71	0.00	0.71	0.71	0.00	0.71
8	52 (100%)	100%	58%	42%	VYTTILA JANATHA	1.80	1.04	0.75	1.81	1.05	0.76	1.84	1.07	0.77	1.93	1.12	0.81	1.98	1.15	0.83	2.11	1.22	0.89	2.14	1.24	0.90
9	53 (100%)	100%	55%	45%	PONNURUNNI	1.78	0.98	0.80	1.79	0.98	0.80	1.82	1.00	0.82	1.92	1.05	0.86	1.97	1.08	0.89	2.09	1.15	0.94	2.12	1.17	0.96
10	54 (100%)	100%		100%	ELAMKULAM	2.14	0.00	2.14	2.15	0.00	2.15	2.19	0.00	2.19	2.30	0.00	2.30	2.36	0.00	2.36	2.51	0.00	2.51	2.55	0.00	2.55
11	55 (100%)	100%	70%	30%	GIRINAGAR	1.36	0.95	0.41	1.36	0.95	0.41	1.39	0.97	0.42	1.46	1.02	0.44	1.50	1.05	0.45	1.60	1.12	0.48	1.62	1.13	0.49
12	56 (100%)	100%	85%	15%	PANAMPILLY NAGAR	1.56	1.33	0.23	1.57	1.34	0.24	1.60	1.36	0.24	1.68	1.43	0.25	1.73	1.47	0.26	1.84	1.56	0.28	1.86	1.59	0.28
13	57 (100%)	100%	26%	74%	KADAVANTHRA	2.24	0.58	1.66	2.25	0.59	1.67	2.30	0.60	1.70	2.42	0.63	1.79	2.48	0.64	1.84	2.64	0.69	1.95	2.68	0.70	1.98
14	58 (100%)	100%		100%	KONTHURUTHY	1.58	0.00	1.58	1.59	0.00	1.59	1.62	0.00	1.62	1.70	0.00	1.70	1.75	0.00	1.75	1.86	0.00	1.86	1.88	0.00	1.88
15	59 (100%)	100%		100%	THEVARA	1.30	0.00	1.30	1.31	0.00	1.31	1.33	0.00	1.33	1.40	0.00	1.40	1.43	0.00	1.43	1.52	0.00	1.52	1.54	0.00	1.54
16	60 (100%)	100%	61%	39%	PERUMANOOR	1.99	1.21	0.77	2.00	1.22	0.78	2.04	1.24	0.79	2.14	1.31	0.83	2.20	1.34	0.86	2.34	1.43	0.91	2.37	1.45	0.92
17	61 (100%)	100%		100%	RAVIPURAM	1.18	0.00	1.18	1.19	0.00	1.19	1.21	0.00	1.21	1.28	0.00	1.28	1.31	0.00	1.31	1.39	0.00	1.39	1.41	0.00	1.41
18	62 (100%)	100%	18%	82%	ERNAKULAM SOUTH	1.48	0.27	1.21	1.48	0.27	1.22	1.51	0.27	1.24	1.59	0.29	1.30	1.63	0.29	1.34	1.74	0.31	1.42	1.76	0.32	1.44
19	63 (100%)	100%	68%	32%	GANDHINAGAR	1.74	1.18	0.56	1.75	1.19	0.56	1.78	1.21	0.57	1.87	1.27	0.60	1.92	1.31	0.61	2.04	1.39	0.65	2.07	1.41	0.66
20	64 (100%)	100%	100%		KATHRIKADAV	2.00	2.00	0.00	2.01	2.01	0.00	2.05	2.05	0.00	2.16	2.16	0.00	2.21	2.21	0.00	2.36	2.36	0.00	2.39	2.39	0.00
21	65 (85%)	85%	85%		KALOOR SOUTH	1.34	1.34	0.00	1.34	1.34	0.00	1.37	1.37	0.00	1.44	1.44	0.00	1.48	1.48	0.00	1.57	1.57	0.00	1.59	1.59	0.00
22	66 (100%)	100%	24%	76%	ERNAKULAM CENTRAL	1.74	0.42	1.32	1.75	0.42	1.33	1.78	0.43	1.36	1.87	0.45	1.42	1.92	0.46	1.46	2.05	0.49	1.56	2.08	0.50	1.58
23	67 (60%)	60%		60%	ERNAKULAM NORTH	0.71	0.00	0.71	0.71	0.00	0.71	0.72	0.00	0.72	0.76	0.00	0.76	0.78	0.00	0.78	0.83	0.00	0.83	0.84	0.00	0.84
					TOTAL	34.35	13.44	20.20	33.81	13.51	20.30	35.21	13.78	20.71	36.25	14.48	21.77	37.18	14.85	22.33	39.59	15.82	23.78	40.96	16.03	24.93

TOTAL	KMRL	KWA
87.33	43.54	43.79
	87.33	

Verified the population projection and sewage load calculation and found correct based on Sewerage Master Plan prepared for Kochi Corporation

Executive Engineer
Sewerage Circle
Kochi - 11

General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

KOCHI METRO RAIL LIMITED
PROJECT KOCHI

No.	Name of ward	Population as per 2011 Census	% increase of population adopted	Anticipated population in 2020	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2020	domestic demand in MLD in 2020	Road length in km	Infiltration in MLD in 2020	Total sewer load in MLD in 2020 with RR	Anticipated population in 2021	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2021	domestic demand in MLD in 2021
1	FORTKOCHI	10271	6.03	10827	1.62	0.417	0.31	10.85	0.049	2.05	10891	1.63	0.419	0.31
2	KALVATHY	7811	6.03	8234	1.24	0.317	0.23	8.25	0.037	1.56	8282	1.24	0.319	0.23
3	ERAVELY	6425	6.03	6773	1.02	0.261	0.19	6.78	0.031	1.28	6813	1.02	0.262	0.19
4	KARIPALAM	8882	6.03	9363	1.40	0.360	0.27	9.38	0.042	1.77	9418	1.41	0.363	0.27
5	MATTANCHERY	10144	6.03	10693	1.60	0.412	0.30	10.71	0.048	2.02	10756	1.61	0.414	0.30
6	KOCHANGADY	7108	6.03	7493	1.12	0.288	0.21	7.51	0.034	1.42	7537	1.13	0.290	0.21
7	CHERLAI	7741	6.03	8160	1.22	0.314	0.23	8.17	0.037	1.54	8208	1.23	0.316	0.23
8	PANAYAPPILLY	11429	6.03	12048	1.81	0.464	0.34	12.07	0.054	2.28	12119	1.82	0.467	0.34
9	CHAKKAMADAM	5046	6.03	5319	0.80	0.205	0.15	5.33	0.024	1.00	5350	0.80	0.206	0.15
10	KARUVELIPADY	7643	6.03	8057	1.21	0.310	0.23	8.07	0.036	1.52	8104	1.22	0.312	0.23
11	THOPPUMPADY	9266	6.03	9768	1.47	0.376	0.28	9.78	0.044	1.85	9825	1.47	0.378	0.28
12	THAREBHAGAM	8925	6.03	9408	1.41	0.362	0.27	9.42	0.042	1.78	9463	1.42	0.364	0.27
13	KADEBAGAM	10203	6.03	10755	1.61	0.414	0.31	10.77	0.048	2.03	10819	1.62	0.417	0.31
14	THAZHUPPU	10699	6.03	11278	1.69	0.434	0.32	11.30	0.051	2.13	11345	1.70	0.437	0.32
15	EDAKOCHI NORTH	9574	6.03	10092	1.51	0.389	0.29	10.11	0.045	1.91	10152	1.52	0.391	0.29
16	EDAKOCHI SOUTH	7808	6.03	8231	1.23	0.317	0.23	8.24	0.037	1.55	8279	1.24	0.319	0.23
17	PERUMPADAPPU	9442	6.03	9953	1.49	0.383	0.28	9.97	0.045	1.88	10012	1.50	0.385	0.28
18	KONNAM	9863	6.03	10397	1.56	0.400	0.30	10.41	0.047	1.96	10458	1.57	0.403	0.30
19	PALLURUTHY KACHERIPADY	11100	6.03	11701	1.76	0.450	0.33	11.72	0.053	2.21	11770	1.77	0.453	0.33
20	NAMBIAPURAM	8748	6.03	9222	1.38	0.355	0.26	9.24	0.042	1.74	9276	1.39	0.357	0.26
21	PULLARDESAM	11046	6.03	11644	1.75	0.448	0.33	11.66	0.052	2.20	11712	1.76	0.451	0.33
22	MUNDAMVELY	14723	6.03	15520	2.33	0.598	0.44	15.55	0.070	2.93	15611	2.34	0.601	0.44
23	MANASSERY	8403	6.03	8858	1.33	0.341	0.25	8.87	0.040	1.67	8910	1.34	0.343	0.25
24	MULAMKKUZHY	8121	6.03	8561	1.28	0.330	0.24	8.58	0.039	1.62	8611	1.29	0.332	0.24
25	CHULLICKAL	6623	6.03	6982	1.05	0.269	0.20	6.99	0.031	1.32	7023	1.05	0.270	0.20
26	NAZERATH	7277	6.03	7671	1.15	0.295	0.22	7.68	0.035	1.45	7716	1.16	0.297	0.22
27	FORTKOCHI VELI	7456	6.03	7860	1.18	0.303	0.22	7.87	0.035	1.48	7906	1.19	0.304	0.22
28	AMARAVATHY	9439	6.03	9950	1.49	0.383	0.28	9.97	0.045	1.88	10008	1.50	0.385	0.28
29	ISLAND NORTH	4666	6.03	4919	0.74	0.189	0.14	4.93	0.022	0.93	4948	0.74	0.190	0.14
30	ISLAND SOUTH	10076	6.03	10622	1.59	0.409	0.30	10.64	0.048	2.01	10684	1.60	0.411	0.30
WESTERN KOCHI		**265958.00**		**280359.00**	**42.05**	**10.79**	**7.98**	**280.84**	**1.26**	**52.96**	**282006.00**	**42.30**	**10.86**	**7.98**
31	VADUTHALA WEST	9025	6.03	9514	1.43	0.366	0.27	9.53	0.043	1.80	9570	1.44	0.368	0.27
32	VADUTHALA EAST	7795	6.03	8217	1.23	0.316	0.23	8.23	0.037	1.55	8265	1.24	0.318	0.23
33	ELAMAKKARA NORTH	8547	6.03	9010	1.35	0.347	0.26	9.03	0.041	1.70	9063	1.36	0.349	0.26
34	PUTHUKKALAVATTOM	9034	6.03	9523	1.43	0.367	0.27	9.54	0.043	1.80	9579	1.44	0.369	0.27
35	PONEKKARA	8757	6.03	9231	1.38	0.355	0.26	9.25	0.042	1.74	9285	1.39	0.357	0.26
36	KUNNUMPURAM	7589	6.03	8000	1.20	0.308	0.23	8.01	0.036	1.51	8047	1.21	0.310	0.23
37	EDAPPALLY	9183	6.03	9680	1.45	0.373	0.28	9.70	0.044	1.83	9737	1.46	0.375	0.28
38	DEVANKULNGARA	8634	6.03	9101	1.37	0.350	0.26	9.12	0.041	1.72	9155	1.37	0.352	0.26
39	KARUKAPPALLY	9166	6.03	9662	1.45	0.372	0.27	9.68	0.044	1.83	9719	1.46	0.374	0.27
40	MAMANGALAM	6924	6.03	7299	1.09	0.281	0.21	7.31	0.033	1.38	7342	1.10	0.283	0.21
41	PADIVATTOM	7277	6.03	7671	1.15	0.295	0.22	7.68	0.035	1.45	7716	1.16	0.297	0.22
42	VENNALA	9652	6.03	10175	1.53	0.392	0.29	10.19	0.046	1.92	10234	1.54	0.394	0.29

KOCHI METRO RAIL LIMITED ★ KOCHI ★ PROJECT JOURNALISTS

43	PALARIVATTOM	9708	6.03	10234	1.54	0.394	0.29	10.25	0.046	1.93	10294	1.54	0.396	0.29
44	KARANAKODAM	9354	6.03	9860	1.48	0.380	0.28	9.88	0.044	1.86	9918	1.49	0.382	0.28
45	THAMMANAM	8582	6.03	9047	1.36	0.348	0.26	9.06	0.041	1.71	9100	1.37	0.350	0.26
46	CHAKKARAPARAMBU	9938	6.03	10476	1.57	0.403	0.30	10.49	0.047	1.98	10538	1.58	0.406	0.30
47	CHALIKKAVATTOM	6557	6.03	6912	1.04	0.266	0.20	6.92	0.031	1.31	6953	1.04	0.268	0.20
48	PONNURUNNI EAST	5943	6.03	6265	0.94	0.241	0.18	6.28	0.028	1.18	6302	0.95	0.243	0.18
49	VYTTILA	6428	6.03	6776	1.02	0.261	0.19	6.79	0.031	1.28	6816	1.02	0.262	0.19
50	CHAMBAKKARA	7091	6.03	7475	1.12	0.288	0.21	7.49	0.034	1.41	7519	1.13	0.289	0.21
51	POONITHURA	7524	6.03	7931	1.19	0.305	0.23	7.94	0.036	1.50	7978	1.20	0.307	0.23
52	VYTTILA JANATHA	9024	6.03	9513	1.43	0.366	0.27	9.53	0.043	1.80	9568	1.44	0.368	0.27
53	PONNURUNNI	8935	6.03	9419	1.41	0.363	0.27	9.43	0.042	1.78	9474	1.42	0.365	0.27
54	ELAMKULAM	10726	6.03	11307	1.70	0.435	0.32	11.33	0.051	2.14	11373	1.71	0.438	0.32
55	GIRINAGAR	6808	6.03	7177	1.08	0.276	0.20	7.19	0.032	1.36	7219	1.08	0.278	0.20
56	PANAPPILLY NAGAR	7849	6.03	8274	1.24	0.319	0.24	8.29	0.037	1.56	8323	1.25	0.320	0.24
57	KADAVANTHRA	11267	6.03	11877	1.78	0.457	0.34	11.90	0.054	2.24	11947	1.79	0.460	0.34
58	KONTHURUTHY	7933	6.03	8362	1.25	0.322	0.24	8.38	0.038	1.58	8412	1.26	0.324	0.24
59	THEVARA	6522	6.03	6875	1.03	0.265	0.20	6.89	0.031	1.30	6915	1.04	0.266	0.20
60	PERUMANOOR	9973	6.03	10513	1.58	0.405	0.30	10.53	0.047	1.99	10575	1.59	0.407	0.30
61	RAVIPURAM	5940	6.03	6262	0.94	0.241	0.18	6.27	0.028	1.18	6298	0.94	0.242	0.18
62	ERNAKULAM SOUTH	7407	6.03	7808	1.17	0.301	0.22	7.82	0.035	1.48	7854	1.18	0.302	0.22
63	GANDHI NAGAR	8721	6.03	9193	1.38	0.354	0.26	9.21	0.041	1.74	9247	1.39	0.356	0.26
64	KATHRIKADAVU	10047	6.03	10591	1.59	0.408	0.30	10.61	0.048	2.00	10653	1.60	0.410	0.30
65	KALOOR SOUTH	7887	6.03	8314	1.25	0.320	0.24	8.33	0.037	1.57	8363	1.25	0.322	0.24
66	ERNAKULAM CENTRAL	8734	6.03	9207	1.38	0.354	0.26	9.22	0.042	1.74	9261	1.39	0.357	0.26
67	ERNAKULAM NORTH	5914	6.03	6234	0.94	0.240	0.18	6.24	0.028	1.18	6271	0.94	0.241	0.18
68	AYYAPPANKAVU	5970	6.03	6293	0.94	0.242	0.18	6.30	0.028	1.19	6330	0.95	0.244	0.18
69	THRIKKANARVATTOM	9018	6.03	9506	1.43	0.366	0.27	9.52	0.043	1.80	9562	1.43	0.368	0.27
70	KLOOR NORTH	10174	6.03	10725	1.61	0.413	0.31	10.74	0.048	2.03	10788	1.62	0.415	0.31
71	ELAMAKKARA SOUTH	8585	6.03	9050	1.36	0.348	0.26	9.07	0.041	1.71	9103	1.37	0.350	0.26
72	POTTAKUZHY	7148	6.03	7535	1.13	0.290	0.21	7.55	0.034	1.42	7579	1.14	0.292	0.21
73	PACHALAM	10262	6.03	10818	1.62	0.416	0.31	10.84	0.049	2.04	10881	1.63	0.419	0.31
74	THATTAZHAM	10043	6.03	10587	1.59	0.408	0.30	10.60	0.048	2.00	10649	1.60	0.410	0.30
	ERNAKULAM	**367595**		**387499**	**58.12**	**14.92**	**11.02**	**388.16**	**1.75**	**73.20**	**389775.00**	**58.47**	**15.01**	11.02
	Total of Kochi Corporation	**633553**		**667858.00**	**100.18**	**25.71**	**19.00**	**669.00**	**3.01**	**126.17**	**671781.00**	**100.77**	**25.86**	19.00

KOCHI METRO RAIL LIMITED * KOCHI * PROJECT

Road length in km	Infiltration in MLD in 2021	Total sewer load in MLD in 2021 with RR	Anticipated population in 2025	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2025	domestic demand in MLD in 2025	Road length in km	Infiltration in MLD in 2025	Total sewer load in MLD in 2025 with RR	Anticipated population in 2035	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2035	domestic demand in MLD in 2035	Road length in km	Infiltration in MLD in 2035
10.85	0.049	2.06	11149	1.67	0.429	0.31	10.85	0.049	2.10	11822	1.77	0.455	0.31	10.85	0.049
8.25	0.037	1.56	8479	1.27	0.326	0.23	8.25	0.037	1.59	8990	1.35	0.346	0.23	8.25	0.037
6.78	0.031	1.29	6974	1.05	0.269	0.19	6.78	0.031	1.31	7395	1.11	0.285	0.19	6.78	0.031
9.38	0.042	1.78	9641	1.45	0.371	0.27	9.38	0.042	1.81	10223	1.53	0.394	0.27	9.38	0.042
10.71	0.048	2.03	11011	1.65	0.424	0.30	10.71	0.048	2.07	11675	1.75	0.449	0.30	10.71	0.048
7.51	0.034	1.42	7716	1.16	0.297	0.21	7.51	0.034	1.45	8181	1.23	0.315	0.21	7.51	0.034
8.17	0.037	1.55	8403	1.26	0.324	0.23	8.17	0.037	1.58	8910	1.34	0.343	0.23	8.17	0.037
12.07	0.054	2.29	12406	1.86	0.478	0.34	12.07	0.054	2.33	13154	1.97	0.506	0.34	12.07	0.054
5.33	0.024	1.01	5477	0.82	0.211	0.15	5.33	0.024	1.03	5808	0.87	0.224	0.15	5.33	0.024
8.07	0.036	1.53	8296	1.24	0.319	0.23	8.07	0.036	1.56	8797	1.32	0.339	0.23	8.07	0.036
9.78	0.044	1.85	10058	1.51	0.387	0.28	9.78	0.044	1.89	10665	1.60	0.411	0.28	9.78	0.044
9.42	0.042	1.79	9688	1.45	0.373	0.27	9.42	0.042	1.82	10272	1.54	0.395	0.27	9.42	0.042
10.77	0.048	2.04	11075	1.66	0.426	0.31	10.77	0.048	2.08	11743	1.76	0.452	0.31	10.77	0.048
11.30	0.051	2.14	11613	1.74	0.447	0.32	11.30	0.051	2.18	12314	1.85	0.474	0.32	11.30	0.051
10.11	0.045	1.92	10392	1.56	0.400	0.29	10.11	0.045	1.95	11019	1.65	0.424	0.29	10.11	0.045
8.24	0.037	1.56	8475	1.27	0.326	0.23	8.24	0.037	1.59	8987	1.35	0.346	0.23	8.24	0.037
9.97	0.045	1.89	10249	1.54	0.395	0.28	9.97	0.045	1.93	10867	1.63	0.418	0.28	9.97	0.045
10.41	0.047	1.97	10706	1.61	0.412	0.30	10.41	0.047	2.01	11352	1.70	0.437	0.30	10.41	0.047
11.72	0.053	2.22	12049	1.81	0.464	0.33	11.72	0.053	2.27	12776	1.92	0.492	0.33	11.72	0.053
9.24	0.042	1.75	9496	1.42	0.366	0.26	9.24	0.042	1.79	10069	1.51	0.388	0.26	9.24	0.042
11.66	0.052	2.21	11990	1.80	0.462	0.33	11.66	0.052	2.26	12714	1.91	0.489	0.33	11.66	0.052
15.55	0.070	2.95	15981	2.40	0.615	0.44	15.55	0.070	3.01	16946	2.54	0.652	0.44	15.55	0.070
8.87	0.040	1.68	9121	1.37	0.351	0.25	8.87	0.040	1.72	9672	1.45	0.372	0.25	8.87	0.040
8.58	0.039	1.63	8815	1.32	0.339	0.24	8.58	0.039	1.66	9347	1.40	0.360	0.24	8.58	0.039
6.99	0.031	1.33	7189	1.08	0.277	0.20	6.99	0.031	1.35	7623	1.14	0.293	0.20	6.99	0.031
7.68	0.035	1.46	7899	1.18	0.304	0.22	7.68	0.035	1.49	8376	1.26	0.322	0.22	7.68	0.035
7.87	0.035	1.49	8093	1.21	0.312	0.22	7.87	0.035	1.52	8582	1.29	0.330	0.22	7.87	0.035
9.97	0.045	1.89	10246	1.54	0.394	0.28	9.97	0.045	1.93	10864	1.63	0.418	0.28	9.97	0.045
4.93	0.022	0.93	5065	0.76	0.195	0.14	4.93	0.022	0.95	5370	0.81	0.207	0.14	4.93	0.022
10.64	0.048	2.02	10937	1.64	0.421	0.30	10.64	0.048	2.06	11597	1.74	0.446	0.30	10.64	0.048
280.84	**1.26**	**53.23**	**288689.00**	**43.30**	**11.11**	**7.98**	**280.84**	**1.26**	**54.30**	**306110.00**	**45.92**	**11.79**	**7.98**	**280.84**	**1.26**
9.53	0.043	1.81	9796	1.47	0.377	0.27	9.53	0.043	1.84	10387	1.56	0.400	0.27	9.53	0.043
8.23	0.037	1.56	8461	1.27	0.326	0.23	8.23	0.037	1.59	8972	1.35	0.345	0.23	8.23	0.037
9.03	0.041	1.71	9278	1.39	0.357	0.26	9.03	0.041	1.75	9837	1.48	0.379	0.26	9.03	0.041
9.54	0.043	1.81	9806	1.47	0.378	0.27	9.54	0.043	1.84	10398	1.56	0.400	0.27	9.54	0.043
9.25	0.042	1.75	9505	1.43	0.366	0.26	9.25	0.042	1.79	10079	1.51	0.388	0.26	9.25	0.042
8.01	0.036	1.52	8238	1.24	0.317	0.23	8.01	0.036	1.55	8735	1.31	0.336	0.23	8.01	0.036
9.70	0.044	1.84	9968	1.50	0.384	0.28	9.70	0.044	1.87	10569	1.59	0.407	0.28	9.70	0.044
9.12	0.041	1.73	9372	1.41	0.361	0.26	9.12	0.041	1.76	9937	1.49	0.383	0.26	9.12	0.041
9.68	0.044	1.83	9949	1.49	0.383	0.27	9.68	0.044	1.87	10550	1.58	0.406	0.27	9.68	0.044
7.31	0.033	1.39	7516	1.13	0.289	0.21	7.31	0.033	1.41	7969	1.20	0.307	0.21	7.31	0.033
7.68	0.035	1.46	7899	1.18	0.304	0.22	7.68	0.035	1.49	8376	1.26	0.322	0.22	7.68	0.035
10.19	0.046	1.93	10477	1.57	0.403	0.29	10.19	0.046	1.97	11109	1.67	0.428	0.29	10.19	0.046

KOCHI METRO RAIL LIMITED
PROJECT KOCHI (IURWTS)

10.25	0.046	1.94	10538	1.58	0.406	0.29	10.25	0.046	1.98	11174	1.68	0.430	0.29	10.25	0.046
9.88	0.044	1.87	10154	1.52	0.391	0.28	9.88	0.044	1.91	10766	1.61	0.414	0.28	9.88	0.044
9.06	0.041	1.72	9316	1.40	0.359	0.26	9.06	0.041	1.75	9878	1.48	0.380	0.26	9.06	0.041
10.49	0.047	1.99	10787	1.62	0.415	0.30	10.49	0.047	2.03	11438	1.72	0.440	0.30	10.49	0.047
6.92	0.031	1.31	7117	1.07	0.274	0.20	6.92	0.031	1.34	7547	1.13	0.291	0.20	6.92	0.031
6.28	0.028	1.19	6451	0.97	0.248	0.18	6.28	0.028	1.21	6840	1.03	0.263	0.18	6.28	0.028
6.79	0.031	1.29	6977	1.05	0.269	0.19	6.79	0.031	1.31	7398	1.11	0.285	0.19	7.84	0.035
7.49	0.034	1.42	7697	1.15	0.296	0.21	7.49	0.034	1.45	8161	1.22	0.314	0.21	7.49	0.034
7.94	0.036	1.51	8167	1.23	0.314	0.23	7.94	0.036	1.54	8660	1.30	0.333	0.23	7.94	0.036
9.53	0.043	1.81	9795	1.47	0.377	0.27	9.53	0.043	1.84	10386	1.56	0.400	0.27	8.47	0.038
9.43	0.042	1.79	9699	1.45	0.373	0.27	9.43	0.042	1.82	10284	1.54	0.396	0.27	9.43	0.042
11.33	0.051	2.15	11643	1.75	0.448	0.32	11.33	0.051	2.19	12345	1.85	0.475	0.32	11.33	0.051
7.19	0.032	1.36	7390	1.11	0.285	0.20	7.19	0.032	1.39	7836	1.18	0.302	0.20	7.19	0.032
8.29	0.037	1.57	8520	1.28	0.328	0.24	8.29	0.037	1.60	9034	1.36	0.348	0.24	8.29	0.037
11.90	0.054	2.25	12230	1.83	0.471	0.34	11.90	0.054	2.30	12968	1.95	0.499	0.34	11.90	0.054
8.38	0.038	1.59	8611	1.29	0.332	0.24	8.38	0.038	1.62	9131	1.37	0.352	0.24	8.38	0.038
6.89	0.031	1.31	7079	1.06	0.273	0.20	6.89	0.031	1.33	7507	1.13	0.289	0.20	5.83	0.026
10.53	0.047	2.00	10825	1.62	0.417	0.30	10.53	0.047	2.04	11479	1.72	0.442	0.30	10.53	0.047
6.27	0.028	1.19	6448	0.97	0.248	0.18	6.27	0.028	1.21	6837	1.03	0.263	0.18	6.27	0.028
7.82	0.035	1.48	8040	1.21	0.310	0.22	7.82	0.035	1.51	8525	1.28	0.328	0.22	7.82	0.035
9.21	0.041	1.75	9466	1.42	0.364	0.26	9.21	0.041	1.78	10038	1.51	0.386	0.26	9.21	0.041
10.61	0.048	2.01	10906	1.64	0.420	0.30	10.61	0.048	2.05	11564	1.73	0.445	0.30	10.61	0.048
8.33	0.037	1.58	8561	1.28	0.330	0.24	8.33	0.037	1.61	9078	1.36	0.350	0.24	8.33	0.037
9.22	0.042	1.75	9481	1.42	0.365	0.26	9.22	0.042	1.78	10053	1.51	0.387	0.26	9.22	0.042
6.24	0.028	1.18	6419	0.96	0.247	0.18	6.24	0.028	1.21	6807	1.02	0.262	0.18	4.66	0.021
6.30	0.028	1.19	6480	0.97	0.249	0.18	6.30	0.028	1.22	6871	1.03	0.265	0.18	6.30	0.028
9.52	0.043	1.80	9789	1.47	0.377	0.27	9.52	0.043	1.84	10379	1.56	0.400	0.27	9.52	0.043
10.74	0.048	2.04	11044	1.66	0.425	0.31	10.74	0.048	2.08	11710	1.76	0.451	0.31	10.74	0.048
9.07	0.041	1.72	9319	1.40	0.359	0.26	9.07	0.041	1.75	9881	1.48	0.380	0.26	9.07	0.041
7.55	0.034	1.43	7759	1.16	0.299	0.21	7.55	0.034	1.46	8227	1.23	0.317	0.21	7.55	0.034
10.84	0.049	2.05	11139	1.67	0.429	0.31	10.84	0.049	2.10	11811	1.77	0.455	0.31	11.36	0.051
10.60	0.048	2.01	10901	1.64	0.420	0.30	10.60	0.048	2.05	11559	1.73	0.445	0.30	12.72	0.057
388.16	**1.75**	**73.57**	**399013.00**	**59.85**	**15.36**	11.02	**388.16**	**1.75**	**75.05**	**423090**	**63.46**	**16.29**	**11.02**	**388.16**	**1.75**
669.00	**3.01**	**126.80**	**687702.00**	**103.16**	25.712	19.00	**669.00**	**3.01**	**129.35**	**729200**	**109.38**	**28.07**	**19.00**	**669.00**	**3.01**

KOCHI METRO RAIL LIMITED ★ KOCHI ★ PROJECT WORKS

Total sewer load in MLD in 2035 with RR	Anticipated population in 2040	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2040	domestic demand in MLD in 204	Road length in km	Infiltration in MLD in 2040	Total sewer load in MLD in 2040with RR	Anticipated population in 2053	domestic demand in MLD @ 150 LPCD in	demand @ 70 LPCD in 2050	domestic demand in MLD in 2050	Road length in km	ation in MLD in	Total sewer load in MLD in 2050 with RR
2.20	12173	1.83	0.469	0.31	10.85	0.049	2.26	13136	1.97	0.50	0.31	10.85	0.049	2.41
1.68	9257	1.39	0.356	0.23	8.25	0.037	1.72	9990	1.50	0.38	0.23	8.25	0.037	1.83
1.38	7615	1.14	0.293	0.19	6.78	0.031	1.41	8217	1.23	0.31	0.19	6.78	0.031	1.51
1.91	10527	1.58	0.405	0.27	9.38	0.042	1.96	11360	1.70	0.43	0.27	9.38	0.042	2.08
2.18	12022	1.80	0.463	0.30	10.71	0.048	2.23	12974	1.95	0.49	0.30	10.71	0.048	2.38
1.53	8424	1.26	0.324	0.21	7.51	0.034	1.56	9091	1.36	0.34	0.21	7.51	0.034	1.67
1.66	9174	1.38	0.353	0.23	8.17	0.037	1.70	9900	1.49	0.37	0.23	8.17	0.037	1.81
2.45	13545	2.03	0.521	0.34	12.07	0.054	2.52	14617	2.19	0.55	0.34	12.07	0.054	2.68
1.08	5980	0.90	0.230	0.15	5.33	0.024	1.11	6454	0.97	0.24	0.15	5.33	0.024	1.18
1.64	9058	1.36	0.349	0.23	8.07	0.036	1.68	9775	1.47	0.37	0.23	8.07	0.036	1.79
1.99	10982	1.65	0.423	0.28	9.78	0.044	2.04	11851	1.78	0.45	0.28	9.78	0.044	2.17
1.92	10578	1.59	0.407	0.27	9.42	0.042	1.96	11415	1.71	0.43	0.27	9.42	0.042	2.09
2.19	12092	1.81	0.466	0.31	10.77	0.048	2.25	13049	1.96	0.49	0.31	10.77	0.048	2.39
2.30	12680	1.90	0.488	0.32	11.30	0.051	2.36	13684	2.05	0.52	0.32	11.30	0.051	2.51
2.06	11347	1.70	0.437	0.29	10.11	0.045	2.11	12245	1.84	0.46	0.29	10.11	0.045	2.24
1.68	9254	1.39	0.356	0.23	8.24	0.037	1.72	9986	1.50	0.38	0.23	8.24	0.037	1.83
2.03	11190	1.68	0.431	0.28	9.97	0.045	2.08	12076	1.81	0.46	0.28	9.97	0.045	2.21
2.12	11689	1.75	0.450	0.30	10.41	0.047	2.17	12614	1.89	0.48	0.30	10.41	0.047	2.31
2.38	13155	1.97	0.506	0.33	11.72	0.053	2.44	14197	2.13	0.54	0.33	11.72	0.053	2.60
1.88	10368	1.56	0.399	0.26	9.24	0.042	1.93	11188	1.68	0.42	0.26	9.24	0.042	2.05
2.37	13091	1.96	0.504	0.33	11.66	0.052	2.43	14127	2.12	0.53	0.33	11.66	0.052	2.59
3.16	17449	2.62	0.672	0.44	15.55	0.070	3.24	18830	2.82	0.71	0.44	15.55	0.070	3.45
1.80	9959	1.49	0.383	0.25	8.87	0.040	1.85	10747	1.61	0.41	0.25	8.87	0.040	1.97
1.74	9625	1.44	0.371	0.24	8.58	0.039	1.79	10386	1.56	0.39	0.24	8.58	0.039	1.90
1.42	7849	1.18	0.302	0.20	6.99	0.031	1.46	8471	1.27	0.32	0.20	6.99	0.031	1.55
1.56	8625	1.29	0.332	0.22	7.68	0.035	1.60	9307	1.40	0.35	0.22	7.68	0.035	1.71
1.60	8837	1.33	0.340	0.22	7.87	0.035	1.64	9536	1.43	0.36	0.22	7.87	0.035	1.75
2.03	11187	1.68	0.431	0.28	9.97	0.045	2.08	12072	1.81	0.46	0.28	9.97	0.045	2.21
1.00	5530	0.83	0.213	0.14	4.93	0.022	1.03	5968	0.90	0.23	0.14	4.93	0.022	1.09
2.16	11942	1.79	0.460	0.30	10.64	0.048	2.22	12887	1.93	0.49	0.30	10.64	0.048	2.36
57.09	**315204**	**47.28**	**12.14**	**7.98**	**280.84**	**1.26**	**58.55**	**340150.00**	**51.02**	**12.87**	**7.98**	**280.84**	**1.26**	**62.35**
1.94	10696	1.60	0.412	0.27	9.53	0.043	1.99	11543	1.73	0.44	0.27	9.53	0.043	2.12
1.67	9238	1.39	0.356	0.23	8.23	0.037	1.72	9970	1.50	0.38	0.23	8.23	0.037	1.83
1.83	10130	1.52	0.390	0.26	9.03	0.041	1.88	10931	1.64	0.41	0.26	9.03	0.041	2.00
1.94	10707	1.61	0.412	0.27	9.54	0.043	1.99	11554	1.73	0.44	0.27	9.54	0.043	2.12
1.88	10379	1.56	0.400	0.26	9.25	0.042	1.93	11200	1.68	0.42	0.26	9.25	0.042	2.05
1.63	8994	1.35	0.346	0.23	8.01	0.036	1.67	9706	1.46	0.37	0.23	8.01	0.036	1.78
1.97	10883	1.63	0.419	0.28	9.70	0.044	2.02	11745	1.76	0.44	0.28	9.70	0.044	2.15
1.85	10233	1.53	0.394	0.26	9.12	0.041	1.90	11043	1.66	0.42	0.26	9.12	0.041	2.02
1.97	10863	1.63	0.418	0.27	9.68	0.044	2.02	11723	1.76	0.44	0.27	9.68	0.044	2.15
1.49	8206	1.23	0.316	0.21	7.31	0.033	1.52	8856	1.33	0.34	0.21	7.31	0.033	1.62
1.56	8625	1.29	0.332	0.22	7.68	0.035	1.60	9307	1.40	0.35	0.22	7.68	0.035	1.71
2.07	11439	1.72	0.440	0.29	10.19	0.046	2.12	12345	1.85	0.47	0.29	10.19	0.046	2.26

KOCHI METRO RAIL LIMITED * KOCHI * PROJECT WORKS

2.08	11506	1.73	0.443	0.29	10.25	0.046	2.14	12416	1.86	0.47	0.29	10.25	0.046	2.28
2.01	11086	1.66	0.427	0.28	9.88	0.044	2.06	11963	1.79	0.45	0.28	9.88	0.044	2.19
1.84	10171	1.53	0.392	0.26	9.06	0.041	1.89	10976	1.65	0.42	0.26	9.06	0.041	2.01
2.13	11778	1.77	0.453	0.30	10.49	0.047	2.19	12710	1.91	0.48	0.30	10.49	0.047	2.33
1.41	7771	1.17	0.299	0.20	6.92	0.031	1.44	8386	1.26	0.32	0.20	6.92	0.031	1.54
1.28	7044	1.06	0.271	0.18	6.28	0.028	1.31	7601	1.14	0.29	0.18	6.28	0.028	1.39
1.38	7618	1.14	0.293	0.19	7.84	0.035	1.42	8221	1.23	0.31	0.19	7.84	0.035	1.51
1.52	8404	1.26	0.324	0.21	7.49	0.034	1.56	9069	1.36	0.34	0.21	7.49	0.034	1.66
1.62	8917	1.34	0.343	0.23	7.94	0.036	1.66	9623	1.44	0.36	0.23	7.94	0.036	1.76
1.93	10695	1.60	0.412	0.27	8.47	0.038	1.98	11541	1.73	0.44	0.27	8.47	0.038	2.11
1.92	10590	1.59	0.408	0.27	9.43	0.042	1.97	11428	1.71	0.43	0.27	9.43	0.042	2.09
2.30	12712	1.91	0.489	0.32	11.33	0.051	2.36	13718	2.06	0.52	0.32	11.33	0.051	2.51
1.46	8069	1.21	0.311	0.20	7.19	0.032	1.50	8707	1.31	0.33	0.20	7.19	0.032	1.60
1.68	9302	1.40	0.358	0.24	8.29	0.037	1.73	10039	1.51	0.38	0.24	8.29	0.037	1.84
2.42	13353	2.00	0.514	0.34	11.90	0.054	2.48	14410	2.16	0.55	0.34	11.90	0.054	2.64
1.70	9402	1.41	0.362	0.24	8.38	0.038	1.75	10146	1.52	0.38	0.24	8.38	0.038	1.86
1.40	7730	1.16	0.298	0.20	5.83	0.026	1.43	8341	1.25	0.32	0.20	5.83	0.026	1.52
2.14	11820	1.77	0.455	0.30	10.53	0.047	2.20	12755	1.91	0.48	0.30	10.53	0.047	2.34
1.28	7040	1.06	0.271	0.18	6.27	0.028	1.31	7597	1.14	0.29	0.18	6.27	0.028	1.39
1.59	8779	1.32	0.338	0.22	7.82	0.035	1.63	9473	1.42	0.36	0.22	7.82	0.035	1.74
1.87	10336	1.55	0.398	0.26	9.21	0.041	1.92	11154	1.67	0.42	0.26	9.21	0.041	2.04
2.16	11907	1.79	0.458	0.30	10.61	0.048	2.21	12850	1.93	0.49	0.30	10.61	0.048	2.36
1.69	9347	1.40	0.360	0.24	8.33	0.037	1.74	10087	1.51	0.38	0.24	8.33	0.037	1.85
1.87	10351	1.55	0.399	0.26	9.22	0.042	1.92	11170	1.68	0.42	0.26	9.22	0.042	2.05
1.26	7009	1.05	0.270	0.18	4.66	0.021	1.29	7564	1.13	0.29	0.18	4.66	0.021	1.38
1.28	7076	1.06	0.272	0.18	6.30	0.028	1.31	7635	1.15	0.29	0.18	6.30	0.028	1.40
1.94	10688	1.60	0.411	0.27	9.52	0.043	1.99	11534	1.73	0.44	0.27	9.52	0.043	2.11
2.18	12058	1.81	0.464	0.31	10.74	0.048	2.24	13012	1.95	0.49	0.31	10.74	0.048	2.39
1.84	10175	1.53	0.392	0.26	9.07	0.041	1.89	10980	1.65	0.42	0.26	9.07	0.041	2.01
1.53	8472	1.27	0.326	0.21	7.55	0.034	1.57	9142	1.37	0.35	0.21	7.55	0.034	1.68
2.21	12162	1.82	0.468	0.31	11.36	0.051	2.26	13125	1.97	0.50	0.31	11.36	0.051	2.41
2.17	11903	1.79	0.458	0.30	12.72	0.057	2.22	12845	1.93	0.49	0.30	12.72	0.057	2.36
78.91	**435664**	**65.35**	**16.77**	11.02	**388.16**	**1.75**	**80.92**	**470141**	**70.52**	**17.79**	**11.02**	**388.16**	**1.75**	**86.18**
136.00	**750868.00**	**112.63**	**28.91**	19.00	**669.00**	**3.01**	**139.47**	**810291.00**	**121.54**	**30.65**	**19.00**	**669.00**	**3.01**	**148.53**

KOCHI METRO RAIL LIMITED* KOCHI PROJECT (URMTS)*

Anticipated population in 2055	domestic demand in MLD @ 150 LPCD in	demand @ 70 LPCD in 2050	domestic demand in MLD in 2055	Road length in km	ation in MLD in	Total sewer load in MLD in 2055 with RR
13291	1.99	0.51	0.31	10.85	0.049	2.44
10108	1.52	0.39	0.23	8.25	0.037	1.86
8314	1.25	0.32	0.19	6.78	0.031	1.53
11494	1.72	0.44	0.27	9.38	0.042	2.11
13127	1.97	0.51	0.30	10.71	0.048	2.41
9198	1.38	0.35	0.21	7.51	0.034	1.69
10017	1.50	0.39	0.23	8.17	0.037	1.84
14790	2.22	0.57	0.34	12.07	0.054	2.72
6530	0.98	0.25	0.15	5.33	0.024	1.20
9890	1.48	0.38	0.23	8.07	0.036	1.82
11991	1.80	0.46	0.28	9.78	0.044	2.20
11549	1.73	0.44	0.27	9.42	0.042	2.12
13203	1.98	0.51	0.31	10.77	0.048	2.42
13845	2.08	0.53	0.32	11.30	0.051	2.54
12389	1.86	0.48	0.29	10.11	0.045	2.27
10104	1.52	0.39	0.23	8.24	0.037	1.86
12218	1.83	0.47	0.28	9.97	0.045	2.24
12763	1.91	0.49	0.30	10.41	0.047	2.34
14364	2.15	0.55	0.33	11.72	0.053	2.64
11320	1.70	0.44	0.26	9.24	0.042	2.08
14294	2.14	0.55	0.33	11.66	0.052	2.62
19052	2.86	0.73	0.44	15.55	0.070	3.50
10874	1.63	0.42	0.25	8.87	0.040	2.00
10509	1.58	0.40	0.24	8.58	0.039	1.93
8570	1.29	0.33	0.20	6.99	0.031	1.57
9417	1.41	0.36	0.22	7.68	0.035	1.73
9648	1.45	0.37	0.22	7.87	0.035	1.77
12214	1.83	0.47	0.28	9.97	0.045	2.24
6038	0.91	0.23	0.14	4.93	0.022	1.11
13039	1.96	0.50	0.30	10.64	0.048	2.39
344160.00	**51.62**	**13.25**	**7.98**	**280.84**	**1.26**	**63.19**
11679	1.75	0.45	0.27	9.53	0.043	2.14
10087	1.51	0.39	0.23	8.23	0.037	1.85
11060	1.66	0.43	0.26	9.03	0.041	2.03
11690	1.75	0.45	0.27	9.54	0.043	2.15
11332	1.70	0.44	0.26	9.25	0.042	2.08
9820	1.47	0.38	0.23	8.01	0.036	1.80
11883	1.78	0.46	0.28	9.70	0.044	2.18
11173	1.68	0.43	0.26	9.12	0.041	2.05
11861	1.78	0.46	0.27	9.68	0.044	2.18
8960	1.34	0.34	0.21	7.31	0.033	1.65
9417	1.41	0.36	0.22	7.68	0.035	1.73
12490	1.87	0.48	0.29	10.19	0.046	2.29

KOCHI METRO RAIL LIMITED ★ (URMTS PROJECT) KOCHI ★

12563	1.88	0.48	0.29	10.25	0.046	2.31
12104	1.82	0.47	0.28	9.88	0.044	2.22
11105	1.67	0.43	0.26	9.06	0.041	2.04
12860	1.93	0.50	0.30	10.49	0.047	2.36
8485	1.27	0.33	0.20	6.92	0.031	1.56
7690	1.15	0.30	0.18	6.28	0.028	1.41
8318	1.25	0.32	0.19	7.84	0.035	1.53
9176	1.38	0.35	0.21	7.49	0.034	1.68
9736	1.46	0.37	0.23	7.94	0.036	1.79
11677	1.75	0.45	0.27	8.47	0.038	2.14
11562	1.73	0.45	0.27	9.43	0.042	2.12
13880	2.08	0.53	0.32	11.33	0.051	2.55
8810	1.32	0.34	0.20	7.19	0.032	1.62
10157	1.52	0.39	0.24	8.29	0.037	1.86
14580	2.19	0.56	0.34	11.90	0.054	2.68
10266	1.54	0.40	0.24	8.38	0.038	1.88
8440	1.27	0.32	0.20	5.83	0.026	1.54
12905	1.94	0.50	0.30	10.53	0.047	2.37
7687	1.15	0.30	0.18	6.27	0.028	1.41
9585	1.44	0.37	0.22	7.82	0.035	1.76
11285	1.69	0.43	0.26	9.21	0.041	2.07
13001	1.95	0.50	0.30	10.61	0.048	2.39
10206	1.53	0.39	0.24	8.33	0.037	1.87
11302	1.70	0.44	0.26	9.22	0.042	2.08
7653	1.15	0.29	0.18	4.66	0.021	1.40
7725	1.16	0.30	0.18	6.30	0.028	1.42
11670	1.75	0.45	0.27	9.52	0.043	2.14
13166	1.97	0.51	0.31	10.74	0.048	2.42
11109	1.67	0.43	0.26	9.07	0.041	2.04
9250	1.39	0.36	0.21	7.55	0.034	1.70
13279	1.99	0.51	0.31	11.36	0.051	2.44
12996	1.95	0.50	0.30	12.72	0.057	2.40
475680	**71.35**	**18.31**	**11.02**	**388.16**	**1.75**	**87.33**
819840	**122.98**	**30.65**	**19.00**	**669.00**	**3.01**	**150.52**

Verified the population projection and sewage load calculation and found correct based on Sewerage Master Plan prepared for Kochi Corporation

Executive Engineer
Sewerage Circle
Kochi - 11

KOCHI METRO RAIL LIMITED (URWTS PROJECT) KOCHI

General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

EXPECTED SEWER LOAD CALCULATION FOR KOCHI CORPORATION							
Return ratio	0.85						
Infiltration of ground water	4500			Litres/km/day			
Storm water flow	(accounted in return ratio)						
Sewer load in year end	**2020**	**2021**	**2025**	**2035**	**2040**	**2053**	**2055**
Sewer load in Western Kochi	52.96	53.23	54.30	57.09	58.55	60.28	63.19
Sewer load in Mainland	73.20	73.57	75.05	80.92	80.92	86.18	87.33
Total	126.17	126.80	129.35	138.01	139.47	146.46	150.52

VENNALA ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
	38 (75%)	75%	42%	33%	**DEVANKULANGARA**	1.29	0.72	0.57	1.30	0.73	0.57	1.32	0.74	0.58	1.39	0.78	0.61	1.43	0.80	0.63	1.52	0.85	0.67	1.54	0.86	0.68
6	40 (73%)	73%	40%	33%	**MAMANGALAM**	1.01	0.55	0.46	1.01	0.55	0.46	1.03	0.57	0.47	1.08	0.59	0.49	1.11	0.61	0.50	1.19	0.65	0.54	1.20	0.66	0.54
1	41 (100%)	100%	79%	21%	**PADIVATTOM**	1.45	1.14	0.30	1.46	1.15	0.31	1.49	1.17	0.31	1.56	1.23	0.33	1.60	1.27	0.34	1.71	1.35	0.36	1.73	1.37	0.36
2	42 (100%)	100%	95.5%	4.5%	**VENNALA**	1.92	1.84	0.09	1.93	1.84	0.09	1.97	1.88	0.09	2.07	1.98	0.09	2.12	2.03	0.10	2.26	2.16	0.10	2.29	2.19	0.10
3	46 (100%)	100%	43%	57%	**CHAKKARAPARAMBU**	1.98	0.85	1.13	1.99	0.86	1.13	2.03	0.87	1.16	2.13	0.92	1.22	2.19	0.94	1.25	2.33	1.00	1.33	2.36	1.02	1.35
4	47 (100%)	100%	61%	39%	**CHALIKKAVATTOM**	1.31	0.80	0.51	1.31	0.80	0.51	1.34	0.82	0.52	1.41	0.86	0.55	1.44	0.88	0.56	1.54	0.94	0.60	1.56	0.95	0.61
5	48 (75%)	75%		75%	**PONNURUNNI EAST**	0.89	0.00	0.89	0.89	0.00	0.89	0.91	0.00	0.91	0.96	0.00	0.96	0.98	0.00	0.98	1.04	0.00	1.04	1.06	0.00	1.06
					TOTAL	**9.84**	**5.90**	**3.94**	**9.89**	**5.93**	**3.96**	**10.09**	**6.05**	**4.04**	**10.61**	**6.36**	**4.24**	**10.88**	**6.52**	**4.35**	**11.58**	**6.95**	**4.64**	**11.74**	**7.04**	**4.70**

MUTTAR ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
2	33 (43%)	43%	43%		**ELAMAKARA NORTH**	0.73	0.73	0.00	0.74	0.74	0.00	0.75	0.75	0.00	0.79	0.79	0.00	0.81	0.81	0.00	0.86	0.86	0.00	0.87	0.87	0.00
3	34 (47%)	47%	47%		**PUTHUKKALAVATTOM**	0.85	0.85	0.00	0.85	0.85	0.00	0.87	0.87	0.00	0.91	0.91	0.00	0.93	0.93	0.00	1.00	1.00	0.00	1.01	1.01	0.00
1	35 (100%)	100%	100%		**PONEKKARA**	1.74	1.74	0.00	1.75	1.75	0.00	1.79	1.79	0.00	1.88	1.88	0.00	1.93	1.93	0.00	2.05	2.05	0.00	2.08	2.08	0.00
2	36 (100%)	100%	18%	82%	**KUNNUMPURAM**	1.51	0.27	1.24	1.52	0.27	1.25	1.55	0.28	1.27	1.63	0.29	1.34	1.67	0.30	1.37	1.78	0.32	1.46	1.80	0.32	1.48
3	37 (100%)	100%	100%		**EDAPPILLY**	1.83	1.83	0.00	1.84	1.84	0.00	1.87	1.87	0.00	1.97	1.97	0.00	2.02	2.02	0.00	2.15	2.15	0.00	2.18	2.18	0.00
4	38 (25%)	25%	25%		**DEVANKULANGARA**	0.43	0.43	0.00	0.43	0.43	0.00	0.44	0.44	0.00	0.46	0.46	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.51	0.51	0.00
5	39 (59%)	59%	59%		**KARUKAPPILLY**	1.08	1.08	0.00	1.08	1.08	0.00	1.10	1.10	0.00	1.16	1.16	0.00	1.19	1.19	0.00	1.27	1.27	0.00	1.28	1.28	0.00
6	40 (27%)	27%	27%		**MAMANGALAM**	0.37	0.37	0.00	0.37	0.37	0.00	0.38	0.38	0.00	0.40	0.40	0.00	0.41	0.41	0.00	0.44	0.44	0.00	0.44	0.44	0.00
6	70 (25%)	25%	25%		**KALOOR NORTH**	0.51	0.51	0.00	0.51	0.51	0.00	0.52	0.52	0.00	0.55	0.55	0.00	0.56	0.56	0.00	0.60	0.60	0.00	0.60	0.60	0.00
7	71 (53%)	53%	53%		**ELAMAKKARA SOUTH**	0.91	0.91	0.00	0.91	0.91	0.00	0.93	0.93	0.00	0.98	0.98	0.00	1.00	1.00	0.00	1.07	1.07	0.00	1.08	1.08	0.00
8	72 (49%)	49%	49%		**POTTAKKUZHY**	0.70	0.70	0.00	0.70	0.70	0.00	0.72	0.72	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.82	0.82	0.00	0.83	0.83	0.00
					TOTAL	**10.65**	**9.41**	**1.24**	**10.70**	**9.46**	**1.25**	**10.92**	**9.65**	**1.27**	**11.48**	**10.14**	**1.34**	**11.77**	**10.40**	**1.37**	**12.54**	**11.08**	**1.46**	**12.71**	**11.23**	**1.48**

PERANDOOR ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
1	32 (28%)	28%	28%		**VADUTHALA EAST**	0.43	0.43	0.00	0.44	0.44	0.00	0.45	0.45	0.00	0.47	0.47	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.52	0.52	0.00
2	33 (57%)	57%	57%		**ELAMAKARA NORTH**	0.97	0.97	0.00	0.98	0.98	0.00	0.99	0.99	0.00	1.05	1.05	0.00	1.07	1.07	0.00	1.14	1.14	0.00	1.16	1.16	0.00
3	34 (53%)	53%	24%	29%	**PUTHUKKALAVATTOM**	0.95	0.43	0.52	0.96	0.43	0.52	0.98	0.44	0.53	1.03	0.47	0.56	1.05	0.48	0.58	1.12	0.51	0.61	1.14	0.52	0.62
4	65 (15%)	15%	15%		**KALOOR SOUTH**	0.24	0.24	0.00	0.24	0.24	0.00	0.24	0.24	0.00	0.25	0.25	0.00	0.26	0.26	0.00	0.28	0.28	0.00	0.28	0.28	0.00
5	69 (46%)	46%	46%		**THRIKKANARVATTOM**	0.83	0.83	0.00	0.83	0.83	0.00	0.85	0.85	0.00	0.89	0.89	0.00	0.91	0.91	0.00	0.97	0.97	0.00	0.99	0.99	0.00
6	70 (75%)	75%	75%		**KALOOR NORTH**	1.52	1.52	0.00	1.53	1.53	0.00	1.56	1.56	0.00	1.64	1.64	0.00	1.68	1.68	0.00	1.79	1.79	0.00	1.81	1.81	0.00
7	71 (47%)	47%	47%		**ELAMAKKARA SOUTH**	0.80	0.80	0.00	0.81	0.81	0.00	0.82	0.82	0.00	0.87	0.87	0.00	0.89	0.89	0.00	0.95	0.95	0.00	0.96	0.96	0.00
8	72 (51%)	51%	51%		**POTTAKKUZHY**	0.73	0.73	0.00	0.73	0.73	0.00	0.74	0.74	0.00	0.78	0.78	0.00	0.80	0.80	0.00	0.85	0.85	0.00	0.87	0.87	0.00
9	73 (88%)	88%	88%		**PACHALAM**	1.80	1.80	0.00	1.81	1.81	0.00	1.84	1.84	0.00	1.94	1.94	0.00	1.99	1.99	0.00	2.12	2.12	0.00	2.15	2.15	0.00
					TOTAL	**8.27**	**7.75**	**0.52**	**8.31**	**7.78**	**0.52**	**8.48**	**7.94**	**0.53**	**8.91**	**8.35**	**0.56**	**9.14**	**8.56**	**0.58**	**9.73**	**9.12**	**0.61**	**9.87**	**9.24**	**0.62**

VADUTHALA ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL		KWA		TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA
SL NO.	DIVISION				NAME																					
1	31 (100%)	100%			**VADUTHALA WEST**	1.80		1.80	1.81		1.81	1.84		1.84	1.94		1.94	1.99		1.99	2.12		2.12	2.14		2.14
2	32 (72%)	72%			**VADUTHALA EAST**	1.12		1.12	1.12		1.12	1.15		1.15	1.20		1.20	1.24		1.24	1.32		1.32	1.33		1.33
3	67 (40%)	40%			**ERNAKULAM NORTH**	0.47		0.47	0.47		0.47	0.48		0.48	0.50		0.50	0.52		0.52	0.55		0.55	0.56		0.56
4	68 (100%)	100%			**AYYAPPANKAV**	1.19		1.19	1.19		1.19	1.22		1.22	1.28		1.28	1.31		1.31	1.40		1.40	1.42		1.42
5	69 (54%)	54%			**THRIKKANARVATTOM**	0.97		0.97	0.97		0.97	0.99		0.99	1.05		1.05	1.07		1.07	1.14		1.14	1.16		1.16
6	73 (12%)	12%			**PACHALAM**	0.25		0.25	0.25		0.25	0.25		0.25	0.26		0.26	0.27		0.27	0.29		0.29	0.29		0.29
7	74 (100%)	100%			**THATTAZHAM**	2.00		2.00	2.01		2.01	2.05		2.05	2.17		2.17	2.22		2.22	2.36		2.36	2.40		2.40
					TOTAL	**7.79**		**7.79**	**7.83**		**7.83**	**7.99**		**7.99**	**8.40**		**8.40**	**8.62**		**8.62**	**9.18**		**9.18**	**9.30**		**9.30**

KOCHI METRO RAIL LIMITED * (WORKS) PROJECT KOCHI *

SEPTAGE ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL		KWA		TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA
SL NO.	DIVISION				NAME																					
1	50 (100%)	100%			CHAMBAKARA	1.41		1.41	1.42		1.42	1.45		1.45	1.52		1.52	1.56		1.56	1.66		1.66	1.68		1.68
2	51 (60%)	60%			POONITHURA	0.90		0.90	0.90		0.90	0.92		0.92	0.97		0.97	0.99		0.99	1.06		1.06	1.07		1.07
					TOTAL	2.31		2.31	2.32		2.32	2.37		2.37	2.49		2.49	2.55		2.55	2.72		2.72	2.76		2.76

ELAMKULAM ZONE

					sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																					
1	39 (41%)	41%	41%		KARUKAPPILLY	0.75	0.75	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.81	0.81	0.00	0.83	0.83	0.00	0.88	0.88	0.00	0.89	0.89	0.00
2	43 (100%)	100%		100%	PALARIVATTOM	1.93	0.00	1.93	1.94	0.00	1.94	1.98	0.00	1.98	2.08	0.00	2.08	2.14	0.00	2.14	2.28	0.00	2.28	2.31	0.00	2.31
3	44 (100%)	100%	53%	47%	KARANAKKODAM	1.86	0.99	0.88	1.87	0.99	0.88	1.91	1.01	0.90	2.01	1.06	0.94	2.06	1.09	0.97	2.19	1.16	1.03	2.22	1.18	1.04
4	45 (100%)	100%	24%	76%	THAMMANAM	1.71	0.41	1.30	1.72	0.41	1.31	1.75	0.42	1.33	1.84	0.44	1.40	1.89	0.45	1.44	2.01	0.48	1.53	2.04	0.49	1.55
5	48 (25%)	25%		25%	PONNURUNNI EAST	0.30	0.00	0.30	0.30	0.00	0.30	0.30	0.00	0.30	0.32	0.00	0.32	0.33	0.00	0.33	0.35	0.00	0.35	0.35	0.00	0.35
6	49 (100%)	100%		100%	VYTTILA	1.28	0.00	1.28	1.29	0.00	1.29	1.31	0.00	1.31	1.38	0.00	1.38	1.42	0.00	1.42	1.51	0.00	1.51	1.53	0.00	1.53
7	51 (40%)	40%		40%	POONITHURA	0.60	0.00	0.60	0.60	0.00	0.60	0.61	0.00	0.61	0.65	0.00	0.65	0.66	0.00	0.66	0.71	0.00	0.71	0.71	0.00	0.71
8	52 (100%)	100%	58%	42%	VYTTILA JANATHA	1.80	1.04	0.75	1.81	1.05	0.76	1.84	1.07	0.77	1.93	1.12	0.81	1.98	1.15	0.83	2.11	1.22	0.89	2.14	1.24	0.90
9	53 (100%)	100%	55%	45%	PONNURUNNI	1.78	0.98	0.80	1.79	0.98	0.80	1.82	1.00	0.82	1.92	1.05	0.86	1.97	1.08	0.89	2.09	1.15	0.94	2.12	1.17	0.96
10	54 (100%)	100%		100%	ELAMKULAM	2.14	0.00	2.14	2.15	0.00	2.15	2.19	0.00	2.19	2.30	0.00	2.30	2.36	0.00	2.36	2.51	0.00	2.51	2.55	0.00	2.55
11	55 (100%)	100%	70%	30%	GIRINAGAR	1.36	0.95	0.41	1.36	0.95	0.41	1.39	0.97	0.42	1.46	1.02	0.44	1.50	1.05	0.45	1.60	1.12	0.48	1.62	1.13	0.49
12	56 (100%)	100%	85%	15%	PANAMPILLY NAGAR	1.56	1.33	0.23	1.57	1.34	0.24	1.60	1.36	0.24	1.68	1.43	0.25	1.73	1.47	0.26	1.84	1.56	0.28	1.86	1.59	0.28
13	57 (100%)	100%	26%	74%	KADAVANTHRA	2.24	0.58	1.66	2.25	0.59	1.67	2.30	0.60	1.70	2.42	0.63	1.79	2.48	0.64	1.84	2.64	0.69	1.95	2.68	0.70	1.98
14	58 (100%)	100%		100%	KONTHURUTHY	1.58	0.00	1.58	1.59	0.00	1.59	1.62	0.00	1.62	1.70	0.00	1.70	1.75	0.00	1.75	1.86	0.00	1.86	1.88	0.00	1.88
15	59 (100%)	100%		100%	THEVARA	1.30	0.00	1.30	1.31	0.00	1.31	1.33	0.00	1.33	1.40	0.00	1.40	1.43	0.00	1.43	1.52	0.00	1.52	1.54	0.00	1.54
16	60 (100%)	100%	61%	39%	PERUMANOOR	1.99	1.21	0.77	2.00	1.22	0.78	2.04	1.24	0.79	2.14	1.31	0.83	2.20	1.34	0.86	2.34	1.43	0.91	2.37	1.45	0.92
17	61 (100%)	100%		100%	RAVIPURAM	1.18	0.00	1.18	1.19	0.00	1.19	1.21	0.00	1.21	1.28	0.00	1.28	1.31	0.00	1.31	1.39	0.00	1.39	1.41	0.00	1.41
18	62 (100%)	100%	18%	82%	ERNAKULAM SOUTH	1.48	0.27	1.21	1.48	0.27	1.22	1.51	0.27	1.24	1.59	0.29	1.30	1.63	0.29	1.34	1.74	0.31	1.42	1.76	0.32	1.44
19	63 (100%)	100%	68%	32%	GANDHINAGAR	1.74	1.18	0.56	1.75	1.19	0.56	1.78	1.21	0.57	1.87	1.27	0.60	1.92	1.31	0.61	2.04	1.39	0.65	2.07	1.41	0.66
20	64 (100%)	100%	100%		KATHRIKADAV	2.00	2.00	0.00	2.01	2.01	0.00	2.05	2.05	0.00	2.16	2.16	0.00	2.21	2.21	0.00	2.36	2.36	0.00	2.39	2.39	0.00
21	65 (85%)	85%	85%		KALOOR SOUTH	1.34	1.34	0.00	1.34	1.34	0.00	1.37	1.37	0.00	1.44	1.44	0.00	1.48	1.48	0.00	1.57	1.57	0.00	1.59	1.59	0.00
22	66 (100%)	100%	24%	76%	ERNAKULAM CENTRAL	1.74	0.42	1.32	1.75	0.42	1.33	1.78	0.43	1.36	1.87	0.45	1.42	1.92	0.46	1.46	2.05	0.49	1.56	2.08	0.50	1.58
23	67 (60%)	60%		60%	ERNAKULAM NORTH	0.71	0.00	0.71	0.71	0.00	0.71	0.72	0.00	0.72	0.76	0.00	0.76	0.78	0.00	0.78	0.83	0.00	0.83	0.84	0.00	0.84
					TOTAL	34.35	13.44	20.20	33.81	13.51	20.30	35.21	13.78	20.71	36.25	14.48	21.77	37.18	14.85	22.33	39.59	15.82	23.78	40.96	16.03	24.93

TOTAL	KMRL	KWA
87.33	43.54	43.79
87.33		

Verified the population projection and sewage load calculation and found correct based on Sewerage Master Plan prepared for Kochi Corporation

Executive Engineer
Sewerage Circle
Kochi - 11

KOCHI METRO RAIL LIMITED * KOCHI * PROJECT WORKS

Anticipaated population in 2035	Floating population in 2035	Floating demand in 2035	Anticipaated population in 2040	Floating population in 2040	Floating demand in 2040	Anticipaated population in 2050	Floating population in 2050	Floating demand in 2050	Anticipaated population in 2055	Floating population in 2055	Floating demand in 2055
729197	401058	28.07	750872	412980	28.91	796175	437896	30.65	819841	450913	31.56
22428	6728	0.47	22428	6728	0.47	22428	6728	0.47	22428	6728	0.47
40776	6116	0.43	41676	6251	0.44	43534	6530	0.46	44494	6674	0.47
87593	17519	1.23	91500	18300	1.28	99846	19969	1.40	104300	20860	1.46
52995	10599	0.74	54907	10981	0.77	58940	11788	0.83	61067	12213	0.85
100261	20052	1.40	105838	21168	1.48	117939	23588	1.65	124500	24900	1.74
60632	12126	0.85	64757	12951	0.91	73871	14774	1.03	78897	15779	1.10
46571	4657	0.33	48978	4898	0.34	54170	5417	0.38	56970	5697	0.40
40758	6114	0.43	42659	6399	0.45	46732	7010	0.49	48912	7337	0.51
26241	2624	0.18	26704	2670	0.19	27656	2766	0.19	28144	2814	0.20
24919	2492	0.17	25168	2517	0.18	25673	2567	0.18	25929	2593	0.18
54435	5444	0.38	55244	5524	0.39	56898	5690	0.40	57744	5774	0.40
22168	2217	0.16	22238	2224	0.16	22380	2238	0.16	22451	2245	0.16
33445	5017	0.35	34406	5161	0.36	36411	5462	0.38	37457	5619	0.39
41555	4156	0.29	42477	4248	0.30	44384	4438	0.31	45369	4537	0.32
32357	6471	0.45	33285	6657	0.47	35223	7045	0.49	36233	7247	0.51
39279	5892	0.41	41378	6207	0.43	45918	6888	0.48	48372	7256	0.51
31739	3174	0.22	32890	3289	0.23	35319	3532	0.25	36600	3660	0.26
18041	1804	0.13	18428	1843	0.13	19227	1923	0.13	19639	1964	0.14
1505390	**524260**	**36.70**	**1555833**	**540996**	**37.87**	**1662724**	**576248.4**	**40.34**	**1719347**	**594810.2**	**41.64**
115224	23045	1.61	120606	24121	1.69	132135	26427	1.85	138307	27661	1.94

Executive Engineer
Sewerage Circle
Kochi - 11

KOCHI METRO RAIL LIMITED
KOCHI PROJECT (FORMS)

General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

Local Body	Population as per 2011 Census data	% increase of population in last decade	Coefficient	Floating population in 2011	% increase of population in Ernakulam District in last decade	% increase of population adopted	Anticipaated population in 2020	Floating population in 2020	Floating demand in 2020	Anticipaated population in 2021	Floating population in 2021	Floating demand in 2021	Anticipaated population in 2025	Floating population in 2025	Floating demand in 2025
Kochi [C]	633553	6.38	0.55	348454	5.69	6.03	667853	367319	25.71	671777	369477	25.86	687705	378238	26.48
Aluva [M]	22428	-6.98	0.3	6728	5.69	0.00	22428	6728	0.47	22428	6728	0.47	22428	6728	0.47
Eloor [M]	36722	3.23	0.15	5508	5.69	4.46	38193	5729	0.40	38360	5754	0.40	39035	5855	0.41
Kalamassery [M]	71038	12.55	0.2	14208	5.69	9.12	76844	15369	1.08	77517	15503	1.09	80271	16054	1.12
Maradu [M]	44704	9.00	0.2	8941	5.69	7.35	47649	9530	0.67	47988	9598	0.67	49368	9874	0.69
Thrikkakkara [M]	77319	17.18	0.2	15464	5.69	11.43	85232	17046	1.19	86160	17232	1.21	89973	17995	1.26
Edathala GP	44204	22.46	0.2	8841	5.69	14.07	49765	9953	0.70	50425	10085	0.71	53152	10630	0.74
Keezhmadu GP	36567	15.51	0.1	3657	5.69	10.60	40038	4004	0.28	40444	4044	0.28	42107	4211	0.29
Choornikkara GP	32746	13.41	0.15	4912	5.69	9.55	35547	5332	0.37	35873	5381	0.38	37205	5581	0.39
Nayarambalam GP	24127	1.43	0.1	2413	5.69	3.56	24899	2490	0.17	24986	2499	0.17	25339	2534	0.18
Njarackal GP	23760	-1.68	0.1	2376	5.69	2.00	24188	2419	0.17	24236	2424	0.17	24430	2443	0.17
Elamkunnappuzha GP	50714	0.30	0.1	5071	5.69	2.99	52079	5208	0.36	52233	5223	0.37	52853	5285	0.37
Mulavukad GP	21833	-4.42	0.1	2183	5.69	0.64	21958	2196	0.15	21972	2197	0.15	22028	2203	0.15
Kumbalam GP	29193	5.97	0.15	4379	5.69	5.83	30720	4608	0.32	30895	4634	0.32	31603	4740	0.33
Chellanam GP	37399	3.29	0.1	3740	5.69	4.49	38906	3891	0.27	39078	3908	0.27	39770	3977	0.28
Kumbalangy GP	28248	5.95	0.2	5650	5.69	5.82	29724	5945	0.42	29892	5978	0.42	30577	6115	0.43
Cheranalloor GP	30594	16.26	0.15	4589	5.69	10.97	33599	5040	0.35	33951	5093	0.36	35395	5309	0.37
Varappuzha GP	26750	9.08	0.1	2675	5.69	7.39	28522	2852	0.20	28725	2873	0.20	29556	2956	0.21
Kadamakkudy GP	16295	2.98	0.1	1630	5.69	4.33	16929	1693	0.12	17001	1700	0.12	17292	1729	0.12
	1288194			**451418**			**1365073**	**477351**	**33.41**	**1373941**	**480331**	**33.62**	**1410087**	**492458**	**34.47**
Tripunithura	**92550**		**0.2**	18510	5.69	9.56	100476	20095	1.41	101398	20280	1.42	105169	21034	1.47

KOCHI METRO RAIL LIMITED (URWTS PROJECT) KOCHI

No.	Name of ward	Population as per 2011 Census	Road length in km	% increase of population adopted	Anticipated population in 2020	domestic demand in MLD @ 150 LPCD in	Floating demand @ 70 LPCD in 2020	non-domestic demand in MLD in 2020	Road length in km	Infiltration in MLD in 2020	Total sewer load in MLD in 2020 with RR	Anticipated population in 2021	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2021	non-domestic demand in MLD in 2021	Road length in km	Infiltration in MLD in 2021
1	Marottichodu	2398	11.723	11.43	2643	0.40	0.037	0.07	11.72	0.053	0.48	2672	0.40	0.037	0.07	11.72	0.053
2	Bm nagar	1969	9.626	11.43	2170	0.33	0.030	0.06	9.63	0.043	0.39	2194	0.33	0.031	0.06	9.63	0.043
3	Thoppil	2285	11.171	11.43	2519	0.38	0.035	0.07	11.17	0.050	0.46	2546	0.38	0.036	0.07	11.17	0.050
4	Thrikkakara	2370	11.587	11.43	2612	0.39	0.037	0.07	11.59	0.052	0.47	2641	0.40	0.037	0.07	11.59	0.052
5	Kollamkudimugal	1805	8.824	11.43	1990	0.30	0.028	0.05	8.82	0.040	0.36	2011	0.30	0.028	0.05	8.82	0.040
6	Navodhaya	1570	7.675	11.43	1731	0.26	0.024	0.04	7.68	0.035	0.31	1749	0.26	0.024	0.04	7.68	0.035
7	Vallyattumugal	1302	6.365	11.43	1435	0.22	0.020	0.04	6.37	0.029	0.26	1451	0.22	0.020	0.04	6.37	0.029
8	Thengode	1953	9.548	11.43	2153	0.32	0.030	0.06	9.55	0.043	0.39	2176	0.33	0.030	0.06	9.55	0.043
9	Edachira	1712	8.370	11.43	1887	0.28	0.026	0.05	8.37	0.038	0.34	1908	0.29	0.027	0.05	8.37	0.038
10	Kalathikuzhy	2005	9.802	11.43	2210	0.33	0.031	0.06	9.80	0.044	0.40	2234	0.34	0.031	0.06	9.80	0.044
11	Nilampathinjimugal	2418	11.821	11.43	2665	0.40	0.037	0.07	11.82	0.053	0.48	2694	0.40	0.038	0.07	11.82	0.053
12	Kuzhikkattumoola	2470	12.075	11.43	2723	0.41	0.038	0.07	12.08	0.054	0.49	2752	0.41	0.039	0.07	12.08	0.054
13	Athani	2546	12.447	11.43	2806	0.42	0.039	0.07	12.45	0.056	0.51	2837	0.43	0.040	0.07	12.45	0.056
14	Mavelipuram	2442	11.939	11.43	2692	0.40	0.038	0.07	11.94	0.054	0.49	2721	0.41	0.038	0.07	11.94	0.054
15	Kakkanad health centre	2284	11.166	11.43	2518	0.38	0.035	0.06	11.17	0.050	0.46	2545	0.38	0.036	0.06	11.17	0.050
16	Kakkanad	1431	6.996	11.43	1577	0.24	0.022	0.04	7.00	0.031	0.29	1595	0.24	0.022	0.04	7.00	0.031
17	Chittethukara	1679	8.208	11.43	1851	0.28	0.026	0.05	8.21	0.037	0.34	1871	0.28	0.026	0.05	8.21	0.037
18	Kannankeri	1970	9.631	11.43	2172	0.33	0.030	0.06	9.63	0.043	0.39	2195	0.33	0.031	0.06	9.63	0.043
19	Thuthiyoor	2315	11.318	11.43	2552	0.38	0.036	0.07	11.32	0.051	0.46	2580	0.39	0.036	0.07	11.32	0.051
20	Kunnathuchira	2578	12.603	11.43	2842	0.43	0.040	0.07	12.60	0.057	0.52	2873	0.43	0.040	0.07	12.60	0.057
21	Palachuvadu	2660	13.004	11.43	2932	0.44	0.041	0.08	13.00	0.059	0.53	2964	0.44	0.041	0.08	13.00	0.059
22	Thanapadam	1483	7.250	11.43	1635	0.25	0.023	0.04	7.25	0.033	0.30	1653	0.25	0.023	0.04	7.25	0.033
23	Kambiveli	1353	6.615	11.43	1491	0.22	0.021	0.04	6.61	0.030	0.27	1508	0.23	0.021	0.04	6.61	0.030
24	T v centre	1626	7.949	11.43	1792	0.27	0.025	0.05	7.95	0.036	0.32	1812	0.27	0.025	0.05	7.95	0.036
25	Olikkuzhy	1478	7.226	11.43	1629	0.24	0.023	0.04	7.23	0.033	0.30	1647	0.25	0.023	0.04	7.23	0.033
26	Padamugal	1528	7.470	11.43	1684	0.25	0.024	0.04	7.47	0.034	0.31	1703	0.26	0.024	0.04	7.47	0.034
27	N g o quarters	1560	7.627	11.43	1720	0.26	0.024	0.04	7.63	0.034	0.31	1738	0.26	0.024	0.04	7.63	0.034
28	Kunneparambu	1463	7.152	11.43	1613	0.24	0.023	0.04	7.15	0.032	0.29	1630	0.24	0.023	0.04	7.15	0.032
29	Vazhakkala east	1488	7.275	11.43	1640	0.25	0.023	0.04	7.27	0.033	0.30	1658	0.25	0.023	0.04	7.27	0.033
30	Vazhakkala west	1463	7.152	11.43	1613	0.24	0.023	0.04	7.15	0.032	0.29	1630	0.24	0.023	0.04	7.15	0.032
31	Snehanilayam	1514	7.402	11.43	1669	0.25	0.023	0.04	7.40	0.033	0.30	1687	0.25	0.024	0.04	7.40	0.033
32	Kunneparambu west	1560	7.627	11.43	1720	0.26	0.024	0.04	7.63	0.034	0.31	1738	0.26	0.024	0.04	7.63	0.034
33	Cherumuttapuzhakkara	1490	7.284	11.43	1642	0.25	0.023	0.04	7.28	0.033	0.30	1660	0.25	0.023	0.04	7.28	0.033
34	Desiyakavala	1542	7.539	11.43	1700	0.26	0.024	0.04	7.54	0.034	0.31	1718	0.26	0.024	0.04	7.54	0.034
35	Housing board colony	2025	9.900	11.43	2232	0.33	0.031	0.06	9.90	0.045	0.40	2256	0.34	0.032	0.06	9.90	0.045
36	Kudilimukku	1349	6.595	11.43	1487	0.22	0.021	0.04	6.60	0.030	0.27	1503	0.23	0.021	0.04	6.60	0.030
37	Maleppally	1358	6.639	11.43	1497	0.22	0.021	0.04	6.64	0.030	0.27	1513	0.23	0.021	0.04	6.64	0.030
38	Krimakkadu	1454	7.108	11.43	1603	0.24	0.022	0.04	7.11	0.032	0.29	1620	0.24	0.023	0.04	7.11	0.032

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39	Model engineering	1625	7.944	11.43	1791	0.27	0.025	0.05	7.94	0.036	0.32	1811	0.27	0.025	0.05	7.94	0.036
40	Sahakarana road	1537	7.514	11.43	1694	0.25	0.024	0.04	7.51	0.034	0.31	1713	0.26	0.024	0.04	7.51	0.034
41	Thoppil south	1473	7.201	11.43	1624	0.24	0.023	0.04	7.20	0.032	0.29	1641	0.25	0.023	0.04	7.20	0.032
42	Mambilliparambu	1432	7.001	11.43	1579	0.24	0.022	0.04	7.00	0.032	0.29	1596	0.24	0.022	0.04	7.00	0.032
43	Kennedi mukku	1356	6.629	11.43	1495	0.22	0.021	0.04	6.63	0.030	0.27	1511	0.23	0.021	0.04	6.63	0.030
	IURWTS THRIKA	**77319**	**378**		**85230**	**12.785**	**1.193**	**2.200**	**378**	**1.701**	**15.452**	**86155**	**12.923**	**1.206**	**2.200**	**378**	**1.701**

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sewer load in MLD in 2021 with RR	Anticipated population in 2025	domestic demand in MLD @ 150	Floating demand @ 70 LPCD in 2025	Total non-domestic demand in MLD in 2025	Road length in km	Infiltration in MLD in 2025	sewer load in MLD in 2025 with RR	Anticipated population in 2035	domestic demand in MLD @ 150 LPCD in	Floating demand @ 70 LPCD in 2035	non-domestic demand in MLD in 2035	Road length in km	Infiltration in MLD in 2035	sewer load in MLD in 2035 with RR	Anticipated population in 2040	domestic demand in MLD @ 150 LPCD in 2040	Floating demand @ 70 LPCD in 2040	non-domestic demand in MLD in 204	Road length in km
0.48	2790	0.42	0.039	0.07	11.72	0.053	0.50	3109	0.47	0.044	0.07	11.72	0.053	0.54	3282	0.49	0.046	0.07	11.72
0.40	2291	0.34	0.032	0.06	9.63	0.043	0.41	2553	0.38	0.036	0.06	9.63	0.043	0.45	2695	0.40	0.038	0.06	9.63
0.46	2659	0.40	0.037	0.07	11.17	0.050	0.48	2963	0.44	0.041	0.07	11.17	0.050	0.52	3127	0.47	0.044	0.07	11.17
0.48	2758	0.41	0.039	0.07	11.59	0.052	0.49	3073	0.46	0.043	0.07	11.59	0.052	0.54	3244	0.49	0.045	0.07	11.59
0.36	2100	0.32	0.029	0.05	8.82	0.040	0.38	2340	0.35	0.033	0.05	8.82	0.040	0.41	2470	0.37	0.035	0.05	8.82
0.32	1827	0.27	0.026	0.04	7.68	0.035	0.33	2036	0.31	0.029	0.04	7.68	0.035	0.36	2149	0.32	0.030	0.04	7.68
0.26	1515	0.23	0.021	0.04	6.37	0.029	0.27	1688	0.25	0.024	0.04	6.37	0.029	0.30	1782	0.27	0.025	0.04	6.37
0.39	2273	0.34	0.032	0.06	9.55	0.043	0.41	2532	0.38	0.035	0.06	9.55	0.043	0.44	2673	0.40	0.037	0.06	9.55
0.35	1992	0.30	0.028	0.05	8.37	0.038	0.36	2220	0.33	0.031	0.05	8.37	0.038	0.39	2343	0.35	0.033	0.05	8.37
0.40	2333	0.35	0.033	0.06	9.80	0.044	0.42	2600	0.39	0.036	0.06	9.80	0.044	0.46	2744	0.41	0.038	0.06	9.80
0.49	2814	0.42	0.039	0.07	11.82	0.053	0.50	3135	0.47	0.044	0.07	11.82	0.053	0.55	3310	0.50	0.046	0.07	11.82
0.50	2874	0.43	0.040	0.07	12.08	0.054	0.51	3203	0.48	0.045	0.07	12.08	0.054	0.56	3381	0.51	0.047	0.07	12.08
0.51	2963	0.44	0.041	0.07	12.45	0.056	0.53	3301	0.50	0.046	0.07	12.45	0.056	0.58	3485	0.52	0.049	0.07	12.45
0.49	2842	0.43	0.040	0.07	11.94	0.054	0.51	3166	0.47	0.044	0.07	11.94	0.054	0.55	3342	0.50	0.047	0.07	11.94
0.46	2658	0.40	0.037	0.06	11.17	0.050	0.48	2961	0.44	0.041	0.06	11.17	0.050	0.52	3126	0.47	0.044	0.06	11.17
0.29	1665	0.25	0.023	0.04	7.00	0.031	0.30	1855	0.28	0.026	0.04	7.00	0.031	0.32	1959	0.29	0.027	0.04	7.00
0.34	1954	0.29	0.027	0.05	8.21	0.037	0.35	2177	0.33	0.030	0.05	8.21	0.037	0.38	2298	0.34	0.032	0.05	8.21
0.40	2292	0.34	0.032	0.06	9.63	0.043	0.41	2554	0.38	0.036	0.06	9.63	0.043	0.45	2696	0.40	0.038	0.06	9.63
0.47	2694	0.40	0.038	0.07	11.32	0.051	0.48	3002	0.45	0.042	0.07	11.32	0.051	0.53	3169	0.48	0.044	0.07	11.32
0.52	3000	0.45	0.042	0.07	12.60	0.057	0.54	3343	0.50	0.047	0.07	12.60	0.057	0.59	3528	0.53	0.049	0.07	12.60
0.54	3095	0.46	0.043	0.08	13.00	0.059	0.55	3449	0.52	0.048	0.08	13.00	0.059	0.60	3641	0.55	0.051	0.08	13.00
0.30	1726	0.26	0.024	0.04	7.25	0.033	0.31	1923	0.29	0.027	0.04	7.25	0.033	0.34	2030	0.30	0.028	0.04	7.25
0.27	1574	0.24	0.022	0.04	6.61	0.030	0.28	1754	0.26	0.025	0.04	6.61	0.030	0.31	1852	0.28	0.026	0.04	6.61
0.33	1892	0.28	0.026	0.05	7.95	0.036	0.34	2108	0.32	0.030	0.05	7.95	0.036	0.37	2225	0.33	0.031	0.05	7.95
0.30	1720	0.26	0.024	0.04	7.23	0.033	0.31	1916	0.29	0.027	0.04	7.23	0.033	0.34	2023	0.30	0.028	0.04	7.23
0.31	1778	0.27	0.025	0.04	7.47	0.034	0.32	1981	0.30	0.028	0.04	7.47	0.034	0.35	2091	0.31	0.029	0.04	7.47
0.31	1815	0.27	0.025	0.04	7.63	0.034	0.33	2023	0.30	0.028	0.04	7.63	0.034	0.35	2135	0.32	0.030	0.04	7.63
0.29	1702	0.26	0.024	0.04	7.15	0.032	0.30	1897	0.28	0.027	0.04	7.15	0.032	0.33	2002	0.30	0.028	0.04	7.15
0.30	1731	0.26	0.024	0.04	7.27	0.033	0.31	1929	0.29	0.027	0.04	7.27	0.033	0.34	2037	0.31	0.029	0.04	7.27
0.29	1702	0.26	0.024	0.04	7.15	0.032	0.30	1897	0.28	0.027	0.04	7.15	0.032	0.33	2002	0.30	0.028	0.04	7.15
0.31	1762	0.26	0.025	0.04	7.40	0.033	0.32	1963	0.29	0.027	0.04	7.40	0.033	0.34	2072	0.31	0.029	0.04	7.40
0.31	1815	0.27	0.025	0.04	7.63	0.034	0.33	2023	0.30	0.028	0.04	7.63	0.034	0.35	2135	0.32	0.030	0.04	7.63
0.30	1734	0.26	0.024	0.04	7.28	0.033	0.31	1932	0.29	0.027	0.04	7.28	0.033	0.34	2039	0.31	0.029	0.04	7.28
0.31	1794	0.27	0.025	0.04	7.54	0.034	0.32	1999	0.30	0.028	0.04	7.54	0.034	0.35	2111	0.32	0.030	0.04	7.54
0.41	2356	0.35	0.033	0.06	9.90	0.045	0.42	2626	0.39	0.037	0.06	9.90	0.045	0.46	2772	0.42	0.039	0.06	9.90
0.27	1570	0.24	0.022	0.04	6.60	0.030	0.28	1749	0.26	0.024	0.04	6.60	0.030	0.31	1846	0.28	0.026	0.04	6.60
0.27	1580	0.24	0.022	0.04	6.64	0.030	0.28	1761	0.26	0.025	0.04	6.64	0.030	0.31	1859	0.28	0.026	0.04	6.64
0.29	1692	0.25	0.024	0.04	7.11	0.032	0.30	1885	0.28	0.026	0.04	7.11	0.032	0.33	1990	0.30	0.028	0.04	7.11

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0.33	1891	0.28	0.026	0.05	7.94	0.036	0.34	2107	0.32	0.030	0.05	7.94	0.036	0.37	2224	0.33	0.031	0.05	7.94
0.31	1788	0.27	0.025	0.04	7.51	0.034	0.32	1993	0.30	0.028	0.04	7.51	0.034	0.35	2104	0.32	0.029	0.04	7.51
0.30	1714	0.26	0.024	0.04	7.20	0.032	0.31	1910	0.29	0.027	0.04	7.20	0.032	0.33	2016	0.30	0.028	0.04	7.20
0.29	1666	0.25	0.023	0.04	7.00	0.032	0.30	1857	0.28	0.026	0.04	7.00	0.032	0.33	1960	0.29	0.027	0.04	7.00
0.27	1578	0.24	0.022	0.04	6.63	0.030	0.28	1758	0.26	0.025	0.04	6.63	0.030	0.31	1856	0.28	0.026	0.04	6.63
15.581	**89969**	**13.495**	**1.260**	**2.200**	**378**	**1.701**	**16.113**	**100251**	**15.038**	**1.404**	**2.200**	**378**	**1.701**	**17.546**	**105825**	**15.874**	**1.482**	**2.200**	**378**

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Infiltration in MLD in 2040	sewer load in MLD in 2040with RR	Anticipated population in 2053	Anticipated population in 2050	domestic demand in MLD @ 150	ng demand @ 70 LPCD	non-domestic demand in	Road length in km	ratio n in MLD in 2053	l sewer load in	Anticipated population in 2055	domestic demand in MLD @ 150	g demand @ 70 LPCD in 2055	Total non-domestic demand in MLD in 2055	Road length in km	Infiltration in MLD in 2055	sewer load in MLD in 2055 with RR
0.053	0.57	3778	3657	0.55	0.05	0.07	11.72	0.053	0.62	3861	0.58	0.05	0.07	11.72	0.053	0.65
0.043	0.47	3102	3003	0.45	0.04	0.06	9.63	0.043	0.51	3170	0.48	0.04	0.06	9.63	0.043	0.53
0.050	0.54	3600	3485	0.52	0.05	0.07	11.17	0.050	0.59	3679	0.55	0.05	0.07	11.17	0.050	0.62
0.052	0.56	3734	3615	0.54	0.05	0.07	11.59	0.052	0.61	3816	0.57	0.05	0.07	11.59	0.052	0.64
0.040	0.43	2844	2753	0.41	0.04	0.05	8.82	0.040	0.47	2906	0.44	0.04	0.05	8.82	0.040	0.49
0.035	0.37	2473	2394	0.36	0.03	0.04	7.68	0.035	0.41	2528	0.38	0.04	0.04	7.68	0.035	0.42
0.029	0.31	2051	1986	0.30	0.03	0.04	6.37	0.029	0.34	2096	0.31	0.03	0.04	6.37	0.029	0.35
0.043	0.46	3077	2979	0.45	0.04	0.06	9.55	0.043	0.51	3144	0.47	0.04	0.06	9.55	0.043	0.53
0.038	0.41	2697	2611	0.39	0.04	0.05	8.37	0.038	0.44	2756	0.41	0.04	0.05	8.37	0.038	0.46
0.044	0.48	3159	3058	0.46	0.04	0.06	9.80	0.044	0.52	3228	0.48	0.05	0.06	9.80	0.044	0.54
0.053	0.57	3809	3688	0.55	0.05	0.07	11.82	0.053	0.63	3893	0.58	0.05	0.07	11.82	0.053	0.65
0.054	0.59	3891	3767	0.57	0.05	0.07	12.08	0.054	0.64	3977	0.60	0.06	0.07	12.08	0.054	0.67
0.056	0.60	4011	3883	0.58	0.05	0.07	12.45	0.056	0.66	4099	0.61	0.06	0.07	12.45	0.056	0.69
0.054	0.58	3847	3724	0.56	0.05	0.07	11.94	0.054	0.63	3931	0.59	0.06	0.07	11.94	0.054	0.66
0.050	0.54	3598	3483	0.52	0.05	0.06	11.17	0.050	0.59	3677	0.55	0.05	0.06	11.17	0.050	0.62
0.031	0.34	2254	2182	0.33	0.03	0.04	7.00	0.031	0.37	2304	0.35	0.03	0.04	7.00	0.031	0.39
0.037	0.40	2645	2561	0.38	0.04	0.05	8.21	0.037	0.43	2703	0.41	0.04	0.05	8.21	0.037	0.45
0.043	0.47	3104	3005	0.45	0.04	0.06	9.63	0.043	0.51	3172	0.48	0.04	0.06	9.63	0.043	0.53
0.051	0.55	3647	3531	0.53	0.05	0.07	11.32	0.051	0.60	3727	0.56	0.05	0.07	11.32	0.051	0.63
0.057	0.61	4062	3932	0.59	0.06	0.07	12.60	0.057	0.67	4150	0.62	0.06	0.07	12.60	0.057	0.70
0.059	0.63	4191	4057	0.61	0.06	0.08	13.00	0.059	0.69	4282	0.64	0.06	0.08	13.00	0.059	0.72
0.033	0.35	2336	2262	0.34	0.03	0.04	7.25	0.033	0.38	2388	0.36	0.03	0.04	7.25	0.033	0.40
0.030	0.32	2132	2064	0.31	0.03	0.04	6.61	0.030	0.35	2178	0.33	0.03	0.04	6.61	0.030	0.37
0.036	0.39	2562	2480	0.37	0.03	0.05	7.95	0.036	0.42	2618	0.39	0.04	0.05	7.95	0.036	0.44
0.033	0.35	2329	2254	0.34	0.03	0.04	7.23	0.033	0.38	2379	0.36	0.03	0.04	7.23	0.033	0.40
0.034	0.36	2407	2330	0.35	0.03	0.04	7.47	0.034	0.40	2460	0.37	0.03	0.04	7.47	0.034	0.41
0.034	0.37	2458	2379	0.36	0.03	0.04	7.63	0.034	0.40	2512	0.38	0.04	0.04	7.63	0.034	0.42
0.032	0.35	2305	2231	0.33	0.03	0.04	7.15	0.032	0.38	2355	0.35	0.03	0.04	7.15	0.032	0.40
0.033	0.35	2344	2269	0.34	0.03	0.04	7.27	0.033	0.39	2396	0.36	0.03	0.04	7.27	0.033	0.40
0.032	0.35	2305	2231	0.33	0.03	0.04	7.15	0.032	0.38	2355	0.35	0.03	0.04	7.15	0.032	0.40
0.033	0.36	2385	2309	0.35	0.03	0.04	7.40	0.033	0.39	2437	0.37	0.03	0.04	7.40	0.033	0.41
0.034	0.37	2458	2379	0.36	0.03	0.04	7.63	0.034	0.40	2512	0.38	0.04	0.04	7.63	0.034	0.42
0.033	0.35	2347	2272	0.34	0.03	0.04	7.28	0.033	0.39	2399	0.36	0.03	0.04	7.28	0.033	0.40
0.034	0.37	2429	2352	0.35	0.03	0.04	7.54	0.034	0.40	2483	0.37	0.03	0.04	7.54	0.034	0.42
0.045	0.48	3190	3088	0.46	0.04	0.06	9.90	0.045	0.52	3260	0.49	0.05	0.06	9.90	0.045	0.55
0.030	0.32	2125	2057	0.31	0.03	0.04	6.60	0.030	0.35	2172	0.33	0.03	0.04	6.60	0.030	0.37
0.030	0.32	2139	2071	0.31	0.03	0.04	6.64	0.030	0.35	2186	0.33	0.03	0.04	6.64	0.030	0.37
0.032	0.34	2291	2218	0.33	0.03	0.04	7.11	0.032	0.38	2341	0.35	0.03	0.04	7.11	0.032	0.39

KOCHI METRO RAIL LIMITED ★ KOCHI ★ PROJECT MONITORING

0.036	0.39	2560	2478	0.37	0.03	0.05	7.94	0.036	0.42	2616	0.39	0.04	0.05	7.94	0.036	0.44
0.034	0.36	2421	2344	0.35	0.03	0.04	7.51	0.034	0.40	2474	0.37	0.03	0.04	7.51	0.034	0.42
0.032	0.35	2321	2247	0.34	0.03	0.04	7.20	0.032	0.38	2371	0.36	0.03	0.04	7.20	0.032	0.40
0.032	0.34	2256	2184	0.33	0.03	0.04	7.00	0.032	0.37	2305	0.35	0.03	0.04	7.00	0.032	0.39
0.030	0.32	2136	2068	0.31	0.03	0.04	6.63	0.030	0.35	2183	0.33	0.03	0.04	6.63	0.030	0.37
1.701	**18.323**	**121810**	**117921**	**17.688**	**1.651**	**2.200**	**378**	**2**	**20**	**124479**	**18.672**	**1.743**	**2.200**	**378.00**	**1.701**	**20.924**

Verified the population projection and found correct

Executive Engineer
Sewerage Circle
Kochi - 11

KOCHI METRO RAIL LIMITED
(URWMTS PROJECT) KOCHI

General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

No.	Name of ward	Population as per 2011 Census	% increase of population adopted	Anticipated population in 2020	Total domestic demand in MLD @ 150 LPCD in 2020	Floating demand @ 70 LPCD in 2020	Total non-domestic demand in MLD in 2020	Road length in km	Infiltration in MLD in 2020	Total sewer load in MLD in 2020 with RR	Anticipated population in 2021	Total domestic demand in MLD @ 150 LPCD in 2021	Floating demand @ 70 LPCD in 2021	Total non-domestic demand in MLD in 2021	Road length in km	Infiltration in MLD in 2021	Total sewer load in MLD in 2021 with RR	Anticipated population in 2025	Total domestic demand in MLD @ 150 LPCD in 2025	Floating demand @ 70 LPCD in 2025	Total non-domestic demand in MLD in 2025	Road length in km	Infiltration in MLD in 2025	Total sewer load in MLD in 2025 with RR	Anticipated population in 2035	Total domestic demand in MLD @ 150 LPCD in 2035
1	GLASS COLONY	2101	9.12	2273	0.34	0.032	0.08	7.63	0.034	0.42	2293	0.34	0.032	0.08	7.63	0.034	0.42	2374	0.36	0.033	0.08	7.63	0.034	0.43	2591	0.39
2	SANTHIGIRI ANNEXE	1976	9.12	2137	0.32	0.030	0.07	7.18	0.032	0.39	2156	0.32	0.030	0.07	7.18	0.032	0.39	2233	0.33	0.031	0.07	7.18	0.032	0.40	2436	0.37
3	RAJAGIRI	1854	9.12	2006	0.30	0.028	0.07	6.73	0.030	0.37	2023	0.30	0.028	0.07	6.73	0.030	0.37	2095	0.31	0.029	0.07	6.73	0.030	0.38	2286	0.34
4	SUNDARAGIRI	1637	9.12	1771	0.27	0.025	0.06	5.95	0.027	0.32	1786	0.27	0.025	0.06	5.95	0.027	0.33	1850	0.28	0.026	0.06	5.95	0.027	0.33	2018	0.30
5	NORTHKALAMASSERY	1719	9.12	1859	0.28	0.026	0.06	6.24	0.028	0.34	1876	0.28	0.026	0.06	6.24	0.028	0.34	1942	0.29	0.027	0.06	6.24	0.028	0.35	2120	0.32
6	HMT JN	1766	9.12	1910	0.29	0.027	0.06	6.41	0.029	0.35	1927	0.29	0.027	0.06	6.41	0.029	0.35	1996	0.30	0.028	0.06	6.41	0.029	0.36	2178	0.33
7	SUBSTATION	2527	9.12	2734	0.41	0.038	0.09	9.18	0.041	0.50	2757	0.41	0.039	0.09	9.18	0.041	0.50	2855	0.43	0.040	0.09	9.18	0.041	0.52	3116	0.47
8	ROCKWELL	2325	9.12	2515	0.38	0.035	0.08	8.44	0.038	0.46	2537	0.38	0.036	0.08	8.44	0.038	0.46	2627	0.39	0.037	0.08	8.44	0.038	0.47	2867	0.43
9	VIDAKUZHA	2000	9.12	2163	0.32	0.030	0.07	7.26	0.033	0.39	2182	0.33	0.031	0.07	7.26	0.033	0.40	2260	0.34	0.032	0.07	7.26	0.033	0.41	2466	0.37
10	PERINGAZHA	2330	9.12	2520	0.38	0.035	0.08	8.46	0.038	0.46	2542	0.38	0.036	0.08	8.46	0.038	0.46	2633	0.39	0.037	0.08	8.46	0.038	0.48	2873	0.43
11	PIPELINE	1803	9.12	1950	0.29	0.027	0.06	6.55	0.029	0.36	1967	0.30	0.028	0.06	6.55	0.029	0.36	2037	0.31	0.029	0.06	6.55	0.029	0.37	2223	0.33
12	HMT ESTATE	959	9.12	1037	0.16	0.015	0.03	3.48	0.016	0.19	1046	0.16	0.015	0.03	3.48	0.016	0.19	1084	0.16	0.015	0.03	3.48	0.016	0.20	1182	0.18
13	KURUPRA	2028	9.12	2194	0.33	0.031	0.07	7.37	0.033	0.40	2213	0.33	0.031	0.07	7.37	0.033	0.40	2292	0.34	0.032	0.07	7.37	0.033	0.41	2501	0.38
14	MEDICAL COLLEGE	1706	9.12	1845	0.28	0.026	0.06	6.20	0.028	0.34	1862	0.28	0.026	0.06	6.20	0.028	0.34	1928	0.29	0.027	0.06	6.20	0.028	0.35	2104	0.32
15	THEVAKKAL	2022	9.12	2187	0.33	0.031	0.07	7.34	0.033	0.40	2206	0.33	0.031	0.07	7.34	0.033	0.40	2285	0.34	0.032	0.07	7.34	0.033	0.41	2493	0.37
16	PARAKKATTUMALA	985	9.12	1065	0.16	0.015	0.04	3.58	0.016	0.19	1075	0.16	0.015	0.04	3.58	0.016	0.20	1113	0.17	0.016	0.04	3.58	0.016	0.20	1215	0.18
17	PULIYAMPURAM.	1322	9.12	1430	0.21	0.020	0.05	4.80	0.022	0.26	1443	0.22	0.020	0.05	4.80	0.022	0.26	1494	0.22	0.021	0.05	4.80	0.022	0.27	1630	0.24
18	MINI TOWNHALL	2301	9.12	2489	0.37	0.035	0.08	8.36	0.038	0.45	2511	0.38	0.035	0.08	8.36	0.038	0.46	2600	0.39	0.036	0.08	8.36	0.038	0.47	2837	0.43
19	KANGARAPADY	946	9.12	1023	0.15	0.014	0.03	3.44	0.015	0.19	1032	0.15	0.014	0.03	3.44	0.015	0.19	1069	0.16	0.015	0.03	3.44	0.015	0.19	1166	0.17
20	VADACODE	1265	9.12	1368	0.21	0.019	0.05	4.59	0.021	0.25	1380	0.21	0.019	0.05	4.59	0.021	0.25	1429	0.21	0.020	0.05	4.59	0.021	0.26	1560	0.23
21	UNIVERSITY COLONY	1560	9.12	1687	0.25	0.024	0.06	5.67	0.025	0.31	1702	0.26	0.024	0.06	5.67	0.025	0.31	1763	0.26	0.025	0.06	5.67	0.025	0.32	1924	0.29
22	PUNNAKKAL	988	9.12	1069	0.16	0.015	0.04	3.59	0.016	0.20	1078	0.16	0.015	0.04	3.59	0.016	0.20	1116	0.17	0.016	0.04	3.59	0.016	0.20	1218	0.18
23	ST. JOSEPH	1546	9.12	1672	0.25	0.023	0.06	5.61	0.025	0.31	1687	0.25	0.024	0.06	5.61	0.025	0.31	1747	0.26	0.024	0.06	5.61	0.025	0.32	1906	0.29
24	TOWN HALL	1391	9.12	1505	0.23	0.021	0.05	5.05	0.023	0.27	1518	0.23	0.021	0.05	5.05	0.023	0.28	1572	0.24	0.022	0.05	5.05	0.023	0.28	1715	0.26
25	CHENGAMPUZHA NAGAR	1243	9.12	1345	0.20	0.019	0.04	4.51	0.020	0.25	1356	0.20	0.019	0.04	4.51	0.020	0.25	1405	0.21	0.020	0.04	4.51	0.020	0.25	1533	0.23
26	UNIVERSITY	1400	9.12	1514	0.23	0.021	0.05	5.08	0.023	0.28	1528	0.23	0.021	0.05	5.08	0.023	0.28	1582	0.24	0.022	0.05	5.08	0.023	0.29	1726	0.26
27	THRIKKAKARA AMBALAM	1985	9.12	2147	0.32	0.030	0.07	7.21	0.032	0.39	2166	0.32	0.030	0.07	7.21	0.032	0.39	2243	0.34	0.031	0.07	7.21	0.032	0.41	2448	0.37
28	KANNAMKULAM	1364	9.12	1475	0.22	0.021	0.05	4.95	0.022	0.27	1488	0.22	0.021	0.05	4.95	0.022	0.27	1541	0.23	0.022	0.05	4.95	0.022	0.28	1682	0.25
29	HILL VALLEY	1406	9.12	1521	0.23	0.021	0.05	5.11	0.023	0.28	1534	0.23	0.021	0.05	5.11	0.023	0.28	1589	0.24	0.022	0.05	5.11	0.023	0.29	1734	0.26
30	LIBRARY	1925	9.12	2082	0.31	0.029	0.07	6.99	0.031	0.38	2101	0.32	0.029	0.07	6.99	0.031	0.38	2175	0.33	0.030	0.07	6.99	0.031	0.39	2374	0.36
31	PUTHUPALLYPRAM	1663	9.12	1799	0.27	0.025	0.06	6.04	0.027	0.33	1815	0.27	0.025	0.06	6.04	0.027	0.33	1879	0.28	0.026	0.06	6.04	0.027	0.34	2051	0.31
32	UNICHIRA	1484	9.12	1605	0.24	0.022	0.05	5.39	0.024	0.29	1619	0.24	0.023	0.05	5.39	0.024	0.30	1677	0.25	0.023	0.05	5.39	0.024	0.30	1830	0.27
33	PARUTHELI	1926	9.12	2083	0.31	0.029	0.07	6.99	0.031	0.38	2102	0.32	0.029	0.07	6.99	0.031	0.38	2176	0.33	0.030	0.07	6.99	0.031	0.39	2375	0.36
34	TOLLGATE	2103	9.12	2275	0.34	0.032	0.08	7.64	0.034	0.42	2295	0.34	0.032	0.08	7.64	0.034	0.42	2376	0.36	0.033	0.08	7.64	0.034	0.43	2593	0.39
35	KOONAMTHAI	1495	9.12	1617	0.24	0.023	0.05	5.43	0.024	0.30	1631	0.24	0.023	0.05	5.43	0.024	0.30	1689	0.25	0.024	0.05	5.43	0.024	0.31	1843	0.28
36	MUSIUM	1515	9.12	1639	0.25	0.023	0.05	5.50	0.025	0.30	1653	0.25	0.023	0.05	5.50	0.025	0.30	1712	0.26	0.024	0.05	5.50	0.025	0.31	1868	0.28
37	MUNICIPAL	1822	9.12	1971	0.30	0.028	0.07	6.62	0.030	0.36	1988	0.30	0.028	0.07	6.62	0.030	0.36	2059	0.31	0.029	0.07	6.62	0.030	0.37	2247	0.34
38	K B PARK	1870	9.12	2023	0.30	0.028	0.07	6.79	0.031	0.37	2041	0.31	0.029	0.07	6.79	0.031	0.37	2113	0.32	0.030	0.07	6.79	0.031	0.38	2306	0.35
39	VATTEKUNNAM	1515	9.12	1639	0.25	0.023	0.05	5.50	0.025	0.30	1653	0.25	0.023	0.05	5.50	0.025	0.30	1712	0.26	0.024	0.05	5.50	0.025	0.31	1868	0.28
40	MUTTAR	1405	9.12	1520	0.23	0.021	0.05	5.10	0.023	0.28	1533	0.23	0.021	0.05	5.10	0.023	0.28	1588	0.24	0.022	0.05	5.10	0.023	0.29	1732	0.26
41	INDUSTRIAL ESTATE	2109	9.12	2281	0.34	0.032	0.08	7.66	0.034	0.42	2301	0.35	0.032	0.08	7.66	0.034	0.42	2383	0.36	0.033	0.08	7.66	0.034	0.43	2600	0.39
42	CHAKYADAM	1751	9.12	1894	0.28	0.027	0.06	6.36	0.029	0.35	1911	0.29	0.027	0.06	6.36	0.029	0.35	1979	0.30	0.028	0.06	6.36	0.029	0.36	2159	0.32
	KALAMSSERY	**71038**		**76839.00**	**11.53**	**1.08**	**2.54**	**258.00**	**1.16**	**14.03**	**77514.00**	**11.63**	**1.09**	**2.54**	**258.00**	**1.16**	**14.13**	**80272.00**	**12.04**	**1.12**	**2.54**	**258.00**	**1.16**	**14.51**	**87594.00**	**13.14**

Verified the population projection and found correct

Executive Engineer
Sewerage Circle
Kochi - 11

General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

KOCHI METRO RAIL LIMITED * KOCHI * PROJECT MONITORING

Floating demand @ 70 LPCD in 2035	Total non-domestic demand in MLD in 2035	Road length in km	Infiltration in MLD in 2035	Total sewer load in MLD in 2035 with RR	Anticipated population in 2040	domestic demand in MLD @ 150 LPCD in 2040	Floating demand @ 70 LPCD in 2040	Total non-domestic demand in MLD in 204	Road length in km	Infiltration in MLD in 2040	Total sewer load in MLD in 2040with RR	Anticipated population in 2050	domestic demand in MLD @ 150 LPCD in 2050	Floating demand @ 70 LPCD in 2050	Total non-domestic demand in MLD in 2050	Road length in km	ation in MLD in 2053	Total sewer load in MLD in 2050 with RR	Anticipated population in 2055	domestic demand in MLD @ 150 LPCD in 2055	Floating demand @ 70 LPCD in 2050	Total non-domestic demand in MLD in 2055	Road length in km	ation in MLD in 2055	Total sewer load in MLD in 2055 with RR
0.036	0.08	7.63	0.034	0.46	2706	0.41	0.038	0.08	7.63	0.034	0.48	2953	0.44	0.04	0.08	7.63	0.034	0.51	3085	0.46	0.04	0.08	7.63	0.034	0.53
0.034	0.07	7.18	0.032	0.43	2545	0.38	0.036	0.07	7.18	0.032	0.45	2777	0.42	0.04	0.07	7.18	0.032	0.48	2901	0.44	0.04	0.07	7.18	0.032	0.50
0.032	0.07	6.73	0.030	0.41	2388	0.36	0.033	0.07	6.73	0.030	0.42	2606	0.39	0.04	0.07	6.73	0.030	0.45	2722	0.41	0.04	0.07	6.73	0.030	0.47
0.028	0.06	5.95	0.027	0.36	2108	0.32	0.030	0.06	5.95	0.027	0.37	2301	0.35	0.03	0.06	5.95	0.027	0.40	2403	0.36	0.03	0.06	5.95	0.027	0.41
0.030	0.06	6.24	0.028	0.38	2214	0.33	0.031	0.06	6.24	0.028	0.39	2416	0.36	0.03	0.06	6.24	0.028	0.42	2524	0.38	0.04	0.06	6.24	0.028	0.43
0.030	0.06	6.41	0.029	0.39	2275	0.34	0.032	0.06	6.41	0.029	0.40	2482	0.37	0.03	0.06	6.41	0.029	0.43	2593	0.39	0.04	0.06	6.41	0.029	0.44
0.044	0.09	9.18	0.041	0.55	3255	0.49	0.046	0.09	9.18	0.041	0.57	3552	0.53	0.05	0.09	9.18	0.041	0.61	3710	0.56	0.05	0.09	9.18	0.041	0.64
0.040	0.08	8.44	0.038	0.51	2995	0.45	0.042	0.08	8.44	0.038	0.53	3268	0.49	0.05	0.08	8.44	0.038	0.56	3414	0.51	0.05	0.08	8.44	0.038	0.58
0.035	0.07	7.26	0.033	0.44	2576	0.39	0.036	0.07	7.26	0.033	0.45	2811	0.42	0.04	0.07	7.26	0.033	0.49	2936	0.44	0.04	0.07	7.26	0.033	0.50
0.040	0.08	8.46	0.038	0.51	3001	0.45	0.042	0.08	8.46	0.038	0.53	3275	0.49	0.05	0.08	8.46	0.038	0.57	3421	0.51	0.05	0.08	8.46	0.038	0.59
0.031	0.06	6.55	0.029	0.39	2322	0.35	0.033	0.06	6.55	0.029	0.41	2534	0.38	0.04	0.06	6.55	0.029	0.44	2647	0.40	0.04	0.06	6.55	0.029	0.45
0.017	0.03	3.48	0.016	0.21	1235	0.19	0.017	0.03	3.48	0.016	0.22	1348	0.20	0.02	0.03	3.48	0.016	0.23	1408	0.21	0.02	0.03	3.48	0.016	0.24
0.035	0.07	7.37	0.033	0.44	2612	0.39	0.037	0.07	7.37	0.033	0.46	2850	0.43	0.04	0.07	7.37	0.033	0.49	2977	0.45	0.04	0.07	7.37	0.033	0.51
0.029	0.06	6.20	0.028	0.37	2197	0.33	0.031	0.06	6.20	0.028	0.39	2398	0.36	0.03	0.06	6.20	0.028	0.41	2505	0.38	0.04	0.06	6.20	0.028	0.43
0.035	0.07	7.34	0.033	0.44	2604	0.39	0.036	0.07	7.34	0.033	0.46	2842	0.43	0.04	0.07	7.34	0.033	0.49	2969	0.45	0.04	0.07	7.34	0.033	0.51
0.017	0.04	3.58	0.016	0.22	1269	0.19	0.018	0.04	3.58	0.016	0.22	1384	0.21	0.02	0.04	3.58	0.016	0.24	1446	0.22	0.02	0.04	3.58	0.016	0.25
0.023	0.05	4.80	0.022	0.29	1703	0.26	0.024	0.05	4.80	0.022	0.30	1858	0.28	0.03	0.05	4.80	0.022	0.32	1941	0.29	0.03	0.05	4.80	0.022	0.33
0.040	0.08	8.36	0.038	0.50	2964	0.44	0.041	0.08	8.36	0.038	0.52	3234	0.49	0.05	0.08	8.36	0.038	0.56	3378	0.51	0.05	0.08	8.36	0.038	0.58
0.016	0.03	3.44	0.015	0.21	1218	0.18	0.017	0.03	3.44	0.015	0.21	1330	0.20	0.02	0.03	3.44	0.015	0.23	1389	0.21	0.02	0.03	3.44	0.015	0.24
0.022	0.05	4.59	0.021	0.28	1629	0.24	0.023	0.05	4.59	0.021	0.29	1778	0.27	0.02	0.05	4.59	0.021	0.31	1857	0.28	0.03	0.05	4.59	0.021	0.32
0.027	0.06	5.67	0.025	0.34	2009	0.30	0.028	0.06	5.67	0.025	0.35	2193	0.33	0.03	0.06	5.67	0.025	0.38	2290	0.34	0.03	0.06	5.67	0.025	0.39
0.017	0.04	3.59	0.016	0.22	1273	0.19	0.018	0.04	3.59	0.016	0.22	1389	0.21	0.02	0.04	3.59	0.016	0.24	1451	0.22	0.02	0.04	3.59	0.016	0.25
0.027	0.06	5.61	0.025	0.34	1991	0.30	0.028	0.06	5.61	0.025	0.35	2173	0.33	0.03	0.06	5.61	0.025	0.38	2270	0.34	0.03	0.06	5.61	0.025	0.39
0.024	0.05	5.05	0.023	0.30	1792	0.27	0.025	0.05	5.05	0.023	0.31	1955	0.29	0.03	0.05	5.05	0.023	0.34	2042	0.31	0.03	0.05	5.05	0.023	0.35
0.021	0.04	4.51	0.020	0.27	1601	0.24	0.022	0.04	4.51	0.020	0.28	1747	0.26	0.02	0.04	4.51	0.020	0.30	1825	0.27	0.03	0.04	4.51	0.020	0.31
0.024	0.05	5.08	0.023	0.31	1803	0.27	0.025	0.05	5.08	0.023	0.32	1968	0.30	0.03	0.05	5.08	0.023	0.34	2055	0.31	0.03	0.05	5.08	0.023	0.35
0.034	0.07	7.21	0.032	0.43	2557	0.38	0.036	0.07	7.21	0.032	0.45	2790	0.42	0.04	0.07	7.21	0.032	0.48	2914	0.44	0.04	0.07	7.21	0.032	0.50
0.024	0.05	4.95	0.022	0.30	1757	0.26	0.025	0.05	4.95	0.022	0.31	1917	0.29	0.03	0.05	4.95	0.022	0.33	2003	0.30	0.03	0.05	4.95	0.022	0.34
0.024	0.05	5.11	0.023	0.31	1811	0.27	0.025	0.05	5.11	0.023	0.32	1976	0.30	0.03	0.05	5.11	0.023	0.34	2064	0.31	0.03	0.05	5.11	0.023	0.35
0.033	0.07	6.99	0.031	0.42	2479	0.37	0.035	0.07	6.99	0.031	0.44	2706	0.41	0.04	0.07	6.99	0.031	0.47	2826	0.42	0.04	0.07	6.99	0.031	0.48
0.029	0.06	6.04	0.027	0.36	2142	0.32	0.030	0.06	6.04	0.027	0.38	2337	0.35	0.03	0.06	6.04	0.027	0.40	2442	0.37	0.03	0.06	6.04	0.027	0.42
0.026	0.05	5.39	0.024	0.32	1911	0.29	0.027	0.05	5.39	0.024	0.34	2086	0.31	0.03	0.05	5.39	0.024	0.36	2179	0.33	0.03	0.05	5.39	0.024	0.37
0.033	0.07	6.99	0.031	0.42	2481	0.37	0.035	0.07	6.99	0.031	0.44	2707	0.41	0.04	0.07	6.99	0.031	0.47	2828	0.42	0.04	0.07	6.99	0.031	0.48
0.036	0.08	7.64	0.034	0.46	2709	0.41	0.038	0.08	7.64	0.034	0.48	2956	0.44	0.04	0.08	7.64	0.034	0.51	3088	0.46	0.04	0.08	7.64	0.034	0.53
0.026	0.05	5.43	0.024	0.33	1926	0.29	0.027	0.05	5.43	0.024	0.34	2101	0.32	0.03	0.05	5.43	0.024	0.36	2195	0.33	0.03	0.05	5.43	0.024	0.38
0.026	0.05	5.50	0.025	0.33	1951	0.29	0.027	0.05	5.50	0.025	0.34	2129	0.32	0.03	0.05	5.50	0.025	0.37	2224	0.33	0.03	0.05	5.50	0.025	0.38
0.031	0.07	6.62	0.030	0.40	2347	0.35	0.033	0.07	6.62	0.030	0.41	2561	0.38	0.04	0.07	6.62	0.030	0.44	2675	0.40	0.04	0.07	6.62	0.030	0.46
0.032	0.07	6.79	0.031	0.41	2409	0.36	0.034	0.07	6.79	0.031	0.42	2628	0.39	0.04	0.07	6.79	0.031	0.45	2745	0.41	0.04	0.07	6.79	0.031	0.47
0.026	0.05	5.50	0.025	0.33	1951	0.29	0.027	0.05	5.50	0.025	0.34	2129	0.32	0.03	0.05	5.50	0.025	0.37	2224	0.33	0.03	0.05	5.50	0.025	0.38
0.024	0.05	5.10	0.023	0.31	1810	0.27	0.025	0.05	5.10	0.023	0.32	1975	0.30	0.03	0.05	5.10	0.023	0.34	2063	0.31	0.03	0.05	5.10	0.023	0.35
0.036	0.08	7.66	0.034	0.46	2716	0.41	0.038	0.08	7.66	0.034	0.48	2964	0.44	0.04	0.08	7.66	0.034	0.51	3096	0.46	0.04	0.08	7.66	0.034	0.53
0.030	0.06	6.36	0.029	0.38	2255	0.34	0.032	0.06	6.36	0.029	0.40	2461	0.37	0.03	0.06	6.36	0.029	0.42	2571	0.39	0.04	0.06	6.36	0.029	0.44
1.23	**2.54**	**258.00**	**1.16**	**15.53**	**91497.00**	**13.72**	**1.28**	**2.54**	**258.00**	**1.16**	**16.07**	**99845**	**14.98**	**1.40**	**2.54**	**258.00**	**1.16**	**17.24**	**104296.00**	**15.64**	**1.46**	**2.54**	**258.00**	**1.16**	**17.86**

KOCHI METRO RAIL LIMITED * KOCHI * (URMTS PROJECT)

Local Body	Non-domestic water demand in MLD in 2011	Non-domestic water demand in MLD in 2020	Non-domestic water demand in MLD in 2035	Non-domestic water demand in MLD in 2050	institutions																	
					hospitals with beds exceeding 100	demand in MLD	hospitals with beds not exceeding 100	demand in MLD	hotels	demand in MLD	hostels	demand in MLD	nursing homes & medical quarters	demand in MLD	boarding schools and colleges	demand in MLD	restaurants	demand in MLD	day schools and colleges	demand in MLD	cinema halls	demand in MLD
Kochi [C]	31.08	48.24	50.75	53.76	50	3.38	50	1.275	150	1.4	120	1.22	150	0.5063	125	5.06	200	1.05	150	3.38	25	0.13
Aluva [M]	0.98	2.41	2.41	2.41	4	0.27	3	0.0765	40	0.4	20	0.20	15	0.0506	20	0.81	25	0.131	15	0.34	5	0.03
Eloor [M]	1.30	1.50	1.51	1.51	1	0.05	3	0.051	5	0	10	0.10	15	0.0506	10	0.41	30	0.158	10	0.23	5	0.03
Kalamassery [M]	2.21	12.11	13.12	13.12	5	0.23	5	0.085	20	0.2	20	0.20	30	0.1013	20	0.81	45	0.236	15	0.34	5	0.03
Maradu [M]	8.26	12.16	12.16	12.16	3	0.14	2	0.034	10	0.1	10	0.10	20	0.0675	10	0.41	25	0.131	10	0.23	7	0.04
Thrikkakkara [M]	14.94	15.76	15.18	17.18	3	0.14	4	0.068	8	0.1	12	0.12	15	0.0506	20	0.81	35	0.184	20	0.45	5	0.03
Edathala GP	2.10	2.83	3.01	3.01	2	0.09	2	0.034	5	0	5	0.05	6	0.0203	7	0.28	20	0.105	15	0.34	5	0.03
Keezhmadu GP	0.26	1.54	1.54	1.54	2	0.09	2	0.034	3	0	10	0.10	10	0.0338	12	0.49	30	0.158	20	0.45	5	0.03
Choornikkara GP	0.29	0.92	0.92	0.92	1	0.05	2	0.034	3	0	4	0.04	8	0.027	5	0.2	20	0.105	15	0.34	2	0.01
Nayarambalam GP	0.64	0.80	0.80	0.80	0	0	2	0.034	4	0	2	0.02	6	0.0203	5	0.2	12	0.063	15	0.34	4	0.02
Njarackal GP	0.72	0.85	0.85	0.85	0	0	2	0.034	4	0	5	0.05	5	0.0169	5	0.2	15	0.079	15	0.34	2	0.01
Elamkunnappuzha GP	1.50	1.73	1.73	1.73	0	0	2	0.034	5	0	5	0.05	5	0.0169	6	0.24	20	0.105	12	0.27	2	0.01
Mulavukad GP	4.32	6.31	7.41	8.51	0	0	2	0.034	2	0	4	0.04	5	0.0169	8	0.32	15	0.079	8	0.18	8	0.04
Kumbalam GP	0.74	1.48	1.48	1.48	0	0	4	0.068	5	0	5	0.05	10	0.0338	15	0.61	20	0.105	20	0.45	3	0.02
Chellanam GP	1.04	1.20	1.20	1.20	0	0	2	0.034	5	0	5	0.05	10	0.0338	12	0.49	20	0.105	15	0.34	2	0.01
Kumbalangy GP	8.68	3.12	3.12	3.12	0	0	2	0.034	7	0.1	8	0.08	8	0.027	5	0.2	15	0.079	8	0.18	2	0.01
Cheranalloor GP	0.87	1.27	1.27	1.27	1	0.05	4	0.068	6	0.1	5	0.05	8	0.027	12	0.49	20	0.105	15	0.34	3	0.02
Varappuzha GP	0.37	1.37	1.37	1.37	1	0.05	2	0.034	6	0.1	8	0.08	8	0.027	15	0.61	20	0.105	12	0.27	6	0.03
Kadamakkudy GP	0.3	0.95	0.95	0.95	0	0	1	0.017	3	0	4	0.04	6	0.0203	8	0.32	30	0.158	12	0.27	3	0.02
Thripunithura	8.50	10.50	12.20	12.20	8	0.36	8	0.136	10	0.1	12	0.12	15	0.0506	15	0.61	35	0.184	15	0.34	3	0.02

KOCHI METRO RAIL LIMITED * KOCHI * (PROJECT) (PURWIS)

offices	demand in MLD	factories	demand in MLD	bus stations	demand in MLD	TOTAL assessed other ND	other ND as per report	Floating demand in MLD in 2050
450	0.71	100	0.45	150	0.34	18.84	19.00	22.58
30	0.05	15	0.07	15	0.03	2.41	1.13	0.47
15	0.02	15	0.07	25	0.06	1.25	1.46	0.58
50	0.08	15	0.07	25	0.06	2.41	2.54	2.37
30	0.05	10	0.05	25	0.06	1.37	1.22	1.31
55	0.09	20	0.09	30	0.07	2.16	2.20	3.01
15	0.02	10	0.05	15	0.03	1.09	0.49	2.05
20	0.03	12	0.05	22	0.05	1.54	0.30	0.90
15	0.02	4	0.02	22	0.05	0.92	0.33	0.75
15	0.02	2	0.01	15	0.03	0.80	0.74	0.18
15	0.02	4	0.02	20	0.05	0.85	0.83	0.17
18	0.03	2	0.01	20	0.05	0.86	1.73	0.36
10	0.02	8	0.04	12	0.03	0.81	0.75	0.15
25	0.04	3	0.01	25	0.06	1.48	0.85	0.51
20	0.03	2	0.01	24	0.05	1.20	1.20	0.30
15	0.02	2	0.01	10	0.02	0.73	0.83	0.50
20	0.03	2	0.01	20	0.05	1.27	1.00	0.77
24	0.04	5	0.02	24	0.05	1.37	0.42	0.53
20	0.03	3	0.01	15	0.03	0.95	0.34	0.13
55	0.09	10	0.05	30	0.07	2.10	2.20	3.01

General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

Executive Engineer
Sewerage Circle
Kochi - 11

KOCHI METRO RAIL LIMITED
KOCHI PROJECT (JUNMRS)

ANNEXURE 2

WATER QUALITY TEST RESULTS

Standards
Environmental Monitoring

TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006123F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006123	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Proposed STP
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2529
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	6.19
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.12
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2574
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	14.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	41.8
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	238
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	1.83
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	481
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	31.0
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.50
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	40

End of Report

For and on behalf of
Standards Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

Laiju P. N.
Laboratory Head

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

Standards Environmental & Analytical Laboratories
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K.J. Tower, Pathalam, Udyogamandal P.O., Ernakulam-683 501, Tel. 0484-2546660, 93 87 27 24 02, 90 74 34 14 43
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Standard^{S}
Environmental Monitoring

TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006123F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006123	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Proposed STP
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2529
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	6.19
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.12
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2574
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	14.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	41.8
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	238
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	1.83
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	481
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	31.0
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.50
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	40

End of Report

For and on behalf of
Standard^{s} Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Laiju P. N.
Laboratory Head

Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

Standard^{S} Environmental & Analytical Laboratories
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Web: www.sealabs.in, E-mail: seaalab@gmail.com

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Environmental Monitoring

TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006124F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006124	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Lulu Mall
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.56
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	400
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	63.4
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	12.4
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	481
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26.4
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	0.20
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	49.0
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	0.10
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	30.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	37.1
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.84
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	13

End of Report

For and on behalf of
Standards Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

Laiju P. N.
Laboratory Head

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Standards Environmental Monitoring

TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006124F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006124	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Lulu Mall
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.56
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	400
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	63.4
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	12.4
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	481
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26.4
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	0.20
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	49.0
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	0.10
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	30.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	37.1
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.84
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	13

End of Report

For and on behalf of
Standards Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

Laiju P. N.
Laboratory Head

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006125F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006125	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Railway
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.85
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2581
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	345
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	4.49
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.09
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2648
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	12.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	39.3
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	1.97
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	21.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.18
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	14

End of Report

For and on behalf of
Standards Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

Laiju P. N.
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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006125F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006125	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Railway
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.85
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2581
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	345
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	4.49
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.09
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2648
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	12.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	39.3
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	1.97
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	21.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.18
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	14

End of Report

For and on behalf of
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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006126F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006126	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Amrita
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.75
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	8970
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	1535
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	14.4
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	9038
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	157
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	8.31
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2225
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	36.5
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.62
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	21

End of Report

For and on behalf of
Standard^{s} Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

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Laboratory Head

Page 2-7

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006126F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006126	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Amrita
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.75
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	8970
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	1535
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	14.4
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	9038
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^oC)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	157
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	8.31
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2225
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	36.5
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.62
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	21

End of Report

For and on behalf of
Standards Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006127F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006127	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Behind KSEB
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.17
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	569
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	123
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	23.2
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	659
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	39.2
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.9
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	126
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	0.15
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	58.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	72.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.22
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	22

End of Report

For and on behalf of
Standard^{s} Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

Laiju P. N.
Laboratory Head

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006127F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006127	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Behind KSEB
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.17
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	569
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	123
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	23.2
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	659
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	39.2
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.9
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	126
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	0.15
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	58.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	72.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.22
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	22

End of Report

For and on behalf of
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Salini T. S.
Microbiologist

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006128F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006128	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Elamkulam
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.30
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	3107
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	495
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	13.1
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.05
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	3202
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	0.71
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	20.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	59.0
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	2.59
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	42.2
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.66
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	26

End of Report

For and on behalf of
Standards Environmental & Analytical Laboratories

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Microbiologist

Authorized Signatory

Authorized Signatory

Laju P. N.
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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006128F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006128	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Elamkulam
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.30
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	3107
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	495
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	13.1
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.05
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	3202
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	0.71
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	20.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	59.0
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	2.59
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	42.2
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.66
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	26

End of Report

For and on behalf of
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Page 2-12

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NABL(TC-5402)

TEST REPORT

Test Report No: TC540219000006129F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006129	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near JalVayuVihar
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.04
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2698
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	8.05
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.08
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2766
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	28.5
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 ^oC)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	128
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	2.23
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	402
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	49.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.42
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	27

End of Report

For and on behalf of
Standard^s Environmental & Analytical Laboratories

Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

Laiju P. N.
Laboratory Head

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Environmental Monitoring

TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006129F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006129	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near JalVayuVihar
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.04
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2698
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	8.05
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.08
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2766
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	28.5
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	128
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	2.23
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	402
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	49.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.42
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	27

End of Report

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006130F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006130	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near P&T Colony
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	6498
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	95.0
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	7.23
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.04
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	6549
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	42.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	1.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.5
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	108
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	0.61
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	33.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	43.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.98
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	33

End of Report

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Test Report No: TC540219000006130F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006130	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near P&T Colony
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	6498
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	95.0
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	7.23
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.04
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	6549
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	42.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	1.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.5
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	108
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	0.61
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15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	33

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TEST REPORT

NABL(TC-5402)

Test Report No: TC540219000006131F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006131	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoorCanal	Sampling Location	Near Mini India
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	8.13
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	12324
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	1931
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	13.1
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.06
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	12392
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	18.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	92.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	315
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	11.3
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2825
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	29.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	1.44
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	17

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Test Report No: TC540219000006131F	Date: 24.03.2020	Page 1 of 1

CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group Ist Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006131	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoorCanal	Sampling Location	Near Mini India
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	8.13
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	12324
03	Total Hardness (as $CaCO_3$)	IS 3025 Part 21: 2009 RA 2019	mg/L	1931
04	Nitrate (as NO_3)	APHA 23rdEdition 4500-NO3 B 2017	mg/L	13.1
05	Nitrite (as NO_2)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.06
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	12392
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	18.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 ^{o}C)	IS 3025 Part 44: 1993 RA 2019	mg/L	92.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	315
11	Salinity	APHA 23rdEdition 2520 B Edn 2017	mg/L	11.3
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2825
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	29.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	1.44
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	17

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ANNEXURE 3

GROUNDWATER STUDY

ANNEXURE 3 - WATER LEVEL MONITORING REPORT (Source:Groundwater Dept. Ernakulam)

State : Kerala District: Ernakulam				State : Kerala District: Ernakulam			State : Kerala District: Ernakulam			State : Kerala District: Ernakulam		
Well No: TW 01 Well Type: Tube Well				Well No: E89 Well Type: Dug Well			Well No: GWE-07 Well Type: Dug Well			Well No :E85 Well Type: Dug Well		
Location: Ernakulam Revenue Tower Compound				Location :Edappally St. George church compound			Location: In the plot of Sri. Krishnan near Edakochi bus stand			Location: Luthiram centre compound, Ravipuram junction		
N9 58.448 E76 16.812				N10 01.427 E76 18.415			N9 54.861 E76 17.444			N9 57.456 E76 17.349		
Monitoring Date	Time (hh:mm)	Water level		Monitoring Date	Time (hh:mm)	Water level	Monitoring Date	Time (hh:mm)	Water level	Monitoring Date	Time (hh:mm)	Water level
30-Jan-15	14:00	10.02	1.02	31-Jan-15	11:00	1.87	30-Jan-15	11:10	0.72	30-Jan-15	13:30	0.77
23-Feb-15	16:00	9.9	0.9	23-Feb-15	11:10	1.6	20-Feb-15	10:45	0.83	23-Feb-15	15:30	0.9
24-Mar-15	14:05	10.07	1.07	25-Mar-15	14:05	1.6	24-Mar-15	16:15	0.87	24-Mar-15	14:30	0.81
25-Apr-15	13:10	9.92	0.92	25-Apr-15	14:20	1.7	23-Apr-15	15:40	0.67	23-Apr-15	14:00	0.28
14-May-15	10:35	9.7	0.7	14-May-15	16:05	1.01	14-May-15	11:30	0.68	14-May-15	10:50	0.55
22-Jun-15	10:30	9.55	0.55	29-Jun-15	14:00	0.7	22-Jun-15	14:50	0.22	22-Jun-15	11:50	0.1
22-Jul-15	11:50	9.6	0.6	21-Jul-15	14:50	0.65	22-Jul-15	14:10	0.32	22-Jul-15	14:20	0.2
19-Aug-15	12:20	9.54	0.54	22-Aug-15	14:40	0.73	22-Aug-15	11:10	0.54	22-Aug-15	14:05	0.4
17-Sep-15	13:45	9.62	0.62	17-Sep-15	11:15	0.59	22-Sep-15	12:07	0.52	17-Sep-15	13:55	-0.03
27-Oct-15	14:30	9.6	0.6	27-Oct-15	10:55	1.05	29-Oct-15	12:30	0.47	27-Oct-15	14:35	0.47
30-Nov-15	14:15	9.62	0.62	30-Nov-15	11:10	1.09	26-Nov-15	14:00	0.42	30-Nov-15	14:45	0.49
14-Dec-15	15:30	9.7	0.7	28-Dec-15	13:45	0.89	28-Dec-15	11:15	0.77	28-Dec-15	13:15	0.57
23-Jan-16	11:30	10.19	1.19	25-Jan-16	10:50	1.15	23-Jan-16	12:35	0.77	23-Jan-16	11:55	0.76
25-Feb-16	13:50	10.05	1.05	25-Feb-16	11:15	1.46	15-Feb-16	11:50	0.73	15-Feb-16	13:10	0.49
30-Mar-16	14:05	10.85	1.85	30-Mar-16	11:02	1.37	17-Mar-16	12:35	0.88	17-Mar-16	14:45	0.69
19-Apr-16	14:00	12.95	3.95	29-Apr-16	10:15	1.42	19-Apr-16	11:00	0.87	19-Apr-16	13:15	0.64
23-May-16	11:40	11.02	2.02	30-May-16	09:50	0.68	23-May-16	13:49	0.51	23-May-16	12:10	0.46
08-Jun-16	13:10	10.22	1.22	30-Jun-16	10:26	0.65	08-Jun-16	10:45	0.17	08-Jun-16	12:10	-0.05
12-Jul-16	12:15	10.05	1.05	13-Jul-16	10:55	0.59	12-Jul-16	10:10	0	12-Jul-16	11:45	-0.08
19-Aug-16	14:10	9.6	0.6	12-Aug-16	10:30	0.79	19-Aug-16	10:55	0.69	19-Aug-16	13:40	0.47
29-Sep-16	15:00	11.22	2.22	19-Sep-16	11:20	1.03	20-Sep-16	10:40	0.84	20-Sep-16	12:20	0.54
14-Oct-16	13:30	10.9	1.9	18-Oct-16	10:40	1.04	14-Oct-16	11:10	0.72	14-Oct-16	12:55	0.04
02-Nov-16	11:30	11.24	2.24	02-Nov-16	14:00	0.95	16-Nov-16	12:20	0.5	16-Nov-16	11:50	0.42
17-Dec-16	15:10	11.6	2.6	17-Dec-16	10:45	1.15	13-Dec-16	11:25	0.79	13-Dec-16	13:05	0.64
09-Jan-17	14:05	9.92	0.92	09-Jan-17	11:00	1.34	11-Jan-17	15:08	0.9	11-Jan-17	11:20	0.73
09-Feb-17	12:00	11.98	2.98	13-Feb-17	11:45	1.5	09-Feb-17	15:25	0.8	09-Feb-17	12:28	0.81
09-Mar-17	13:30	12.2	3.2	09-Mar-17	10:50	1.21	08-Mar-17	13:01	0.78	09-Mar-17	11:05	0.93
12-Apr-17	11:58	12.45	3.45	07-Apr-17	11:10	1.52	12-Apr-17	15:45	0.89	12-Apr-17	12:30	0.95
16-May-17	12:43	11.73	2.73	04-May-17	10:25	1.5	02-May-17	11:35	1.05	02-May-17	13:40	0.87
03-Jun-17	14:00	11.13	2.13	03-Jun-17	11:05	0.67	14-Jun-17	10:30	0.31	14-Jun-17	13:45	0.14
05-Jul-17	15:11	10.4	1.4	05-Jul-17	11:20	0.7	07-Jul-17	11:00	0.22	07-Jul-17	14:30	0.23
01-Aug-17	15:00	10.37	1.37	01-Aug-17	10:30	0.78	08-Aug-17	10:55	0.32	08-Aug-17	13:20	0.05
07-Sep-17	13:10	10.55	1.55	18-Sep-17	13:00	0.55	22-Sep-17	14:45	0.4	22-Sep-17	16:00	0.21
11-Oct-17	13:12	10.39	1.39	13-Oct-17	10:13	1.12	11-Oct-17	11:18	0.47	11-Oct-17	12:57	0.31
04-Nov-17	14:30	10.65	1.65	04-Nov-17	10:23	0.94	16-Nov-17	14:00	0.6	16-Nov-17	12:12	0.62
11-Dec-17	11:00	10.74	1.74	11-Dec-17	15:30	2.03	01-Dec-17	11:13	0.62	01-Dec-17	12:46	0.53
05-Jan-18	14:35	11	2	05-Jan-18	10:55	1.19	17-Jan-18	13:15	1.34	17-Jan-18	16:32	0.75
06-Feb-18	12:45	10.8	1.8	06-Feb-18	10:00	1.33	05-Feb-18	14:15	0.75	05-Feb-18	16:10	0.81
09-Mar-18	11:05	10.94	1.94	03-Mar-18	10:30	1.22	02-Mar-18	14:30	0.79	09-Mar-18	11:45	0.81
03-Apr-18	15:50	10.88	1.88	03-Apr-18	10:30	1.6	10-Apr-18	14:40	0.94	10-Apr-18	13:23	0.94
04-May-18	11:00	8.92	-0.08	05-May-18	20:05	1.64	04-May-18	11:50	0.54	04-May-18	11:30	0.47
08-Jun-18	11:00	10.52	1.52	13-Jun-18	10:20	0.5	08-Jun-18	11:41	0.14	08-Jun-18	11:10	0.04
11-Jul-18	11:10	10.35	1.35	11-Jul-18	10:45	0.72	11-Jul-18	13:20	0	11-Jul-18	11:35	-0.03
04-Aug-18	12:15	10.66	1.66	04-Aug-18	11:20	0.63	04-Aug-18	15:15	0.25	04-Aug-18	12:39	0.37
06-Sep-18	14:30	10.66	1.66	30-Aug-18	10:30	1	06-Sep-18	11:00	0.71	06-Sep-18	14:10	0.55
29-Sep-18	14:20			24-Sep-18	10:30	1.27	29-Sep-18	12:00	0.84	29-Sep-18	14:00	0.42
11-Oct-18	15:00	10.45	1.45	04-Oct-18	15:30	0.75	11-Oct-18	10:30	0.33	11-Oct-18	14:30	0.33
07-Nov-18	12:00	10.53	1.53	13-Nov-18	10:30	0.91	07-Nov-18	14:45	0.58	07-Nov-18	12:40	0.42
01-Dec-18	12:15	10.59	1.59	03-Dec-18	10:15	1.18	01-Dec-18	10:05	1.07	01-Dec-18	11:40	0.51

Average season			Difference water level and groundwater level	
E85	E89		E85	E89
0.69	1.693	Dec-Apr	0.19	0.59
0.69	1.693		0.19	0.59
0.69	1.693		0.19	0.59
0.69	1.693		0.19	0.59
0.311	0.831	May-Nov	-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.630	1.258	Dec-Apr	0.13	0.16
0.630	1.258		0.13	0.16
0.630	1.258		0.13	0.16
0.630	1.258		0.13	0.16
0.630	1.258		0.13	0.16
0.257	0.819	May-Nov	-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.812	1.344	Dec-Apr	0.31	0.24
0.812	1.344		0.31	0.24
0.812	1.344		0.31	0.24
0.812	1.344		0.31	0.24
0.812	1.344		0.31	0.24
0.347	0.894	May-Nov	-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.768	1.474	Dec-Apr	0.27	0.37
0.768	1.474		0.27	0.37
0.768	1.474		0.27	0.37
0.768	1.474		0.27	0.37
0.768	1.474		0.27	0.37
0.321	0.928	May-Nov	-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.738	1.536	Dec-Apr	0.24	0.44

	Well No.		
	E85	TW01	E89
average	0.48	1.59	1.12
stdev	0.29	0.77	0.41
min	-0.08	-0.08	0.50
max	0.95	3.95	2.08

	E85	difference water level (0.5 m bgl) *	
Dec-Apr	0.73	0.23	151 dgn
May-Nov	0.32	-0.18	214 dgn

	E89	difference water level (1.1 m bgl) *	
Dec-Apr	1.46	0.36	151 dgn
May-Nov	0.92	-0.18	214 dgn

* positive = infiltration from canal to groundwater
negative = drainage from groundwater to canal

surface water (m bgl)		
	Edappally	other canals
30-Jan-15	1.1	0.5
04-Dec-19	1.1	0.5

ANNEXURE 3 - WATER LEVEL MONITORING REPORT (Source:Groundwater Dept. Ernakulam)

State : Kerala District: Ernakulam				State : Kerala District: Ernakulam			State : Kerala District: Ernakulam			State : Kerala District: Ernakulam		
Well No: TW 01 Well Type: Tube Well				Well No: E89 Well Type: Dug Well			Well No: GWE-07 Well Type: Dug Well			Well No :E85 Well Type: Dug Well		
Location: Ernakulam Revenue Tower Compound				Location :Edappally St. George church compound			Location: In the plot of Sri. Krishnan near Edakochi bus stand			Location: Luthiram centre compound, Ravipuram junction		
N9 58.448 E76 16.812				N10 01.427 E76 18.415			N9 54.861 E76 17.444			N9 57.456 E76 17.349		
Monitoring Date	Time (hh:mm)	Water level		Monitoring Date	Time (hh:mm)	Water level	Monitoring Date	Time (hh:mm)	Water level	Monitoring Date	Time (hh:mm)	Water level
10-Jan-19	14:50	10.85	1.85	07-Jan-19	10:30	1.23	10-Jan-19	11:00	0.73	10-Jan-19	14:30	0.75
04-Feb-19	14:30	11.08	2.08	01-Feb-19	10:30	1.54	04-Feb-19	12:00	0.95	04-Feb-19	14:15	0.8
15-Mar-19	13:50	11.29	2.29	13-Mar-19	10:10	1.65	15-Mar-19	10:30	0.79	15-Mar-19	13:30	0.85
09-Apr-19	14:00	10.48	1.48	05-Apr-19	10:20	2.08	09-Apr-19	10:50	0.89	09-Apr-19	13:30	0.78
07-May-19	14:50	11.24	2.24	03-May-19	15:30	1.53	04-May-19	10:30	0.62	04-May-19	13:40	0.65
10-Jun-19	14:10	11.15	2.15	11-Jun-19	10:30	1.54	10-Jun-19	11:00	0.6	10-Jun-19	13:00	-0.01
03-Jul-19	13:40	11.3	2.3	05-Jul-19	10:30	0.87	03-Jul-19	10:30	0.58	31-Jul-19	13:10	0.52
03-Aug-19	10:30	10.99	1.99	08-Aug-19	15:30	0.7	03-Aug-19	13:45	0.58	03-Aug-19	11:00	0.49
05-Sep-19	13:05	10.38	1.38	05-Sep-19	09:10	0.68	05-Sep-19	11:40	0.32	05-Sep-19	11:10	0.33
10-Oct-19	13:40	10.62	1.62	01-Oct-19	10:30	0.61	10-Oct-19	11:00	0.37	10-Oct-19	13:00	0.41
04-Nov-19	14:40	10.07	1.07	05-Nov-19	10:30	1.84	04-Nov-19	11:20	0.2	04-Nov-19	13:20	0.23
04-Dec-19	12:45	10.54	1.54	02-Dec-19	09:50	0.78	04-Dec-19	10:40	0.61	04-Dec-19	12:30	0.46
average		10.59				1.12			0.61			0.48
stdev		0.77				0.41			0.27			0.29
min		8.92				0.50			0.00			-0.08
max		12.95				2.08			1.34			0.95

Average season			Difference water level and groundwater level	
E85	E89		E85	E89
0.738	1.536		0.24	0.44
0.738	1.536		0.24	0.44
0.738	1.536		0.24	0.44
0.738	1.536		0.24	0.44
0.374	1.110	May-Nov	-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01

Annexure 3 - Groundwater Ernakulam - Wells

Well No	Location	N	E	Water level
E85	Lutheran centre compound, Ravipuram junction	9.9617	76.2883	0.48
GWE-07	Sri. Krishnan near Edakochi bus stand	9.8958	76.2958	0.61
TW-01	Ernakulam Revenue Tower Compound	9.9747	76.2797	10.59
E89	Edappally St. George church compound	10.0219	76.3072	1.12

ANNEXURE 4

GEOTECHNICAL REPORT - STP

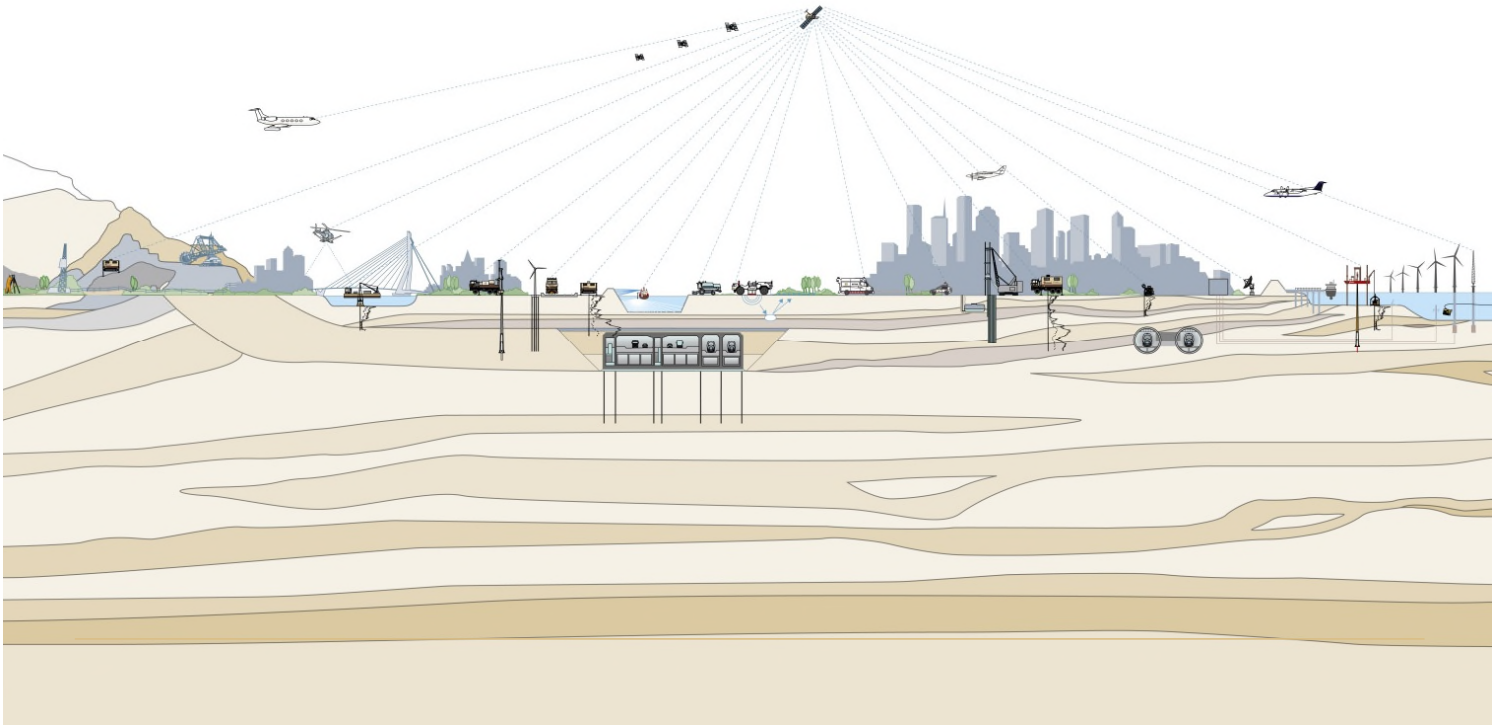
FUGRO INDIA

Detailed Factual Report
Geotechnical Investigation For Integrated Urban Regeneration and Water Transport Project (IURWTS), Kochi
Kerala, India

24 July to 22 August 2020
Fugro Project No.: P908223

ANTEA INDIA PRIVATE LIMITED

Volume - I Addendum



Detailed Factual Report
Geotechnical Investigation For Integrated Urban Regeneration and Water Transport Project (IURWTS), Kochi
Kerala, India

24 July to 22 August 2020
Fugro Project No.: P908223

Volume I - Addendum

Prepared for: ANTEA INDIA PRIVATE LIMITED
Magnum Towers, Tower 1,
Unit No. 219-221, 2nd Floor,
Golf Course Extension Road,
Sector 58, Gurugram-122001
Haryana, India

01	Addendum	SG	ISH	SM	18 January 2021
Issue	**Report Status**	**Prepared**	**Checked**	**Approved**	**Date**

Fugro Ref: FGTL/AIPL/ED/170202/DFR/Vol-1/Addendum January 18, 2021

ANTEA INDIA PRIVATE LIMITED
Magnum Towers, Tower 1,
Unit No. 219-221, 2nd Floor,
Golf Course Extension Road,
Sector 58, Gurugram-122001,
Haryana, India

GEOTECHNICAL INVESTIGATION FOR INTEGRATED URBAN REGENERATION AND WATER TRANSPORT PROJECT (IURWTS)

- Regarding submission of Addendum to Volume 1 Detailed Factual Report (DFR) of EDAPALLY CANAL

Dear Sir / Madam,

In continuation with submission of hard copies of Volume 1 Detailed Factual Final Report for the captioned project dated October 26, 2020, Fugro is pleased to submit the Addendum to Volume 1 comprising EDC LBH-02 & LBH-12.

Should you have any query please do not hesitate to contact.

Kind regards,

Siddharam Ishwarkatti
Engineering Manager
Fugro

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Fugro Geotech (India) Pvt. Ltd.

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Summary of Boreholes

Sl No	Location ID	Field Activity Dates		Coordinates		RL, m CD	TD, m	Borehole Water Depth, wrt m CD
		From	To	Easting, m	Northing, m			
1	EDC LBH-02	17/10/2020	20/10/2020	642589.00	1110469.00	1.93	23.25	1.18
2	EDC LBH-12	09/10/2020	10/10/2020	646014.00	1105148.00	0.88	11.53	0.38

Borehole Profile - EDC LBH-02 (Muttal STP)

Description	h_1	h_2 [m]	H [m]	N	Nc	CR	RQ	γ	c	ϕ
	[m]	[m]	[m]	[-]	[-]	[%]	[%]	[m]	[kPa]	[Deg.]
CLAY	0.00	1.50	1.50	-	-	-	-	17	-	-
SAND	1.50	4.00	2.50	7	10	-	-	17	-	28
CLAY	4.00	5.50	1.50	14	14	-	-	17	90	-
SAND	5.50	18.25	12.75	19	17	-	-	17	-	29
CHARNOCKITE	18.25	23.25	5.00	180	-	18	0	22	-	-

Borehole Profile - EDC LBH-12 (Vennala STP)

Description	h_1	h_2 [m]	H [m]	N	Nc	CR	RQ	γ	c	ϕ
	[m]	[m]	[m]	[-]	[-]	[%]	[%]	[m]	[kPa]	[Deg.]
CLAY	0.00	4.50	4.50	3	-	-	-	15	15	-
CLAY	4.50	9.00	4.50	3	-	-	-	15	20	-
CLAY	9.00	10.00	1.00	16	-	-	-	17	100	-
SAND	10.00	11.53	1.53	509	277	-	-	19	-	35

Summary of chemical test results – soil samples

BH No.	Depth (m)	pH	Chloride Content (%)	Sulphate content in terms of SO4 (%)	Sulphate content in terms of SO3 (%)	Class of Cement (Table 4, IS 456)
EDC LBH-02	3.00 - 3.45	6.28	0.0070	0.0247	0.0206	1
EDC LBH-12	1.50 - 1.95	7.41	0.0021	0.0593	0.0494	1

Summary of chemical test results – borehole water samples

BH No.	pH	Chloride Content (mg/l)	Sulphate content in terms of SO_4 (mg/l)	Sulphate content in terms of SO_3 (mg/l)	Sulphate content in terms of SO_3 (g/l)	Class of Cement (Table 4, IS 456)
EDC LBH-02	7.40	575	192	160	0.160	1
EDC LBH-12	7.03	115	188	156	0.156	1

Summary of the vertical pile capacities

Location	BH ID	Pile Length below EGL, m	Safe Pile Capacity, Ton							
			Compression				Tension			
			0.50 m	0.60 m	0.75 m	1.00 m	0.50 m	0.60 m	0.75 m	1.00 m
Muttal STP	EDC LBH-02	10	21	31	43	68	11	15	16	22
		12	24	36	60	87	14	19	28	31
		15	30	44	72	118	18	26	38	47
		18	35	52	84	162	23	32	49	84
Vennala STP	EDC LBH-12	10	21	35	54	95	3	3	4	5

Summary of the lateral pile capacities

Parameter	EDC LBH-02				EDC LBH-12			
D, m	0.50	0.60	0.75	1.00	0.50	0.60	0.75	1.00
N	7				-			
C, kPa	-				15			
z_{fr}, m	4	5	6	8	6	7	9	12
z_{fi}, m	5	6	7	9	7	8	10	13
H_{fr}, kN	16	22	31	49	7	9	11	14
H_{fi}, kN	42	56	80	127	18	22	28	37

Summary of the net allowable bearing pressure – isolated square footing (1.5m x 1.5m)

Location	Depth of foundation below original ground level, m	Estimated Net Safe Bearing Capacity in kPa	Stress intensity required to happen allowable settlement in kPa	Net Allowable Bearing Pressure in kPa
LBH-02	1.5	42	>400	**42**
LBH-02	2.5	67	>400	**67**
LBH-12	1.5	32	9	**9**
LBH-12	2.5	36	11	**11**

Summary of the net allowable bearing pressure – isolated rectangle footing (5m x 10m)

Location	Depth of foundation below original ground level, m	Estimated Net Safe Bearing Capacity in kPa	Stress intensity required to happen allowable settlement in kPa	Net Allowable Bearing Pressure in kPa
LBH-02	1.5	62	92	**62**
LBH-02	2.5	81	93	**81**
LBH-12	1.5	24	2	**2**
LBH-12	2.5	25	3	**3**

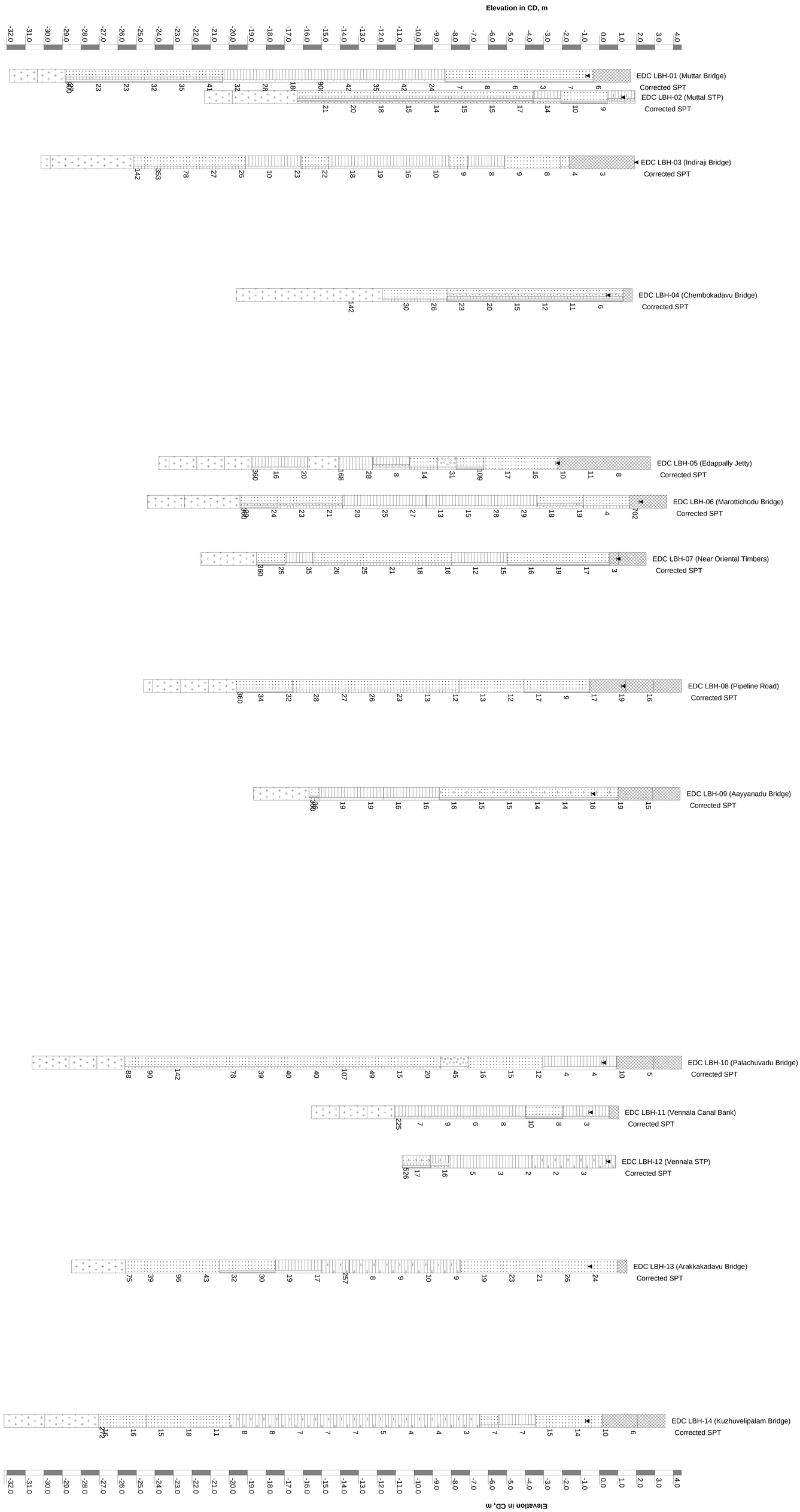
Summary of the Pile Capacities based on SPT Approach as per Clause B-8 of IS 2911 (Part 1/Sec 2): 2010																		
Applicable Locations	SPT	Socketing below Top of Rock, m	End Bearing, kN				Skin Friction, kN				Allowable Total Vertical Pile Capacity, kN				Allowable Uplift Pile Capacity, kN			
			0.50 m	0.60 m	0.75 m	1.00 m	0.50 m	0.60 m	0.75 m	1.00 m	0.50 m	0.60 m	0.75 m	1.00 m	0.50 m	0.60 m	0.75 m	1.00 m
EDC LBH-02	180	1D	1031	1484	2319	4123	412	594	928	1649	1443	2078	3247	5773	289	416	649	1155
		2D					825	1188	1856	3299	1856	2672	4175	7422	577	831	1299	2309
		3D					1237	1781	2783	4948	2268	3266	5103	9071	866	1247	1948	3464

Annexure A

Corrected SPT values
Longitudinal Section
Borehole Logs

BH No.	Test Type	Depth [m]	Soil Type	Soil Behaviour [D-Drained/ U-Undrained]	Overburden Pressure (t/m^2)	Corrected Overburden Pressure (Kg/cm^2)	Correction Factor for Overburden Pressure [CN]	Field SPT Value (N)	Due to Overburden [N']	Due to Dilatancy [N'']	Remark
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10] = [9] x [8]	[11]	[12]
EDC-LBH-02	SPT	1.50	SAND	D	2.48	0.15	1.64	6	10	**10**	
EDC-LBH-02	SPT	3.00	SAND	D	4.95	0.25	1.47	7	10	**10**	
EDC-LBH-02	SPT	4.50	CLAY	U	7.45	0.35	1.36	14	14	**14**	
EDC-LBH-02	SPT	6.00	SAND	D	10.00	0.45	1.27	16	20	**18**	
EDC-LBH-02	SPT	7.50	SAND	D	12.55	0.56	1.20	13	16	**15**	
EDC-LBH-02	SPT	9.00	SAND	D	15.10	0.66	1.14	14	16	**15**	
EDC-LBH-02	SPT	10.50	SAND	D	17.70	0.77	1.09	13	14	**14**	
EDC-LBH-02	SPT	12.00	SAND	D	20.40	0.89	1.04	15	16	**15**	
EDC-LBH-02	SPT	13.50	SAND	D	23.10	1.01	1.00	22	22	**18**	
EDC-LBH-02	SPT	15.00	SAND	D	25.80	1.13	0.96	26	25	**20**	
EDC-LBH-02	SPT	16.50	SAND	D	28.50	1.25	0.93	30	28	**21**	
EDC-LBH-12	SPT	1.50	CLAY	U	2.48	0.15	1.64	3	3	**3**	
EDC-LBH-12	SPT	3.00	CLAY	U	4.95	0.25	1.47	2	2	**2**	
EDC-LBH-12	SPT	4.50	CLAY	U	7.45	0.35	1.36	2	2	**2**	
EDC-LBH-12	SPT	6.00	CLAY	U	10.00	0.45	1.27	3	3	**3**	
EDC-LBH-12	SPT	7.50	CLAY	U	12.55	0.56	1.20	5	5	**5**	
EDC-LBH-12	SPT	9.00	CLAY	U	15.10	0.66	1.14	16	16	**16**	

BH No.	Test Type	Depth [m]	Soil Type	Soil Behaviour [D-Drained/ U-Undrained]	Overburden Pressure (t/m^2)	Corrected Overburden Pressure (Kg/cm^2)	Correction Factor for Overburden Pressure [CN]	Field SPT Value (N)	Due to Overburden [N']	Due to Dilatancy [N"]	Remark
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10] = [9] x [8]	[11]	[12]
EDC-LBH-12	SPT	10.50	SAND	D	17.70	0.77	1.09	18	20	**17**	
EDC-LBH-12	SPT	11.50	SAND	D	19.50	0.85	1.06	1000	1056	**536**	



EDAPALLY CANAL
LONGITUDINAL BOREHOLE PROFILE

Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)

ANTEA INDIA PRIVATE LIMITED

PROJECT	: Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)	**TYPE OF BORING**	: Rotary borehole drilling, sampling and testing
CLIENT	: Antea India Private Limited	**BORE HOLE DIA**	: 150 mm
LOCATION	: Muttal STP	**GWT**	: 0.75 m
BORE HOLE NO.	: EDC LBH-02	**CASING DEPTH (m)**	:
CO-ORDINATES	: N 1110469.00 E 642589.00	**DATE OF COMMENCEMENT**	: 17/10/2020
RL	: 1.93 m	**DATE OF COMPLETION**	: 20/10/2020

DEPTH BELOW EGL (m)	TEST DEPTH (m)	SAMPLE TYPE	STANDARD PENETRATION TEST						PROFILE	DESCRIPTION	ROCK DRILLING					LABORATORY TEST RESULTS												
			(N_1)	(N_2)	(N_3)	"N" (blows/mm)	"N_{ex}"	"N_c"			CR [%]	SCR [%]	RQD [%]	WG	FF	CLAY [%]	SILT [%]	SAND [%]	GRAVEL [%]	LL [%]	PL [%]	PI [%]	NMC [%]	DST c [kPa]	DST ϕ [Deg.]	UUT c [kPa]	UUT ϕ [Deg.]	UCS [MPa]
0	0.00 - 0.50	DS-1								0.00 m to 1.50 m - Light reddish brown silty CLAY, with medium to fine subangular to subrounded gravel, organic matter & sand																		
1																	6	94	0					1	34			
2	1.50 - 1.95	SPT-1	1	2	4	6		9		1.50 m to 4.00 m - Loose brownish grey silty fine to medium SAND																		
3	2.50 - 3.00	DS-2															3	97	0									
	3.00 - 3.45	SPT-2	2	3	4	7		10																				
4																												
	4.00 - 4.50	DS-3								4.00 m to 5.50 m - Stiff whitish light grey sandy CLAY, with silt & subangular to subrounded gravel						43	22	33	2	70	34	36						
5	4.50 - 4.95	SPT-3	2	5	9	14		14																				
6	5.50 - 6.00	DS-4								5.50 m to 18.25 m - Medium dense to very dense light reddish white to light brown clayey fine to coarse SAND with silt & traces of subangular gravel						26	13	58	3	50	29	21						
	6.00 - 6.45	SPT-4	3	5	11	16		17																				
7																												
	7.00 - 7.50	DS-5														34	15	51	0	44	31	13		8	28			
8	7.50 - 7.95	SPT-5	4	5	8	13		15																				
9	8.50 - 9.00	DS-6														32	17	50	1	47	31	16						
	9.00 - 9.45	SPT-6	3	6	8	14		15																				
10																												
	10.00 - 10.50	DS-7														22	24	54	0	45	30	15		7	31			
11	10.50 - 10.95	SPT-7	4	4	9	13		14																				
12	11.50 - 12.00	DS-8																										
	12.00 - 12.45	SPT-8	2	5	10	15		15																				
13																												
	13.00 - 13.50	DS-9														14	22	64	0	38	28	10		3	32			
14	13.50 - 13.95	SPT-9	4	10	12	22		18																				

SPT - Standard Penetration Test
UDS - Undisturbed Sample
DS - Disturbed Sample
n.i. - non-intact core (Fracture index >10)
FF - Fracture Frequency
CR - Core Recovery
RQD - Rock Quality Designation
WG - Weathering Grade
Blank values indicate that no fractures were observed.
SCR - Solid Core Recovery

PROJECT	: Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)	**TYPE OF BORING**	: Rotary borehole drilling, sampling and testing
CLIENT	: Antea India Private Limited	**BORE HOLE DIA**	: 150 mm
LOCATION	: Muttal STP	**GWT**	: 0.75 m
BORE HOLE NO.	: EDC LBH-02	**CASING DEPTH (m)**	:
CO-ORDINATES	: N 1110469.00 E 642589.00	**DATE OF COMMENCEMENT**	: 17/10/2020
RL	: 1.93 m	**DATE OF COMPLETION**	: 20/10/2020

DEPTH BELOW EGL (m)	TEST DEPTH (m)	SAMPLE TYPE	STANDARD PENETRATION TEST						PROFILE	DESCRIPTION	ROCK DRILLING					LABORATORY TEST RESULTS												
			(N_1)	(N_2)	(N_3)	"N" (blows/mm)	"N_{ex}"	"N_c"			CR [%]	SCR [%]	RQD [%]	WG	FF	CLAY [%]	SILT [%]	SAND [%]	GRAVEL [%]	LL [%]	PL [%]	PI [%]	NMC [%]	DST c [kPa]	DST ϕ [Deg.]	UUT c [kPa]	UUT ϕ [Deg.]	UCS [MPa]
14										5.50 m to 18.25 m - Medium dense to very dense light reddish white to light brown clayey fine to coarse SAND with silt & traces of subangular gravel																		
15	14.50 - 15.00	DS-10																										
	15.00 - 15.45	SPT-10	5	11	15	26		20																				
16																												
	16.00 - 16.50	DS-11														16	9	75	0	29	18	11						
17	16.50 - 16.95	SPT-11	6	12	18	30		21																				
18	17.50 - 18.00	DS-12														13	10	77	0									
	18.00 - 18.25	SPT-12	8	60		60/100	180																					
19	18.25 - 19.75	RC-1								18.25 m to 21.75 m - Very weak to Weak moderately weathered to highly weathered whitish light brown CHARNOCKITE with extremely close to very close spaced subvertical to subhorizontal fractures	15	0	0	III-IV	n.i.													
20	19.75 - 20.25	RC-2									22	0	0	III-IV	n.i.													
21	20.25 - 21.75	RC-3								21.75 m to 23.25 m - Moderately strong to Weak moderately weathered to highly weathered whitish light brown CHARNOCKITE with extremely close to very close spaced subvertical to subhorizontal fractures	16	0	0	III-IV	n.i.													
22	21.75 - 23.25	RC-4									18	0	0	III-IV	n.i.													
23																												
24																												
25																												
26																												
27																												
28																												

SPT - Standard Penetration Test UDS - Undisturbed Sample DS - Disturbed Sample n.i. - non-intact core (Fracture index >10) FF - Fracture Frequency

CR - Core Recovery RQD - Rock Quality Designation WG - Weathering Grade Blank values indicate that no fractures were observed. SCR - Solid Core Recovery

PROJECT	: Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)	**TYPE OF BORING**	: Rotary borehole drilling, sampling and testing
CLIENT	: Antea India Private Limited	**BORE HOLE DIA**	: 150 mm
LOCATION	: Vennala STP	**GWT**	: 0.50 m
BORE HOLE NO.	: EDC LBH-12	**CASING DEPTH (m)**	: SX:5.50m/HX:8.50m/NX:11.50m
CO-ORDINATES	: N 1105148.00 E 646014.00	**DATE OF COMMENCEMENT**	: 09/10/2020
RL	: 0.88 m	**DATE OF COMPLETION**	: 10/10/2020

DEPTH BELOW EGL (m)	TEST DEPTH (m)	SAMPLE TYPE	STANDARD PENETRATION TEST						PROFILE	DESCRIPTION	ROCK DRILLING					LABORATORY TEST RESULTS													
			(N_1)	(N_2)	(N_3)	"N" (blows/mm)	"N_{ex}"	"N_c"			CR [%]	SCR [%]	RQD [%]	WG	FF	CLAY [%]	SILT [%]	SAND [%]	GRAVEL [%]	LL [%]	PL [%]	PI [%]	NMC [%]	DST c [kPa]	DST ϕ [Deg.]	UUT c [kPa]	UUT ϕ [Deg.]	UCS [MPa]
0	0.00 - 0.50	DS-1								0.00 m to 4.50 m - Soft dark brownish grey to dark brown silty CLAY, with organic matter																			
1																													
2	1.50 - 1.95	SPT-1	1	2	1	3		3								71	25	4	0	130	35	95							
3	2.50 - 3.00	DS-2														63	31	6	0	100	31	69							
	3.00 - 3.45	SPT-2	1	1	1	2		2																					
4	4.00 - 4.45	UDS-1														66	33	1	0	154	39	115							
5	4.50 - 4.95	SPT-3	1	1	1	2		2		4.50 m to 9.00 m - Soft to firm dark grey silty CLAY																			
6	5.50 - 6.00	DS-3														68	31	1	0	133	37	96							
	6.00 - 6.45	SPT-4	1	2	1	3		3																					
7	7.00 - 7.50	DS-4														64	34	2	0	131	35	96							
8	7.50 - 7.95	SPT-5	1	2	3	5		5																					
9	8.50 - 9.00	DS-5								9.00 m to 10.00 m - Very stiff dark grey silty CLAY, with fine sand, organic matter, traces of gravel						52	18	27	3	117	33	84							
	9.00 - 9.45	SPT-6	5	7	9	16		16																					
10	10.00 - 10.50	DS-6								10.00 m to 11.53 m - Medium dense white to brownish grey clayey silty fine to medium SAND, with organic matter & rock fragments						6	7	59	28										
11	10.50 - 10.95	SPT-7	6	8	10	18		17																					
	11.50 - 11.53	SPT-8	100			100/30	1000	526																					
12																													
13																													
14																													

SPT - Standard Penetration Test UDS - Undisturbed Sample DS - Disturbed Sample n.i. - non-intact core (Fracture index >10) FF - Fracture Frequency
CR - Core Recovery RQD - Rock Quality Designation WG - Weathering Grade Blank values indicate that no fractures were observed. SCR - Solid Core Recovery

ANNEXURE 5

ESTIMATES

Cost Summary for 16.5MLD plant at Muttar and Sewer network with appurtenant structures for Edappally and Chilavanoor North Catchments prepared based on PRICE software using DSR 2018.

Sl. No.	Description of works	Estimated cost in INR
1(a)	Design and build SBR Sewage Treatment Plant of 16.5MLD installed capacity and all appurtenant structures and allied works including Wet Well [1 no.] for collection of raw sewage at STP for Block 3C and Block 4	**43.89 Crores**
1(b)	Operation & Maintenance for a period of 10 years including defect liability period of 24 months [O&M– **INR 17.93 Crores** & Electrical Energy– **INR 12.33 Crores**]	**30.26 Crores**
2 (a)	Collection system of Muttar includes laying of sewer lines [104Km], Construction of Manholes [4430 nos.], Lift Manholes [20 nos.], Sewage Pumping Station [2 nos.] Pumping Main [2 nos. 400mm DI K9-2Km for WW1 to WW2 & 450mm DI K9-3.5km for WW2 to STP] and providing Household Service connections [12781 nos.]	**206.34 Crores**
2 (b)	Operation & Maintenance for a period of 10 years including defect liability period of 24 months [O&M– **INR 15.49 Crores** & Energy Cost– **INR 4.35 Crores**]	**19.84 Crores**
3	Collection wells cum pumping station for the blocks 3A, 3B & 2 : The gravity main system seems to be uneconomical and results in improper functioning of sewer system. Hence, two Collection well cum Pumping stations are proposed. The land acquisition for the same is considered as 0.123 Hectare costing @ INR 10.79 Crores	**1.33 Crores**
4	Preparation Detailed Project Report for the Sewerage Scheme for Muttar Zone @1.5% of the total estimate Amount	**4.52 Crores**
5	Supervision charges for the execution of the entire sewerage scheme @ 6% of the Estimate cost	**18.10 Crores**
	Total Project Cost	**324.28 Crores**

ANNEXURE 5

ESTIMATES -SEWER NETWORK

SEWE NETWORK - MUTTAR GENERAL ABSTRACT		
General Abstract - Construction and Commissioning of Muttar Sewerage system comprising Collection System with Wet well/Pumping station 2 nos and Lift Stations 20 nos Est Cost Rs 226.18 Crore		
S. No	**Description**	**Amount Rs in Crore**
	CAPITAL COST	
1	Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Muttar Collection System, including earth work excavation, side protection arrangements, Site safety measures, dewatering, proper bedding for sewers to facilitate the designed slope vital for gravity flow, refilling haunch/crown portions, backfills in layers as per standard specifications, etc complete.	45.65
2	Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Muttar sewer network system, including earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, M20 concrete for benching and channeling, manhole base slab, side walls, , centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anti-corrosive bituminous paint to the outer surfaces, supply and fixing of SFRC-EHD Manhole cover of 600mm diameter, de-watering with suitable pumpset including conveyance, erection, dismantling and taking back, cost of fuel lubricating oil and other stores, side protection with close timbering, site protection and safety measures,provision of pipe connection for inlet, outlet and Sewer service connection pipes, providing danger lights, barricades etc complete	48.04
3	Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Muttar sewer network system, includes earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc and nonclog submercible pumpsets and compatible Silent Geneator set meeting the CPCB norms	3.70

S. No	Description	Amount Rs in Crore
4	Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 2+3B) and Wet-well 2 (Block 3A) with allied components as per standard specifications, and supply,erection, trial run and commissioning of non-clog submersible pumpsets for 1DWF, 2DWF and 3 DWF as per Pump operating plan designed therefor , including pump rooms, electrical connections and allied accessories , compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches etc.complete for commissioning the Pumping Stations etc complete	2.71
5	Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 2 nos for Muttar Collection system , including earthwork excavation, dewatering wherever necessary, side protection for trenches, site protection and safety measures during the course of works, barricading, danger lights, signage,refilling and removal of surplus earth as per standard specifications etc complete.	4.59
6	Laying of pipes under railway lines and NH66 by HDD method to Muttar STP, including excavation, side protection, mobilization charges, breakdown charges, utility shifting,dewatering includes for all labour,materials and machinaries etc. complete.	0.48
7	Road restoration charges for BM&BC and CC roads (PWD Road)	42.78
8	House-hold sewer service connection including earthwork,road cutting, supply, delivery, laying and joining etc for 110mm/160mm uPVC pipe along with inspection chamber, pipe connections, joineries etc complete until commissioning of house sewer connections.	22.60
9	Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements etc complete as per standards and specifications	1.28
10	Utility shifting works and its restoration as directed by the Department	2.03
11	Additional cost for SCADA, Solar system for sewer network system	1.00
	Sub Total Item [1+12]	**174.86**
	Provision for GST Payment @ 18%	**31.47**
	Total -1	**206.34**
	ANNUAL MAINTENANCE FOR 10 YEARS [OPERATIONAL COST]	
12	Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years	
12.1	O& M Cost excluding Electrical Energy for 10 years	13.12
12.2	Electrical Energy Cost for 10 years	3.69
	Sub Total [Item 7]	**16.82**
	Provision for GST Payment @ 18%	**3.03**
	Add for sundries	
	Total -2	**19.845**
	Grand Total	**226.180**

(Rupees Two hundred and twenty six cro**re and Eighteen Lakhs only)**

AMC FOR SEWER NETWORK MUTTAR FOR 10 YEARS	
AMC Collection System- Maintenance including SPS 2 nos & 14 LiMs	
Annual Mace for 1st Year Estimate attached includes materials and labour and conveyance charges if any (Without GST) From Estimate including pumpsets, Generator for main pumping station and lift manholes	0.00
Annual Mace for 2nd Year	0.00
Annual Mace for 3rd Year (5 % increase)	50,12,000.00
Annual Mace for 4th Year (5 % increase)	52,62,600.00
Annual Mace for 5th Year (5 % increase)	55,25,730.00
Annual Mace for 6th Year (10 % increase)	60,78,303.00
Annual Mace for 7th Year (10 % increase)	66,86,133.30
Annual Mace for 8th Year (10 % increase)	73,54,746.63
Annual Mace for 9th Year (15 % increase)	84,57,958.62
Annual Mace for 10th Year (20 % increase)	1,01,49,550.35
Total AMC for 10 Years	5,45,27,021.90
Say Rs 620.12 lakh	**54527022.00**

AM- Cost of Electrical Energy	
	Rs
Annual Mace for ist Year Estimate attached for energy charges (Without GUT) From Estimate	29,36,000.00
Annual Mace for 2nd Year	30,82,800.00
Annual Mace for 3rd Year (5 % increase)	32,36,940.00
Annual Mace for 4th Year (5 % increase)	33,98,787.00
Annual Mace for 5th Year (5 % increase)	35,68,726.35
Annual Mace for 6th Year (5 % increase)	37,47,162.67
Annual Mace for 7th Year (5 % increase)	39,34,520.80
Annual Mace for 8th Year (5 % increase)	41,31,246.84
Annual Mace for 9th Year (5 % increase)	43,37,809.18
Annual Mace for 10th Year (5 % increase)	45,54,699.64
Total AMC for 10 Years	**3,69,28,692.48**
AMC for 10 year O&M- Electrical Energy	**Rs 369.28 lakh**

	Abstract of AMC for 10 year O & M cost		
1)	Manpower Charges for O& M	767.20113	7,67,20,113.00
2)	Maintenance	545.27022	54527022.00
3)	Electrical Energy	369.2869248	3,69,28,692.48
	Total Cost of O& M	**1681.758275**	**16,81,75,827.48**
	O& M Excluding Energy Charges	**1312.47135**	

ENERGY DEMAND & CONSUMPTION COST FOR COLLECTION SYSTEM				
S.No	**Description**	**Value**	**Unit**	**Remarks**
1	**Calculation of Electrical Energy demand and energy Consumption**			
2.1	Electrical Energy Demand			
a	Working Load	191	KW	
b	Average working hours of plant/ day	7	hours	
c	Total energy consumption per day	1,337.00	KWH	
d	Monthly consumption 1127*30	40110	KWH	
e	Energy Consumption per Annum	4,81,320.00	KWH	
3	Energy charges per Annum (RS 6.10/KWH)	2936052	481320*6.10	
		Rs 29.36 lakh	Rs	
Say Rs 24.75 lakh/Annum				
			Rs	
	Energy charges payable /annum	**₹ 29,36,000**	Rs in Lakh	

1.1 ESTABLISHMENT CHARGES						
SL. No	**Location**	**Description**	**Nos**	**Wage/ Month**	**Cost per Month**	**Cost per Annum**
1	Sewer network 103.69km	Sewer Inspector	2	22,000.00	44,000.00	
2		Helper/Maintenance Assistant for Sewer Network, Manhole maintenance and collection system	4	15,000.00	60,000.00	
5		Fitter/Technician	4	20,000.00	80,000.00	
7		Maintenance Assistant/HSC cleaning-1no/4000 connections	4	15,000.00	60,000.00	
1	Pumping station 2nos. Lift manhole 14nos	Electrician for Sewage Pumping Stations(2nos) & Lift Stations(14nos)	6	18,000.00	1,08,000.00	
2		Helper cum Maintenance Assistant for SPS && LiSs	6	15,000.00	90,000.00	
		Total	**26**		4,42,000.00	53,04,000.00
Add contractor's profit 15% Total					**5,08,300.00**	**60,99,600.00**
						60,99,600.00

Annual Mace for 1st Year Estimate attached for Manpower (Without GST) From Estimate	60,99,600.00
Annual Mace for 2nd Year 5% increase	64,04,580.00
Annual Mace for 3rd Year (5 % increase)	67,24,809.00
Annual Mace for 4th Year (5 % increase)	70,61,049.45
Annual Mace for 5th Year (5 % increase)	74,14,101.92
Annual Mace for 6th Year (5 % increase)	77,84,807.02
Annual Mace for 7th Year (5 % increase)	81,74,047.37
Annual Mace for 8th Year (5 % increase)	85,82,749.74
Annual Mace for 9th Year (5 % increase)	90,11,887.22
Annual Mace for 10th Year (5 % increase	94,62,481.59
Total AMC for 10 Years	7,67,20,113.31
Say	7,67,20,113.00

5	MAINTENANCE COST			
SL NO	**DESCRIPTION**	**CAPTAL COST Rs.**	**RATE**	**ANNUAL MAINTENANCE COST Rs.**
2	Mechanical, Electrical & Instrumentation Works @ 2% of Capital Cost	2,24,00,000	2.00%	4,48,000
	TOTAL (Rs./year)	**2,24,00,000**		**4,48,000**

	Lakh		
LiMs	20 lakh		
SPS2	82 lakh		82
SPS1	62 lakh		62
Genset	60 lakh		53.8
Total	224 lakh		197.8
AME @ 2%	4.48 lakh	Added with Maintenance Cost & factored in 10 Years O& M	3.956

Please insert a table to show the base cost of Maintena 57 lakh projected in the Base Year(3rd year) since DLP is 2 years

	1.4. MAINTENANCE (Capital Cost =38.7+2.8+44.87+2.41+4.73+0.48+ =93.92 crore, Civil: 93.92-(2.24-0.60)=91.28			
SL NO	**DESCRIPTION**	**CAPTAL COST Rs.**	**RATE**	**ANNUAL MAINTENANCE COST**
1	Civil Works @ 0.5 % of Capital Cost	91,28,00,000.00	0.50%	45,64,000
2	Mechanical, Electrical & Instrumentation Works @ 2% of Capital Cost	2,24,00,000.00	2.00%	4,48,000
	TOTAL (Rs./year)			50,12,000
Cost of Maintenance = Rs 50.12 lakhs				

IURWTS Project-Sewerage Scheme-Collection System Construction of Sewer network for Muttar STP16.5MLD including all sewer appurtenances and annual maintenance of 10 years- R4 (FINAL)

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Muttar Collection System**	456516812.18
2	**Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Muttar sewer network system**	480366320.84
3	**Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Muttar sewer network system**	36987070.55
4	**Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 2+3B) and Wet-well 2 (Block 3A) with allied components as per standard specifications**	27069976.62
5	**Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 2 nos for Muttar Collection system**	45870861.15
6	**Laying of pipes under NH 66 by HDD method to Muttar STP-1**	2191146.40
7	**Laying of pipes under railway lines by HDD method to Muttar STP -2**	2616998.79
8	**ROAD RESTORATION CHARGES**	427845094.84
9	**Household Connection**	225985840.73
10	**Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements**	12809277.99
11	**Utility shifting works and its restoration as directed by the Department**	20340000.00
12	**Additional cost for SCADA, Solar system for sewer network system**	10000000.00
13	**Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years**	168175827.47
	Provision for GST payments (in %) @	**18.0%**
	Amount reserved for GST payments	**345019540.96**
	Total	**2261794768.96**
	Lumpsum for round off	**5231.04**
		TOTAL Rs 2261800000.00
		Rounded Total Rs 2,26,18,00,000
		Rupees Two Hundred Twenty Six Crore Eighteen Lakh Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations PRICE

IURWTS Project-Sewerage Scheme-Collection System Construction of Sewer network for Muttar STP16.5MLD including all sewer appurtenances and annual maintenance of 10 years- R4 (FINAL)

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

1 Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Muttar Collection System		
1	15.43.2 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:Bituminous road	
	Net Total Quantity	75728.918 sqm
	Say 75728.918 sqm @ Rs 360.94 / sqm	**Rs 27333595.66**
2	od201716/2022_2023 Cutting and removal of the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffice diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation. Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:	
	Net Total Quantity	10818.426 sqm
	Say 10818.426 sqm @ Rs 227.92 / sqm	**Rs 2465735.65**
3	16.83 Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.	
	Net Total Quantity	21636.841 sqm
	Say 21636.841 sqm @ Rs 110.71 / sqm	**Rs 2395414.67**
4	15.2.2 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.Nominal concrete 1:4:8 leaner mix (including equivalent design mix)	
	Net Total Quantity	2176.411 cum
	Say 2176.411 cum @ Rs 1262.82 / cum	**Rs 2748415.34**
5	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.	
	Net Total Quantity	26.250 cum

Other Engineering Organisations
PRICE

	Say 26.250 cum @ Rs 2983.59 / cum	**Rs 78319.24**
6	15.9.2 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges:In cement mortar	
	Net Total Quantity	270.000 cum
	Say 270.000 cum @ Rs 2064.97 / cum	**Rs 557541.90**
7	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidatingeach deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)	
	Net Total Quantity	139486.632 cum
	Say 139486.632 cum @ Rs 555.51 / cum	**Rs 77486218.94**
8	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil (Ref. Item No. 2.11 of DSR)	
	Net Total Quantity	49761.049 cum
	Say 49761.049 cum @ Rs 661.88 / cum	**Rs 32935843.11**
9	100.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m All kinds of soil (Ref. Item No. 2.12 of DSR)	
	Net Total Quantity	14990.167 cum
	Say 14990.167 cum @ Rs 768.25 / cum	**Rs 11516195.80**

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PRICE

10	100.1.4 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m in depth but not exceeding 6 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 4.5m to 6.0m All kinds of soil. (Ref. Item No. 2.12 of DSR)	
	Net Total Quantity	3287.203 cum
	Say 3287.203 cum @ Rs 874.62 / cum	**Rs 2875053.49**
11	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)	
	Net Total Quantity	51819.500 metre
	Say 51819.500 metre @ Rs 28.01 / metre	**Rs 1451464.20**
12	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m	
	Net Total Quantity	81502.321 sqm
	Say 81502.321 sqm @ Rs 152.95 / sqm	**Rs 12465780.00**
13	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m	
	Net Total Quantity	52224.583 sqm
	Say 52224.583 sqm @ Rs 166.17 / sqm	**Rs 8678158.96**
14	2.16.3 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m	
	Net Total Quantity	21675.365 sqm
	Say 21675.365 sqm @ Rs 196.06 / sqm	**Rs 4249672.06**

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15	od203302/2022_2023 Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete. (Refernce KWA approved data no.100.6.1)	
	Net Total Quantity	36962.625 sqm
	Say 36962.625 sqm @ Rs 776.89 / sqm	**Rs 28715893.74**
16	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070	
	Net Total Quantity	13428.000 Kwh
	Say 13428.000 Kwh @ Rs 36.95 / Kwh	**Rs 496164.60**
17	100.7.2 Bailing out water with engine and pumpset above 5 HP upto 10 HP including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070	
	Net Total Quantity	3730.000 Kwh
	Say 3730.000 Kwh @ Rs 18.44 / Kwh	**Rs 68781.20**
18	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible	
	Net Total Quantity	90.000 Day
	Say 90.000 Day @ Rs 878.76 / Day	**Rs 79088.40**
19	od191120/2022_2023 Supply, Delivery and laying of 200mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 200mm nominal outer dia pipes.	
	Net Total Quantity	87911.000 metre

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	Say 87911.000 metre @ Rs 522.67 / metre	**Rs 45948442.37**
20	od191121/2022_2023 Supply, Delivery and laying of 250mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 250mm nominal outer dia pipes.	
	Net Total Quantity	4150.500 metre
	Say 4150.500 metre @ Rs 838.60 / metre	**Rs 3480609.30**
21	od191122/2022_2023 Supply, Delivery and laying of 300mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 300mm nominal outer dia pipes.	
	Net Total Quantity	1490.500 metre
	Say 1490.500 metre @ Rs 1134.79 / metre	**Rs 1691404.49**
22	od191126/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 400mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.	
	Net Total Quantity	3356.000 per metre
	Say 3356.000 per metre @ Rs 8954.05 / per metre	**Rs 30049791.80**

Other Engineering Organisations
PRICE

23	od191127/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 450mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.	
	Net Total Quantity	1218.000 per metre
	Say 1218.000 per metre @ Rs 10479.31 / per metre	**Rs 12763799.58**
24	od204173/2022_2023 Supplying conveying and laying pipes and specials ISI marked 500 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.	
	Net Total Quantity	8.500 per metre
	Say 8.500 per metre @ Rs 14026.40 / per metre	**Rs 119224.40**
25	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)	
	Net Total Quantity	162.000 cum
	Say 162.000 cum @ Rs 7204.78 / cum	**Rs 1167174.36**
26	od191128/2022_2023 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with: Cement mortar 1:6 (1 cement : 6 coarse sand) excluding cost of rubble. Rubble can be taken from the stacked qty obtained from dismantled work	
	Net Total Quantity	108.000 cum
	Say 108.000 cum @ Rs 5472.39 / cum	**Rs 591018.12**
27	od191129/2022_2023 construction of precast drain and cover slab, including cost of, concrete, centering and shuttering, reinforcements, and all other allied activities in including all tools and plants as per the requirements of the Engineer in charge as per the drawings	
	Net Total Quantity	2176.411 cum

Other Engineering Organisations PRICE

	Say 2176.411 cum @ Rs 13523.78 / cum	**Rs 29433303.55**
28	16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.	
	Net Total Quantity	12982.105 sqm
	Say 12982.105 sqm @ Rs 1011.57 / sqm	**Rs 13132307.95**
29	16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)	
	Net Total Quantity	8654.737 sqm
	Say 8654.737 sqm @ Rs 381.62 / sqm	**Rs 3302820.73**
30	od224799/2022_2023 Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	
	Net Total Quantity	24873.361 cum
	Say 24873.361 cum @ Rs 2548.23 / cum	**Rs 63383044.70**
31	od224756/2022_2023 Supplying and filling in plinth with Stone dust under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	16582.241 cum
	Say 16582.241 cum @ Rs 2102.04 / cum	**Rs 34856533.87**
2 Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Muttar sewer network system		

Other Engineering Organisations
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1	od209944/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.3m (depth up to 1.5m) including, earth work in excavation by mechanical means of depth 0-1.5m including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. 	
	Net Total Quantity	1733.000 no
	Say 1733.000 no @ Rs 65945.44 / no	**Rs 114283447.52**
2	od209947/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.75m (depth 1.5m to 3m) including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.	
	Net Total Quantity	953.000 no
	Say 953.000 no @ Rs 77589.64 / no	**Rs 73942926.92**
3	od210970/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 2.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	

Other Engineering Organisations PRICE

	Net Total Quantity	410.000 no
	Say 410.000 no @ Rs 159117.09 / no	**Rs 65238006.90**
4	od209956/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	
	Net Total Quantity	249.000 no
	Say 249.000 no @ Rs 182844.58 / no	**Rs 45528300.42**
5	od209957/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	
	Net Total Quantity	142.000 no
	Say 142.000 no @ Rs 204075.81 / no	**Rs 28978765.02**

Other Engineering Organisations PRICE

6	od209958/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 5.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	
	Net Total Quantity	61.000 no
	Say 61.000 no @ Rs 274589.97 / no	**Rs 16749988.17**
7	od209959/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 5.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	
	Net Total Quantity	29.000 no
	Say 29.000 no @ Rs 296438.13 / no	**Rs 8596705.77**
8	od209960/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	

Other Engineering Organisations PRICE

	Net Total Quantity	127.000 no
	Say 127.000 no @ Rs 253001.21 / no	**Rs 32131153.67**
9	od209961/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.	
	Net Total Quantity	115.000 no
	Say 115.000 no @ Rs 230765.75 / no	**Rs 26538061.25**
10	od209950/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 2.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.	
	Net Total Quantity	611.000 no
	Say 611.000 no @ Rs 111913.20 / no	**Rs 68378965.20**
3 Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Muttar sewer network system		

Other Engineering Organisations
PRICE

1	od217126/2022_2023 Construction of manhole of 3.5m diameter for an average depth of 6.67m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 3.50m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 656247.10 / no	**Rs 656247.10**
2	od217217/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.97m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 478376.39 / no	**Rs 478376.39**
3	od217127/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.77m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.	

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	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 466597.84 / no	**Rs 466597.84**
4	od217128/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.8m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 400060.78 / no	**Rs 400060.78**
5	od217129/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.7m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 403828.97 / no	**Rs 403828.97**

Other Engineering Organisations PRICE

6	od217130/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.17m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 431402.80 / no	**Rs 431402.80**
7	od217131/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.05m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 424394.99 / no	**Rs 424394.99**
8	od217132/2022_2023 Construction of manhole of 4m diameter for an average depth of 6.56m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 4m diameter.	

Other Engineering Organisations PRICE

	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 863151.59 / no	**Rs 863151.59**
9	od217133/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.49m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 509023.75 / no	**Rs 509023.75**
10	od217134/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.69m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 521040.98 / no	**Rs 521040.98**

Other Engineering Organisations PRICE

11	od217135/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 400727.15 / no	**Rs 400727.15**
12	od217136/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.4m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 503818.73 / no	**Rs 503818.73**
13	od217137/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.1m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	

Other Engineering Organisations PRICE

	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 427333.48 / no	**Rs 427333.48**
14	od217138/2022_2023 Construction of manhole of 3m diameter for an average depth of 6.49m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 3m diameter.	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 619449.15 / no	**Rs 619449.15**
15	od219476/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.0m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.	
	Net Total Quantity	6.000 no
	Say 6.000 no @ Rs 453698.08 / no	**Rs 2722188.48**
16	od218427/2022_2023 Providing nonclog submercible pumpset of suitable capacity (5 HP) in 20 nos lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size (200mm Dia) electrical installations such as adequate capacity generator set, cables, switch boxes,MCC panels, isolators ,float switches, and cost for connecting KSEB feeder lines from lift manholes integrating with nearby pumping stations and with STP, etc complete necessary for functioning of lifting stations all as directed by Engineer in charge For upto 3MLD (For Muttar STP)	
	Net Total Quantity	1.000 set
	Say 1.000 set @ Rs 27159428.37 / set	**Rs 27159428.37**

Other Engineering Organisations PRICE

4 Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 2+3B) and Wet-well 2 (Block 3A) with allied components as per standard specifications		
1	od216181/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 3A of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 18014944.48 / no	**Rs 18014944.48**
2	od216182/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 2 and 3B of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches, Construction of Control room integrally with that required for adjoining STP Components and Pumping main of 400 mm DI K9 class pipes to the adjoining inlet chamber of the STP with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 9055032.14 / no	**Rs 9055032.14**
5 Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 2 nos for Muttar Collection system		
1	2.10.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m:Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm	
	Net Total Quantity	5500.000 metre
	Say 5500.000 metre @ Rs 669.27 / metre	**Rs 3680985.00**

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2	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070	
	Net Total Quantity	5013.120 Kwh
	Say 5013.120 Kwh @ Rs 36.95 / Kwh	**Rs 185234.78**
3	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible	
	Net Total Quantity	168.000 Day
	Say 168.000 Day @ Rs 878.76 / Day	**Rs 147631.68**
4	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m	
	Net Total Quantity	3040.000 sqm
	Say 3040.000 sqm @ Rs 152.95 / sqm	**Rs 464968.00**
5	100.14.7 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 400 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.21 in DAR	
	Net Total Quantity	2000.000 metre
	Say 2000.000 metre @ Rs 327.31 / metre	**Rs 654620.00**
6	100.14.8 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 450 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.22 in DAR	
	Net Total Quantity	3500.000 metre
	Say 3500.000 metre @ Rs 384.87 / metre	**Rs 1347045.00**
7	18.30.9 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:400 mm diameter pipe	
	Net Total Quantity	2.000 no
	Say 2.000 no @ Rs 1066.42 / no	**Rs 2132.84**
8	18.30.10 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:450 mm diameter pipe	

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	Net Total Quantity	2.000 no
	Say 2.000 no @ Rs 1312.65 / no	**Rs 2625.30**
9	18.70.7 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:400 mm dia pipes	
	Net Total Quantity	364.000 joint
	Say 364.000 joint @ Rs 681.34 / joint	**Rs 248007.76**
10	18.70.8 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:450 mm dia pipes	
	Net Total Quantity	637.000 joint
	Say 637.000 joint @ Rs 784.25 / joint	**Rs 499567.25**
11	18.83.9 Labour for cutting C.I. pipe with steel saw.400 mm diameter C.I. pipe	
	Net Total Quantity	20.000 Each Cut
	Say 20.000 Each Cut @ Rs 855.71 / Each Cut	**Rs 17114.20**
12	18.83.10 Labour for cutting C.I. pipe with steel saw.450 mm diameter C.I. pipe	
	Net Total Quantity	35.000 each
	Say 35.000 each @ Rs 961.06 / each	**Rs 33637.10**
13	100.35.7 Testing 400mm DI/CI pipeline with potable water to the required test pressure. 400 mm dia Observed Data derived from item no.1026 of PHED DATA	
	Net Total Quantity	2000.000 metre
	Say 2000.000 metre @ Rs 85.49 / metre	**Rs 170980.00**
14	100.35.8 Testing 450mm DI/CI pipeline with potable water to the required test pressure. 450 mm dia Observed Data derived from item no.1027 of PHED DATA	
	Net Total Quantity	3500.000 metre
	Say 3500.000 metre @ Rs 94.33 / metre	**Rs 330155.00**
15	100.98.121 Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia.	
	Net Total Quantity	2000.000 metre
	Say 2000.000 metre @ Rs 5377.35 / metre	**Rs 10754700.00**

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16	100.98.122 Supply of DI K9 Pipe Conforming to IS 8329/2000, 450mm Dia.	
	Net Total Quantity	3500.000 metre
	Say 3500.000 metre @ Rs 6420.75 / metre	**Rs 22472625.00**
17	18.69.1 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :Upto 600 mm dia	
	Net Total Quantity	75.933 quintal
	Say 75.933 quintal @ Rs 21145.26 / quintal	**Rs 1605623.03**
18	od220746/2022_2023 Providing, laying and fixing C.I. sluice valves (with cap) and connecting lead dwc pipe of 250mm dia to the nearest manhole considering an average distance. all completme with bolts, nuts, rubber installation etc. cost include all necessary specials, labour ,material,etc all complete. 250mm dia	
	Net Total Quantity	2.000 no
	Say 2.000 no @ Rs 49733.46 / no	**Rs 99466.92**
19	od220773/2022_2023 Supplying and fixing C.I double acting air valve of approved quality with bolts, nuts, rubber placing including cost of air valves, specials, labour, hire charges etc. complete 100 mm dia	
	Net Total Quantity	7.000 no
	Say 7.000 no @ Rs 9657.75 / no	**Rs 67604.25**
20	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3(1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	76.801 cum
	Say 76.801 cum @ Rs 10954.04 / cum	**Rs 841281.23**
21	od191113/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	76.801 cum
	Say 76.801 cum @ Rs 1916.05 / cum	**Rs 147154.56**
22	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	3840.000 kilogram
	Say 3840.000 kilogram @ Rs 98.30 / kilogram	**Rs 377472.00**

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23	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	195.072 sqm
	Say 195.072 sqm @ Rs 223.32 / sqm	**Rs 43563.48**
24	50.2.25.1 Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge	
	Net Total Quantity	631.126 cum
	Say 631.126 cum @ Rs 525.82 / cum	**Rs 331858.67**
25	51.2.3 Filling with Quarry Muck Filling up low lying and water logged areas with local material/ quarry muck, spreading in layers, leveling the top at site and consolidation by ramming, etc complete for improving the CBR value of subgrade	
	Net Total Quantity	315.563 cum
	Say 315.563 cum @ Rs 902.34 / cum	**Rs 284745.12**
26	od211147/2022_2023 CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 350mm.	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 50031.50 / each	**Rs 100063.00**
27	od221313/2022_2023 Construction valve chamber of suitable size for air valves and Scour valves in the pumping mains includign eartwprk exacavation by manually/mechnaically, backfilling the trenhes ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggreagates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form waork and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplyimg and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete	
	Net Total Quantity	1.000 set
	Say 1.000 set @ Rs 959999.99 / set	**Rs 959999.99**
6 Laying of pipes under NH 66 by HDD method to Muttar STP-1		

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1	od218400/2022_2023 Drilling of 500mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 400mm dia M.S casing pipe of minimum 6mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
	Net Total Quantity	80.000 metre
	Say 80.000 metre @ Rs 6317.40 / metre	**Rs 505392.00**
2	od218401/2022_2023 Drilling of 900mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 800mm dia M.S casing pipe of minimum 12mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
	Net Total Quantity	80.000 metre
	Say 80.000 metre @ Rs 21071.93 / metre	**Rs 1685754.40**
7 Laying of pipes under railway lines by HDD method to Muttar STP -2		
1	od218400/2022_2023 Drilling of 500mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 400mm dia M.S casing pipe of minimum 6mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
	Net Total Quantity	80.000 metre
	Say 80.000 metre @ Rs 6317.40 / metre	**Rs 505392.00**
2	od218401/2022_2023 Drilling of 900mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 800mm dia M.S casing pipe of minimum 12mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
	Net Total Quantity	80.000 metre
	Say 80.000 metre @ Rs 21071.93 / metre	**Rs 1685754.40**

Other Engineering Organisation PRICE

3	od218406/2022_2023 Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
	Net Total Quantity	40.000 metre
	Say 40.000 metre @ Rs 10646.31 / metre	**Rs 425852.40**
	8 ROAD RESTORATION CHARGES	
1	od209801/2022_2023 Road Restoration Charges for BM&BC as per the directions of Engineer (PWD Road)	
	Net Total Quantity	113593.375 per sqm
	Say 113593.375 per sqm @ Rs 3167.05 / per sqm	**Rs 359755898.29**
2	od209802/2022_2023 Road Restoration Charges for CC roads as per the directions of Engineer (PWD Road)	
	Net Total Quantity	16227.632 per sqm
	Say 16227.632 per sqm @ Rs 4195.88 / per sqm	**Rs 68089196.56**
	9 Household Connection	
1	od191098/2022_2023 Carrying out Household Survey for Sewerage System including all Preparatory Works, Tool Preparation, Data Collection Charges, Interviews, Data Entry, Field level monitoring, Data Verification all allied works	
	Net Total Quantity	12781.000 each
	Say 12781.000 each @ Rs 74.41 / each	**Rs 951034.21**
2	od220827/2022_2023 Providing sewer connection to the existing households and commercialunits including the cost for all suppying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works,Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge	
	Net Total Quantity	12781.000 no

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	Say 12781.000 no @ Rs 14900.62 / no	**Rs 190444824.22**
3	od209948/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 160mm dia uPVC SN8 pipes having including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 160 mm nominal outer dia pipes.	
	Net Total Quantity	2560.000 per metre
	Say 2560.000 per metre @ Rs 981.33 / per metre	**Rs 2512204.80**
4	od217343/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	
	Net Total Quantity	62625.000 metre
	Say 62625.000 metre @ Rs 512.22 / metre	**Rs 32077777.50**
10 Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements		
1	od191082/2022_2023 Providing Advanced odor control mechanism as directed including supplying, erecting and testing cost of all materials, labour and conveyence charges, hire for tools and equipments etc complte all per the directions of Engineer in charge	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 200000.00 / each	**Rs 400000.00**
2	od191083/2022_2023 Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete	
	Net Total Quantity	1.000 no
	Say 1.000 no @ Rs 4556258.00 / no	**Rs 4556258.00**

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3	od209980/2022_2023 Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR	
	Net Total Quantity	1.000 set
	Say 1.000 set @ Rs 862597.00 / set	**Rs 862597.00**
4	od209981/2022_2023 Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.	
	Net Total Quantity	1.000 set
	Say 1.000 set @ Rs 890423.00 / set	**Rs 890423.00**
5	od222611/2022_2023 Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with Collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications	
	Net Total Quantity	5.000 set
	Say 5.000 set @ Rs 20000.00 / set	**Rs 100000.00**
6	od222612/2022_2023 Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.	
	Net Total Quantity	1.000 set
	Say 1.000 set @ Rs 5999999.99 / set	**Rs 5999999.99**
11 Utility shifting works and its restoration as directed by the Department		
	Lump-Sum Total	**Rs 20340000.00**

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	12 Additional cost for SCADA, Solar system for sewer network system	
Lump-Sum Total		**Rs 10000000.00**
	13 Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years	
Lump-Sum Total		**Rs 168175827.47**
	Provision for GST payments (in %) @	**18.0%**
Amount reserved for GST payments		**345019540.96**
Total		**2261794768.96**
Lumpsum for round off		**5231.04**
		TOTAL Rs 2261800000.00
		Rounded Total Rs 2,26,18,00,000
		Rupees Two Hundred Twenty Six Crore Eighteen Lakh Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

IURWTS Project-Sewerage Scheme-Collection System Construction of Sewer network for Muttar STP16.5MLD including all sewer appurtenances and annual maintenance of 10 years- R4 (FINAL)

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Muttar Collection System								
1	15.43.2 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:Bituminous road							
	(0m to 1.5m)70% of sewer lines Tar roads							
	200mm dia pipe	1	42668.580	0.750		0.7	22401.005	
	250mm dia pipe	1	600.000	0.750		0.7	315.000	
	300mm	1	42.000	0.750		0.7	22.050	
	0 to 3m (70% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	1.350		0.7	38167.105	
	250mm dia pipe	1	1023.970	1.350		0.7	967.652	
	300mm dia pipe	1	520.790	1.350		0.7	492.147	
	400mm dia pipe	1	1535.950	1.500		0.7	1612.748	
	450mm dia pipe	1	335.000	1.600		0.7	375.200	
	500 mm dia pipe	1	10.000	1.650		0.7	11.550	
	0 to 4m70% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950		0.7	3687.239	
	250mm dia pipe	1	1169.270	0.950		0.7	777.565	
	300mm dia	1	266.550	0.950		0.7	177.256	
	400mm dia pipe	1	1268.370	1.100		0.7	976.645	
	450mm	1	353.000	1.200		0.7	296.520	
	Up to 4.5m)70% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	1916.120	0.950		0.7	1274.220	
	250mm dia pipe	1	824.140	0.950		0.7	548.054	
	300mm dia pipe	1	441.500	0.950		0.7	293.598	
	400mm dia pipe	1	331.180	1.100		0.7	255.009	

Other Engineering Organisations PRICE

	450mm dia pipe	1	106.000	1.200		0.7	89.040	
	Above 4.5m)70% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	2184.000	0.950		0.7	1452.360	
	250mm dia pipe	1	832.000	0.950		0.7	553.280	
	300mm dia pipe	1	329.000	0.950		0.7	218.785	
	400mm dia pipe	1	449.000	1.100		0.7	345.730	
	450mm dia pipe	1	499.000	1.200		0.7	419.160	
	Total Quantity						75728.918 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						75728.918 sqm	
	Say 75728.918 sqm @ Rs 360.94 / sqm						**Rs 27333595.66**	
2	od201716/2022_2023 Cutting and removal of the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffice diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation. Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:							
	(0m to 1.5m)10% of sewer lines Tar roads							
	200mm dia pipe	1	42668.580	0.750		0.1	3200.144	
	250mm dia pipe	1	600.000	0.750		0.1	45.000	
	300mm	1	42.000	0.750		0.1	3.151	
	0 to 3m (10% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	1.350		0.1	5452.444	
	250mm dia pipe	1	1023.970	1.350		0.1	138.236	
	300mm dia pipe	1	520.790	1.350		0.1	70.307	
	400mm dia pipe	1	1535.950	1.500		0.1	230.393	
	450mm dia pipe	1	335.000	1.600		0.1	53.600	
	500mm dia pipe	1	10.000	1.650		0.1	1.651	
	0 to 4m10% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950		0.1	526.749	

Other Engineering Organisations PRICE

	250mm dia pipe	1	1169.270	0.950		0.1	111.081	
	300mm dia	1	266.550	0.950		0.1	25.323	
	400mm dia pipe	1	1268.370	1.100		0.1	139.521	
	450mm	1	353.000	1.200		0.1	42.360	
	Up to 4.5m)10% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	1916.120	0.950		0.1	182.032	
	250mm dia pipe	1	824.140	0.950		0.1	78.294	
	300mm dia pipe	1	441.500	0.950		0.1	41.943	
	400mm dia pipe	1	331.180	1.100		0.1	36.430	
	450mm dia pipe	1	106.000	1.200		0.1	12.720	
	Above 4.5m)10% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	2184.000	0.950		0.1	207.480	
	250mm dia pipe	1	832.000	0.950		0.1	79.040	
	300mm dia pipe	1	329.000	0.950		0.1	31.256	
	400mm dia pipe	1	449.000	1.100		0.1	49.391	
	450mm dia pipe	1	499.000	1.200		0.1	59.880	
						Total Quantity	10818.426 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	10818.426 sqm	
						Say 10818.426 sqm @ Rs 227.92 / sqm	**Rs 2465735.65**	
3	16.83 Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.							
	(0m to 1.5m)20% of sewer lines Tar roads							
	200mm dia pipe	1	42668.580	0.750		0.2	6400.287	
	250mm dia pipe	1	600.000	0.750		0.2	90.000	
	300mm	1	42.000	0.750		0.2	6.301	
	0 to 3m (20% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	1.350		0.2	10904.887	
	250mm dia pipe	1	1023.970	1.350		0.2	276.472	

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	300mm dia pipe	1	520.790	1.350		0.2	140.614	
	400mm dia pipe	1	1535.950	1.500		0.2	460.786	
	450mm dia pipe	1	335.000	1.600		0.2	107.200	
	500mm dia pipe	1	10.000	1.650		0.2	3.301	
	0 to 4m20% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950		0.2	1053.497	
	250mm dia pipe	1	1169.270	0.950		0.2	222.162	
	300mm dia	1	266.550	0.950		0.2	50.645	
	400mm dia pipe	1	1268.370	1.100		0.2	279.042	
	450mm	1	353.000	1.200		0.2	84.720	
	Up to 4.5m)20% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	1916.120	0.950		0.2	364.063	
	250mm dia pipe	1	824.140	0.950		0.2	156.587	
	300mm dia pipe	1	441.500	0.950		0.2	83.885	
	400mm dia pipe	1	331.180	1.100		0.2	72.860	
	450mm dia pipe	1	106.000	1.200		0.2	25.440	
	Above 4.5m)20% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	2184.000	0.950		0.2	414.960	
	250mm dia pipe	1	832.000	0.950		0.2	158.080	
	300mm dia pipe	1	329.000	0.950		0.2	62.511	
	400mm dia pipe	1	449.000	1.100		0.2	98.781	
	450mm dia pipe	1	499.000	1.200		0.2	119.760	
	Total Quantity						21636.841 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21636.841 sqm	
	Say 21636.841 sqm @ Rs 110.71 / sqm						**Rs 2395414.67**	
4	15.2.2 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.Nominal concrete 1:4:8 leaner mix (including equivalent design mix)							

Other Engineering Organisations
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	For drains and culverts	1	5181.9305	0.700*4	0.150		2176.411	5% of total Road length for drains and culverts
						Total Quantity	2176.411 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2176.411 cum	
						Say 2176.411 cum @ Rs 1262.82 / cum	**Rs 2748415.34**	
5	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.							
	For RCC structures	10	3.500	0.500	1.500		26.250	
						Total Quantity	26.250 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	26.250 cum	
						Say 26.250 cum @ Rs 2983.59 / cum	**Rs 78319.24**	
6	15.9.2 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges:In cement mortar							
	For RR structures	1	500.000	0.450	1.200		270.000	
						Total Quantity	270.000 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	270.000 cum	
						Say 270.000 cum @ Rs 2064.97 / cum	**Rs 557541.90**	
7	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidatingeach deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)							
	(0m to 1.5m)							
	200mm dia pipe	1	42668.580	0.750	1.200		38401.722	
	250mm dia pipe	1	600.000	0.750	1.200		540.000	

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	300mm	1	42.000	0.750	1.200		37.800	
	0 to 3m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	1.350	1.500		81786.652	
	250mm dia pipe	1	1023.970	1.350	1.500		2073.540	
	300mm dia pipe	1	520.790	1.350	1.500		1054.600	
	400mm dia pipe	1	1535.950	1.500	1.500		3455.888	
	450mm dia pipe	1	335.000	1.600	1.500		804.000	
	500mm dia pipe	1	10.000	1.650	1.500		24.750	
	0 to 4m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950	1.500		7901.227	
	250mm dia pipe	1	1169.270	0.950	1.500		1666.210	
	300mm dia	1	266.550	0.950	1.500		379.834	
	400mm dia pipe	1	1268.370	1.100	1.500		2092.811	
	450mm	1	353.000	1.200	1.500		635.400	
	Up to 4.5m)							
	depth of cutting upto 1.5m,200mm dia pipe	1	1916.120	0.950	1.500		2730.471	
	250mm dia pipe	1	824.140	0.950	1.500		1174.400	
	300mm dia pipe	1	441.500	0.950	1.500		629.138	
	400mm dia pipe	1	331.180	1.100	1.500		546.448	
	450mm dia pipe	1	106.000	1.200	1.500		190.800	
	Above 4.5m)							
	depth of cutting upto 1.5m,200mm dia pipe	1	2184.000	0.950	1.500		3112.200	
	250mm dia pipe	1	832.000	0.950	1.500		1185.600	
	300mm dia pipe	1	329.000	0.950	1.500		468.826	
	400mm dia pipe	1	449.000	1.100	1.500		740.850	
	450mm dia pipe	1	499.000	1.200	1.500		898.200	
	Deduction for Manholes							
	1.2m dia Manhole	3297	1.200+.5	1.100	1.500		-9248.085	
	1.5m dia manhole	1133	1.500+.5	1.100	1.500		-3738.900	
	LS 2m dia upto 3 m	14	2.000+.5	1.100	1.500		-57.750	

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	Total Quantity						152531.367 cum	
	Total Deducted Quantity						-13044.735 cum	
	Net Total Quantity						139486.632 cum	
	Say 139486.632 cum @ Rs 555.51 / cum						**Rs 77486218.94**	
8	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil (Ref. Item No. 2.11 of DSR)							
	0 to 3m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	0.750	0.950		28776.785	
	250mm dia pipe	1	1023.970	0.750	0.950		729.579	
	300mm dia pipe	1	520.790	0.750	0.950		371.063	
	400mm dia pipe	1	1535.950	0.900	0.950		1313.238	
	450mm dia pipe	1	335.000	1.000	0.950		318.250	
	500mm dia pipe	1	10.000	1.050	0.950		9.975	
	0m to 4m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950	1.500		7901.227	
	250mm dia pipe	1	1169.300	0.950	1.500		1666.253	
	300mm dia	1	266.550	0.950	1.500		379.834	
	400mm dia pipe	1	1268.370	1.100	1.500		2092.811	
	450mm	1	353.000	1.200	1.500		635.400	
	Up to 4.5m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	1916.120	0.950	1.500		2730.471	
	250mm dia pipe	1	824.140	0.950	1.500		1174.400	
	300mm dia	1	441.500	0.950	1.500		629.138	
	400mm dia pipe	1	331.180	1.100	1.500		546.448	
	450mm	1	106.000	1.200	1.500		190.800	
	above 4.5m							

Other Engineering Organisations PRICE

	Depth of cutting upto 1.5m, 200mm dia pipe	1	2184.000	0.950	1.500		3112.200	
	250mm dia pipe	1	832.000	0.950	1.500		1185.600	
	300mm dia	1	329.000	0.950	1.500		468.826	
	400mm dia pipe	1	449.000	1.100	1.500		740.850	
	450mm	1	499.000	1.200	1.500		898.200	
	Deduction for Manholes							
	1.2m dia	1564	1.200+.5	1.000	1.000		-2658.799	
	1.5m dia manhole	1133	1.500+.5	1.000	1.500		-3399.000	
	LS 2m dia upto 3 m	14	2.000+.5	1.000	1.500		-52.500	
						Total Quantity	55871.348 cum	
						Total Deducted Quantity	-6110.299 cum	
						Net Total Quantity	49761.049 cum	
						Say 49761.049 cum @ Rs 661.88 / cum	**Rs 32935843.11**	
9	100.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m All kinds of soil (Ref. Item No. 2.12 of DSR)							
	0m to 4m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950	0.700		3687.239	
	250mm dia pipe	1	1169.270	0.950	0.700		777.565	
	300mm dia	1	266.550	0.950	0.700		177.256	
	400mm dia pipe	1	1268.370	1.100	0.700		976.645	
	450mm	1	353.000	1.200	0.700		296.520	
	Up to 4.5m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	1916.100	0.950	1.250		2275.369	
	250mm dia pipe	1	824.140	0.950	1.250		978.667	
	300mm dia	1	441.500	0.950	1.250		524.282	
	400mm dia pipe	1	331.180	1.100	1.250		455.373	
	450mm	1	106.000	1.200	1.250		159.000	

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	above 4.5m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	2184.000	0.950	1.500		3112.200	
	250mm dia pipe	1	832.000	0.950	1.500		1185.600	
	300mm dia	1	329.000	0.950	1.500		468.826	
	400mm dia pipe	1	449.000	1.100	1.500		740.850	
	450mm	1	499.000	1.200	1.500		898.200	
	Deduction for Manholes							
	1.5m dia manhole	506	1.500+.5	1.100	1.500		-1669.800	
	LS 2m dia	13	2.000+.5	1.100	1.500		-53.625	
	Total Quantity						16713.592 cum	
	Total Deducted Quantity						-1723.425 cum	
	Net Total Quantity						14990.167 cum	
	Say 14990.167 cum @ Rs 768.25 / cum						**Rs 11516195.80**	
10	100.1.4 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m in depth but not exceeding 6 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 4.5m to 6.0m All kinds of soil. (Ref. Item No. 2.12 of DSR)							
	above 4.5m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	2184.000	0.950	0.950		1971.060	
	250mm dia pipe	1	832.000	0.950	0.950		750.880	
	300mm dia	1	329.000	0.950	0.950		296.923	
	400mm dia pipe	1	449.000	1.100	0.950		469.205	
	450mm	1	499.000	1.200	0.950		568.860	
	Deduction for Manholes							
	1.5m dia manhole	217	1.500+.5	1.100	1.500		-716.100	
	LS 2m dia	13	2.000+.5	1.100	1.500		-53.625	
	Total Quantity						4056.928 cum	
	Total Deducted Quantity						-769.725 cum	
	Net Total Quantity						3287.203 cum	
	Say 3287.203 cum @ Rs 874.62 / cum						**Rs 2875053.49**	

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11	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)							
	50% of Sewer lines	1	103639.000			0.5	51819.500	
	Total Quantity						51819.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						51819.500 metre	
	Say 51819.500 metre @ Rs 28.01 / metre						**Rs 1451464.20**	
12	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m							
	Up to 1.5m (20% considered)							
	200mm dia pipe	2	42668.580		1.200	0.2	20480.919	
	250mm dia pipe	2	600.000		1.200	0.2	288.000	
	300mm	2	42.000		1.200	0.2	20.160	
	Up to 3m (20% is considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	40388.470		1.500	0.2	24233.083	
	250mm dia pipe	2	1023.970		1.500	0.2	614.382	
	300mm dia pipe	2	520.790		1.500	0.2	312.474	
	400mm dia pipe	2	1535.950		1.500	0.2	921.571	
	450mm dia pipe	2	335.000		1.500	0.2	201.000	
	500mm dia pipe	2	10.000		1.500	0.2	6.000	
	upto 4.5							
	200 mm dia	2	7460.840		1.500		22382.520	
	250m dia	2	1993.410		1.500		5980.231	
	300 mm dia	2	708.050		1.500		2124.150	
	400mm dia	2	1599.550		1.500		4798.650	
	450mm dia	2	459.000		1.500		1377.000	
	Deduction for Manholes (20% is considered)							
	1.2m dia Manhole	3297	1.200+.5		1.500	0.2	-1681.469	
	1.5m dia manhole	916	1.500+.5		1.500	0.2	-549.600	
	LS 2m dia upto 3 m	9	2+.5		1.500	0.2	-6.750	

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	Total Quantity						83740.140 sqm	
	Total Deducted Quantity						-2237.819 sqm	
	Net Total Quantity						81502.321 sqm	
	Say 81502.321 sqm @ Rs 152.95 / sqm						**Rs 12465780.00**	
13	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m							
	0 to 3m (20% is considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	40388.470		0.950	0.2	15347.619	
	250mm dia pipe	2	1023.970		0.950	0.2	389.109	
	300mm dia pipe	2	520.790		0.950	0.2	197.901	
	400mm dia pipe	2	1535.950		0.950	0.2	583.661	
	450mm dia pipe	2	335.000		0.950	0.2	127.301	
	500mm dia PIPE	2	10.000		0.950	0.2	3.801	
	3 to 4.5							
	200 mm dia	2	7460.840		1.500		22382.520	
	250m dia	2	1993.410		1.500		5980.231	
	300 mm dia	2	708.050		1.500		2124.150	
	400mm dia	2	1599.550		1.500		4798.650	
	450mm dia	2	459.000		1.500		1377.000	
	Deduction for Manholes							
	1.2m dia Manhole	1564	1.200+.5		1.000	0.2	-531.760	
	1.5m dia manhole	916	1.500+.5		1.500	0.2	-549.600	
	LS 2m dia	8	2.000+.5		1.500	0.2	-6.000	
	Total Quantity						53311.943 sqm	
	Total Deducted Quantity						-1087.360 sqm	
	Net Total Quantity						52224.583 sqm	
	Say 52224.583 sqm @ Rs 166.17 / sqm						**Rs 8678158.96**	
14	2.16.3 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m							
	3 to 4.5							
	200 mm dia	2	7460.840		0.950		14175.596	

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	250m dia	2	1993.410		0.950		3787.479	
	300 mm dia	2	708.050		0.950		1345.295	
	400mm dia	2	1599.550		0.950		3039.145	
	450mm dia	2	459.000		0.950		872.100	
	Deduction for Manhole							
	1.5 m dia	506	1.5+.5		1.500		-1518.000	
	LS-2m dia 3 to 4.5 m	7	2+.5		1.500		-26.250	
	Total Quantity						23219.615 sqm	
	Total Deducted Quantity						-1544.250 sqm	
	Net Total Quantity						21675.365 sqm	
	Say 21675.365 sqm @ Rs 196.06 / sqm						**Rs 4249672.06**	
15	od203302/2022_2023 Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete. (Refernce KWA approved data no.100.6.1)							
	Above 4.5m)							
	depth of cutting upto 1.5m,200mm dia pipe	2	2184.000		4.500		19656.000	
	250mm dia pipe	2	832.000		4.500		7488.000	
	300mm dia pipe	2	329.000		4.500		2961.000	
	400mm dia pipe	2	449.000		4.500		4041.000	
	450mm dia pipe	2	499.000		4.500		4491.000	
	Deduction for Manholes							
	1.5m dia manhole	217	1.500+.5		3.750		-1627.500	
	LS 2m dia upto 3 m	5	2.000+.5		3.750		-46.875	
	Total Quantity						38637.000 sqm	
	Total Deducted Quantity						-1674.375 sqm	
	Net Total Quantity						36962.625 sqm	
	Say 36962.625 sqm @ Rs 776.89 / sqm						**Rs 28715893.74**	
16	100.7.1							

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	Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070							
		3600		5.000	0.746		13428.000	3600 hours
	Total Quantity						13428.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						13428.000 Kwh	
	Say 13428.000 Kwh @ Rs 36.95 / Kwh						**Rs 496164.60**	
17	100.7.2 Bailing out water with engine and pumpset above 5 HP upto 10 HP including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070							
		500	10.000		0.746		3730.000	
	Total Quantity						3730.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						3730.000 Kwh	
	Say 3730.000 Kwh @ Rs 18.44 / Kwh						**Rs 68781.20**	
18	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible							
		90					90.000	
	Total Quantity						90.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						90.000 Day	
	Say 90.000 Day @ Rs 878.76 / Day						**Rs 79088.40**	
19	od191120/2022_2023 Supply, Delivery and laying of 200mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 200mm nominal outer dia pipes.							
		1	92702.000				92702.000	

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	Deduction for manhole							
	1.2m dia manhole	3900	1.200				-4680.000	
	1.5 dia manhole	62	1.500				-93.000	
	LS	9	2.000				-18.000	
						Total Quantity	92702.000 metre	
						Total Deducted Quantity	-4791.000 metre	
						Net Total Quantity	87911.000 metre	
						Say 87911.000 metre @ Rs 522.67 / metre	**Rs 45948442.37**	
20	od191121/2022_2023 Supply, Delivery and laying of 250mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 250mm nominal outer dia pipes.							
		1	4449.000				4449.000	
	Deduction for manhole							
	1.5 dia manhole	195	1.500				-292.500	
	LS	3	2.000				-6.000	
						Total Quantity	4449.000 metre	
						Total Deducted Quantity	-298.500 metre	
						Net Total Quantity	4150.500 metre	
						Say 4150.500 metre @ Rs 838.60 / metre	**Rs 3480609.30**	
21	od191122/2022_2023 Supply, Delivery and laying of 300mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 300mm nominal outer dia pipes.							
		1	1600.000				1600.000	
	Deduction for manhole							
	1.5 dia manhole	73	1.500				-109.500	
						Total Quantity	1600.000 metre	

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	Total Deducted Quantity						-109.500 metre	
	Net Total Quantity						1490.500 metre	
	Say 1490.500 metre @ Rs 1134.79 / metre						**Rs 1691404.49**	
22	od191126/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 400mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.							
		1	3585.000				3585.000	
	Deduction for manhole							
	1.5 dia manhole	150	1.500				-225.000	
	LS	2	2.000				-4.000	
	Total Quantity						3585.000 per metre	
	Total Deducted Quantity						-229.000 per metre	
	Net Total Quantity						3356.000 per metre	
	Say 3356.000 per metre @ Rs 8954.05 / per metre						**Rs 30049791.80**	
23	od191127/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 450mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.							
		1	1293.000				1293.000	
	Deduction for manhole							
	1.5 dia manhole	50	1.500				-75.000	
	Total Quantity						1293.000 per metre	
	Total Deducted Quantity						-75.000 per metre	
	Net Total Quantity						1218.000 per metre	
	Say 1218.000 per metre @ Rs 10479.31 / per metre						**Rs 12763799.58**	
24	od204173/2022_2023 Supplying conveying and laying pipes and specials ISI marked 500 mm dia HDPE pipes having PE8,							

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	PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.							
		1	10.000				10.000	
	Deduction for manhole							
	1.5 dia manhole	1	1.500				-1.500	
						Total Quantity	10.000 per metre	
						Total Deducted Quantity	-1.500 per metre	
						Net Total Quantity	8.500 per metre	
						Say 8.500 per metre @ Rs 14026.40 / per metre	**Rs 119224.40**	
25	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)							
		1	500.000	0.450	1.200	0.6	162.000	
						Total Quantity	162.000 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	162.000 cum	
						Say 162.000 cum @ Rs 7204.78 / cum	**Rs 1167174.36**	
26	od191128/2022_2023 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with: Cement mortar 1:6 (1 cement : 6 coarse sand) excluding cost of rubble. Rubble can be taken from the stacked qty obtained from dismantled work							
		1	500.000	0.450	1.200	0.4	108.000	
						Total Quantity	108.000 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	108.000 cum	
						Say 108.000 cum @ Rs 5472.39 / cum	**Rs 591018.12**	
27	od191129/2022_2023 construction of precast drain and cover slab, including cost of, concrete, centering and shuttering, reinforcements, and all other allied activities in including all tools and plants as per the requirements of the Engineer in charge as per the drawings							

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	for drains and culverts	1	5181.9305	0.700*4	0.150		2176.411	5% of total road length for drains and culverts
						Total Quantity	2176.411 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2176.411 cum	
						Say 2176.411 cum @ Rs 13523.78 / cum	**Rs 29433303.55**	
28	16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.							
	60% considered	1	21636.841			0.6	12982.105	
						Total Quantity	12982.105 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	12982.105 sqm	
						Say 12982.105 sqm @ Rs 1011.57 / sqm	**Rs 13132307.95**	
29	16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)							
	40% considered	1	21636.841			0.4	8654.737	
						Total Quantity	8654.737 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	8654.737 sqm	
						Say 8654.737 sqm @ Rs 381.62 / sqm	**Rs 3302820.73**	
30	od224799/2022_2023 Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge							
	Bedding for pipe upto spring level	1	103639.000	0.800	0.300		24873.361	
						Total Quantity	24873.361 cum	
						Total Deducted Quantity	0.000 cum	

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	Net Total Quantity						24873.361 cum	
	Say 24873.361 cum @ Rs 2548.23 / cum						**Rs 63383044.70**	
31	od224756/2022_2023 Supplying and filling in plinth with Stone dust under floors, including watering, ramming consolidating and dressing complete.							
	Backfilling stone dust above pipe	1	103639.000	0.800	0.200		16582.241	
	Total Quantity						16582.241 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						16582.241 cum	
	Say 16582.241 cum @ Rs 2102.04 / cum						**Rs 34856533.87**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2 Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Muttar sewer network system								
1	od209944/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.3m (depth up to 1.5m) including, earth work in excavation by mechanical means of depth 0-1.5m including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. 							
		1733					1733.000	
	Total Quantity						1733.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1733.000 no	
	Say 1733.000 no @ Rs 65945.44 / no						**Rs 114283447.52**	
2	od209947/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.75m (depth 1.5m to 3m) including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive							

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	bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.							
		953					953.000	
	Total Quantity						953.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						953.000 no	
	Say 953.000 no @ Rs 77589.64 / no						**Rs 73942926.92**	
3	od210970/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 2.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							
		410					410.000	
	Total Quantity						410.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						410.000 no	
	Say 410.000 no @ Rs 159117.09 / no						**Rs 65238006.90**	
4	od209956/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							

Other Engineering Organisations
PRICE

		249					249.000	
						Total Quantity	249.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	249.000 no	
						Say 249.000 no @ Rs 182844.58 / no	**Rs 45528300.42**	
5	od209957/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							
		142					142.000	
						Total Quantity	142.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	142.000 no	
						Say 142.000 no @ Rs 204075.81 / no	**Rs 28978765.02**	
6	od209958/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 5.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							
		61					61.000	
						Total Quantity	61.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	61.000 no	

Other Engineering Organisations
PRICE

	Say 61.000 no @ Rs 274589.97 / no						**Rs 16749988.17**	
7	od209959/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 5.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							
		29					29.000	
	Total Quantity						29.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						29.000 no	
	Say 29.000 no @ Rs 296438.13 / no						**Rs 8596705.77**	
8	od209960/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							
		127					127.000	
	Total Quantity						127.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						127.000 no	
	Say 127.000 no @ Rs 253001.21 / no						**Rs 32131153.67**	
9	od209961/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed							

Other Engineering Organisations PRICE

	cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.							
		115					115.000	
	Total Quantity						115.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						115.000 no	
	Say 115.000 no @ Rs 230765.75 / no						**Rs 26538061.25**	
10	od209950/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 2.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.							
		611					611.000	
	Total Quantity						611.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						611.000 no	
	Say 611.000 no @ Rs 111913.20 / no						**Rs 68378965.20**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
3 Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Muttar sewer network system								

Other Engineering Organisations PRICE

1	od217126/2022_2023 Construction of manhole of 3.5m diameter for an average depth of 6.67m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 3.50m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 656247.10 / no						**Rs 656247.10**	
2	od217217/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.97m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 478376.39 / no						**Rs 478376.39**	
3	od217127/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.77m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole							

Other Engineering Organisations PRICE

	base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 466597.84 / no						**Rs 466597.84**	
4	od217128/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.8m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 400060.78 / no						**Rs 400060.78**	
5	od217129/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.7m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil							

Other Engineering Organisations PRICE

	and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
		1					1.000	
						Total Quantity	1.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	1.000 no	
						Say 1.000 no @ Rs 403828.97 / no	**Rs 403828.97**	
6	od217130/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.17m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
		1					1.000	
						Total Quantity	1.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	1.000 no	
						Say 1.000 no @ Rs 431402.80 / no	**Rs 431402.80**	
7	od217131/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.05m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
		1					1.000	

Other Engineering Organisations
PRICE

	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 424394.99 / no						**Rs 424394.99**	
8	od217132/2022_2023 Construction of manhole of 4m diameter for an average depth of 6.56m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 4m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 863151.59 / no						**Rs 863151.59**	
9	od217133/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.49m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 509023.75 / no						**Rs 509023.75**	

Other Engineering Organisations
PRICE

10	od217134/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.69m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.							
		1					1.000	
						Total Quantity	1.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	1.000 no	
						Say 1.000 no @ Rs 521040.98 / no	**Rs 521040.98**	
11	od217135/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.							
		1					1.000	
						Total Quantity	1.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	1.000 no	
						Say 1.000 no @ Rs 400727.15 / no	**Rs 400727.15**	
12	od217136/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.4m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole							

Other Engineering Organisations PRICE

	base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 503818.73 / no						**Rs 503818.73**	
13	od217137/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.1m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 427333.48 / no						**Rs 427333.48**	
14	od217138/2022_2023 Construction of manhole of 3m diameter for an average depth of 6.49m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil							

Other Engineering Organisations PRICE

	and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 3m diameter.							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 619449.15 / no						**Rs 619449.15**	
15	od219476/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.0m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.							
		6					6.000	
	Total Quantity						6.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						6.000 no	
	Say 6.000 no @ Rs 453698.08 / no						**Rs 2722188.48**	
16	od218427/2022_2023 Providing nonclog submercible pumpset of suitable capacity (5 HP) in 20 nos lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size (200mm Dia) electrical installations such as adequate capacity generator set, cables, switch boxes,MCC panels, isolators ,float switches, and cost for connecting KSEB feeder lines from lift manholes integrating with nearby pumping stations and with STP, etc complete necessary for functioning of lifting stations all as directed by Engineer in charge For upto 3MLD (For Muttar STP)							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 27159428.37 / set						**Rs 27159428.37**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark

Other Engineering Organisations
PRICE

4 Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 2+3B) and Wet-well 2 (Block 3A) with allied components as per standard specifications								
1	od216181/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 3A of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 18014944.48 / no						**Rs 18014944.48**	
2	od216182/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 2 and 3B of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches, Construction of Control room integrally with that required for adjoining STP Components and Pumping main of 400 mm DI K9 class pipes to the adjoining inlet chamber of the STP with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 9055032.14 / no						**Rs 9055032.14**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
5 Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 2 nos for Muttar Collection system								

Other Engineering Organisations PRICE

1	2.10.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m:Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm							
	400mm Dia DI pipe	1	2000.000				2000.000	
	450mm Dia DI pipe	1	3500.000				3500.000	
	Total Quantity						5500.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						5500.000 metre	
	Say 5500.000 metre @ Rs 669.27 / metre						**Rs 3680985.00**	
2	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070							
	For 400mm dia	61	8.000	5.000	0.746		1820.240	
	For 450mm dia	107	8.000	5.000	0.746		3192.880	
	Total Quantity						5013.120 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						5013.120 Kwh	
	Say 5013.120 Kwh @ Rs 36.95 / Kwh						**Rs 185234.78**	
3	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible							
		61+107					168.000	
	Total Quantity						168.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						168.000 Day	
	Say 168.000 Day @ Rs 878.76 / Day						**Rs 147631.68**	
4	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m							
	20% is Considered							
	for 400mm dia pipe	2	2000.000		1.350	0.2	1080.000	
	for 450mm dia pipe	2	3500.000		1.400	0.2	1960.000	

Other Engineering Organisations
PRICE

						Total Quantity	3040.000 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	3040.000 sqm	
						Say 3040.000 sqm @ Rs 152.95 / sqm	**Rs 464968.00**	
5	100.14.7 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 400 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.21 in DAR							
		1	2000.000				2000.000	
						Total Quantity	2000.000 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	2000.000 metre	
						Say 2000.000 metre @ Rs 327.31 / metre	**Rs 654620.00**	
6	100.14.8 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 450 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.22 in DAR							
		1	3500.000				3500.000	
						Total Quantity	3500.000 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	3500.000 metre	
						Say 3500.000 metre @ Rs 384.87 / metre	**Rs 1347045.00**	
7	18.30.9 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:400 mm diameter pipe							
		2					2.000	
						Total Quantity	2.000 no	
						Total Deducted Quantity	0.000 no	
						Net Total Quantity	2.000 no	
						Say 2.000 no @ Rs 1066.42 / no	**Rs 2132.84**	
8	18.30.10 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:450 mm diameter pipe							
		2					2.000	

Other Engineering Organisations
PRICE

	Total Quantity						2.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						2.000 no	
	Say 2.000 no @ Rs 1312.65 / no						**Rs 2625.30**	
9	18.70.7 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:400 mm dia pipes							
		364					364.000	
	Total Quantity						364.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						364.000 joint	
	Say 364.000 joint @ Rs 681.34 / joint						**Rs 248007.76**	
10	18.70.8 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:450 mm dia pipes							
		637					637.000	
	Total Quantity						637.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						637.000 joint	
	Say 637.000 joint @ Rs 784.25 / joint						**Rs 499567.25**	
11	18.83.9 Labour for cutting C.I. pipe with steel saw.400 mm diameter C.I. pipe							
		20					20.000	
	Total Quantity						20.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						20.000 Each Cut	
	Say 20.000 Each Cut @ Rs 855.71 / Each Cut						**Rs 17114.20**	
12	18.83.10 Labour for cutting C.I. pipe with steel saw.450 mm diameter C.I. pipe							
		35					35.000	
	Total Quantity						35.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						35.000 each	
	Say 35.000 each @ Rs 961.06 / each						**Rs 33637.10**	
13	100.35.7							

Other Engineering Organisations
PRICE

	Testing 400mm DI/CI pipeline with potable water to the required test pressure. 400 mm dia Observed Data derived from item no.1026 of PHED DATA							
		1	2000.000				2000.000	
	Total Quantity						2000.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2000.000 metre	
	Say 2000.000 metre @ Rs 85.49 / metre						**Rs 170980.00**	
14	100.35.8 Testing 450mm DI/CI pipeline with potable water to the required test pressure. 450 mm dia Observed Data derived from item no.1027 of PHED DATA							
		1	3500.000				3500.000	
	Total Quantity						3500.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						3500.000 metre	
	Say 3500.000 metre @ Rs 94.33 / metre						**Rs 330155.00**	
15	100.98.121 Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia.							
		1	2000.000				2000.000	
	Total Quantity						2000.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2000.000 metre	
	Say 2000.000 metre @ Rs 5377.35 / metre						**Rs 10754700.00**	
16	100.98.122 Supply of DI K9 Pipe Conforming to IS 8329/2000, 450mm Dia.							
		1	3500.000				3500.000	
	Total Quantity						3500.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						3500.000 metre	
	Say 3500.000 metre @ Rs 6420.75 / metre						**Rs 22472625.00**	
17	18.69.1 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :Upto 600 mm dia							
	400mm dia 90 degree socket bend	9	128.000	1/100			11.520	

Other Engineering Organisations
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	450mm dia 90 degree socket bend	10	165.000	1/100			16.500	
	400mm dia 45 degree socket bend	5	107.000	1/100			5.351	
	450mm dia 45 degree socket bend	15	137.000	1/100			20.550	
	400mm dia 22.5 degree socket bend	4	109.000	1/100			4.360	
	450mm dia 22.5 degree socket bend	5	139.000	1/100			6.951	
	400mm dia MJ colar	4	98.000	1/100			3.920	
	450mm dia MJ colar	6	113.000	1/100			6.781	
	Total Quantity						75.933 quintal	
	Total Deducted Quantity						0.000 quintal	
	Net Total Quantity						75.933 quintal	
	Say 75.933 quintal @ Rs 21145.26 / quintal						**Rs 1605623.03**	
18	od220746/2022_2023 Providing, laying and fixing C.I. sluice valves (with cap) and connecting lead dwc pipe of 250mm dia to the nearest manhole considering an average distance. all completme with bolts, nuts, rubber installation etc. cost include all necessary specials, labour ,material,etc all complete. 250mm dia							
		2					2.000	
	Total Quantity						2.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						2.000 no	
	Say 2.000 no @ Rs 49733.46 / no						**Rs 99466.92**	
19	od220773/2022_2023 Supplying and fixing C.I double acting air valve of approved quality with bolts, nuts, rubber placing including cost of air valves, specials, labour, hire charges etc. complete 100 mm dia							
	for 2 pumping mains	7					7.000	
	Total Quantity						7.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						7.000 no	
	Say 7.000 no @ Rs 9657.75 / no						**Rs 67604.25**	
20	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3(1 cement : 1.5 coarse sand :							

Other Engineering Organisations PRICE

	3 graded stone aggregate 20 mm nominal size)							
	For anchor blocks and pipe supports	48	2.000	1.000	0.800		76.801	
	Total Quantity						76.801 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						76.801 cum	
	Say 76.801 cum @ Rs 10954.04 / cum						**Rs 841281.23**	
21	od191113/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	For anchor blocks and pipe supports	48	2.000	1.000	0.800		76.801	
	Total Quantity						76.801 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						76.801 cum	
	Say 76.801 cum @ Rs 1916.05 / cum						**Rs 147154.56**	
22	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@80kg/cum	48				80.0	3840.000	
	Total Quantity						3840.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						3840.000 kilogram	
	Say 3840.000 kilogram @ Rs 98.30 / kilogram						**Rs 377472.00**	
23	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	3840.000	0.0508			195.072	
	Total Quantity						195.072 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						195.072 sqm	
	Say 195.072 sqm @ Rs 223.32 / sqm						**Rs 43563.48**	
24	50.2.25.1 Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge							

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	450mm Dia DI pipe	1	3500.000	0.850	1.350	0.1	401.626	
	400mm Dia DI pipe	1	2000.000	0.850	1.350	0.1	229.500	
						Total Quantity	631.126 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	631.126 cum	
						Say 631.126 cum @ Rs 525.82 / cum	**Rs 331858.67**	
25	51.2.3 Filling with Quarry Muck Filling up low lying and water logged areas with local material/ quarry muck, spreading in layers, leveling the top at site and consolidation by ramming, etc complete for improving the CBR value of subgrade							
	450mm Dia DI pipe	1	3500.000	0.850	1.350	0.05	200.813	
	400mm Dia DI pipe	1	2000.000	0.850	1.350	0.05	114.750	
						Total Quantity	315.563 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	315.563 cum	
						Say 315.563 cum @ Rs 902.34 / cum	**Rs 284745.12**	
26	od211147/2022_2023 CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 350mm.							
		2					2.000	
						Total Quantity	2.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	2.000 each	
						Say 2.000 each @ Rs 50031.50 / each	**Rs 100063.00**	
27	od221313/2022_2023 Construction valve chamber of suitable size for air valves and Scour valves in the pumping mains includign eartwprk exacavation by manually/mechnaically, backfilling the trenhes ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggreagates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form waork and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplyimg and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete							
		1					1.000	
						Total Quantity	1.000 set	
						Total Deducted Quantity	0.000 set	
						Net Total Quantity	1.000 set	

Other Engineering Organisations
PRICE

	Say 1.000 set @ Rs 959999.99 / set						**Rs 959999.99**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
6 Laying of pipes under NH 66 by HDD method to Muttar STP-1								
1	od218400/2022_2023 Drilling of 500mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 400mm dia M.S casing pipe of minimum 6mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	For 200mm Dia pipe	2	40.000				80.000	
	Total Quantity						80.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						80.000 metre	
	Say 80.000 metre @ Rs 6317.40 / metre						**Rs 505392.00**	
2	od218401/2022_2023 Drilling of 900mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 800mm dia M.S casing pipe of minimum 12mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	For 450mm Dia	2	40.000				80.000	
	Total Quantity						80.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						80.000 metre	
	Say 80.000 metre @ Rs 21071.93 / metre						**Rs 1685754.40**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
7 Laying of pipes under railway lines by HDD method to Muttar STP -2								
1	od218400/2022_2023 Drilling of 500mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 400mm dia M.S casing pipe of minimum 6mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	For 200mm Dia pipe	2	40.000				80.000	
	Total Quantity						80.000 metre	

Other Engineering Organisations
PRICE

	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						80.000 metre	
	Say 80.000 metre @ Rs 6317.40 / metre						**Rs 505392.00**	
2	od218401/2022_2023 Drilling of 900mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 800mm dia M.S casing pipe of minimum 12mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	For 400mm Dia pipe	1	40.000				40.000	
	Pumping main							
	For 450mm Dia	1	40.000				40.000	
	Total Quantity						80.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						80.000 metre	
	Say 80.000 metre @ Rs 21071.93 / metre						**Rs 1685754.40**	
3	od218406/2022_2023 Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	For 250mm Dia pipe	1	40.000				40.000	
	Total Quantity						40.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						40.000 metre	
	Say 40.000 metre @ Rs 10646.31 / metre						**Rs 425852.40**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
8 ROAD RESTORATION CHARGES								
1	od209801/2022_2023 Road Restoration Charges for BM&BC as per the directions of Engineer (PWD Road)							
	(0m to 1.5m)70% of sewer lines Tar roads							
	200mm dia pipe	1	42668.580	0.750	1.500	0.7	33601.507	
	250mm dia pipe	1	600.000	0.750	1.500	0.7	472.500	
	300mm	1	42.000	0.750	1.500	0.7	33.075	

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	0 to 3m (70% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	1.350	1.500	0.7	57250.657	
	250mm dia pipe	1	1023.970	1.350	1.500	0.7	1451.478	
	300mm dia pipe	1	520.790	1.350	1.500	0.7	738.220	
	400mm dia pipe	1	1535.950	1.500	1.500	0.7	2419.122	
	450mm dia pipe	1	335.000	1.600	1.500	0.7	562.800	
	500 mm dia pipe	1	10.000	1.650	1.500	0.7	17.325	
	0 to 4m70% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950	1.500	0.7	5530.859	
	250mm dia pipe	1	1169.270	0.950	1.500	0.7	1166.347	
	300mm dia	1	266.550	0.950	1.500	0.7	265.884	
	400mm dia pipe	1	1268.370	1.100	1.500	0.7	1464.968	
	450mm	1	353.000	1.200	1.500	0.7	444.780	
	Up to 4.5m)70% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	1916.120	0.950	1.500	0.7	1911.330	
	250mm dia pipe	1	824.140	0.950	1.500	0.7	822.080	
	300mm dia pipe	1	441.500	0.950	1.500	0.7	440.397	
	400mm dia pipe	1	331.180	1.100	1.500	0.7	382.513	
	450mm dia pipe	1	106.000	1.200	1.500	0.7	133.560	
	Above 4.5m)70% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	2184.000	0.950	1.500	0.7	2178.540	
	250mm dia pipe	1	832.000	0.950	1.500	0.7	829.920	
	300mm dia pipe	1	329.000	0.950	1.500	0.7	328.178	
	400mm dia pipe	1	449.000	1.100	1.500	0.7	518.595	
	450mm dia pipe	1	499.000	1.200	1.500	0.7	628.740	
	Total Quantity						113593.375 per sqm	
	Total Deducted Quantity						0.000 per sqm	
	Net Total Quantity						113593.375 per sqm	
	Say 113593.375 per sqm @ Rs 3167.05 / per sqm						**Rs 359755898.29**	
2	od209802/2022_2023							

Other Engineering Organisations PRICE

	Road Restoration Charges for CC roads as per the directions of Engineer (PWD Road)							
	(0m to 1.5m)10% of sewer lines Tar roads							
	200mm dia pipe	1	42668.580	0.750	1.500	0.1	4800.216	
	250mm dia pipe	1	600.000	0.750	1.500	0.1	67.500	
	300mm	1	42.000	0.750	1.500	0.1	4.726	
	0 to 3m (10% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	40388.470	1.350	1.500	0.1	8178.666	
	250mm dia pipe	1	1023.970	1.350	1.500	0.1	207.354	
	300mm dia pipe	1	520.790	1.350	1.500	0.1	105.460	
	400mm dia pipe	1	1535.950	1.500	1.500	0.1	345.589	
	450mm dia pipe	1	335.000	1.600	1.500	0.1	80.400	
	500mm dia pipe	1	10.000	1.650	1.500	0.1	2.475	
	0 to 4m10% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	5544.720	0.950	1.500	0.1	790.123	
	250mm dia pipe	1	1169.270	0.950	1.500	0.1	166.621	
	300mm dia	1	266.550	0.950	1.500	0.1	37.984	
	400mm dia pipe	1	1268.370	1.100	1.500	0.1	209.282	
	450mm	1	353.000	1.200	1.500	0.1	63.540	
	Up to 4.5m)10% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	1916.120	0.950	1.500	0.1	273.048	
	250mm dia pipe	1	824.140	0.950	1.500	0.1	117.440	
	300mm dia pipe	1	441.500	0.950	1.500	0.1	62.914	
	400mm dia pipe	1	331.180	1.100	1.500	0.1	54.645	
	450mm dia pipe	1	106.000	1.200	1.500	0.1	19.080	
	Above 4.5m)10% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	2184.000	0.950	1.500	0.1	311.220	
	250mm dia pipe	1	832.000	0.950	1.500	0.1	118.560	
	300mm dia pipe	1	329.000	0.950	1.500	0.1	46.883	
	400mm dia pipe	1	449.000	1.100	1.500	0.1	74.086	
	450mm dia pipe	1	499.000	1.200	1.500	0.1	89.820	

Other Engineering Organisations
PRICE

	Total Quantity						16227.632 per sqm	
	Total Deducted Quantity						0.000 per sqm	
	Net Total Quantity						16227.632 per sqm	
	Say 16227.632 per sqm @ Rs 4195.88 / per sqm						**Rs 68089196.56**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	9 Household Connection							
1	od191098/2022_2023 Carrying out Household Survey for Sewerage System including all Preparatory Works, Tool Preparation, Data Collection Charges, Interviews, Data Entry, Field level monitoring, Data Verification all allied works							
	Residential connection	12525					12525.000	
	Commercial Connection	256					256.000	
	Total Quantity						12781.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						12781.000 each	
	Say 12781.000 each @ Rs 74.41 / each						**Rs 951034.21**	
2	od220827/2022_2023 Providing sewer connection to the existing households and commercialunits including the cost for all suppying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works,Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge							
	Residential connection	12525					12525.000	
	Commercial Connection	256					256.000	
	Total Quantity						12781.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						12781.000 no	

Other Engineering Organisations PRICE

	Say 12781.000 no @ Rs 14900.62 / no						**Rs 190444824.22**	
3	od209948/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 160mm dia uPVC SN8 pipes having including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 160 mm nominal outer dia pipes.							
	Commercial Connection(Taking average length of 10m)	256	10.000				2560.000	
	Total Quantity						2560.000 per metre	
	Total Deducted Quantity						0.000 per metre	
	Net Total Quantity						2560.000 per metre	
	Say 2560.000 per metre @ Rs 981.33 / per metre						**Rs 2512204.80**	
4	od217343/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.							
	Taking average length of 30m for 6 houses to single MH	12525/6	30.000				62625.000	
	Total Quantity						62625.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						62625.000 metre	
	Say 62625.000 metre @ Rs 512.22 / metre						**Rs 32077777.50**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
10 Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements								
1	od191082/2022_2023 Providing Advanced odor control mechanism as directed including supplying, erecting and testing cost of all materials, labour and conveyence charges, hire for tools and equipments etc complte all per the directions of Engineer in charge							
		2					2.000	
	Total Quantity						2.000 each	

Other Engineering Organisations PRICE

	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 200000.00 / each						**Rs 400000.00**	
2	od191083/2022_2023 Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 4556258.00 / no						**Rs 4556258.00**	
3	od209980/2022_2023 Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 862597.00 / set						**Rs 862597.00**	
4	od209981/2022_2023 Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 890423.00 / set						**Rs 890423.00**	
5	od222611/2022_2023							

Other Engineering Organisations
PRICE

	Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with Collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications							
		5					5.000	
	Total Quantity						5.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						5.000 set	
	Say 5.000 set @ Rs 20000.00 / set						**Rs 100000.00**	
6	od222612/2022_2023 Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 5999999.99 / set						**Rs 5999999.99**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
11 Utility shifting works and its restoration as directed by the Department								
Lump-Sum Total						**Rs 20340000.00**		
	Sl No	Description	No	L	B	D	CF	Quantity
Remark	**12 Additional cost for SCADA, Solar system for sewer network system**							
Lump-Sum Total						**Rs 10000000.00**		
	Sl No	Description	No	L	B	D	CF	Quantity
Remark	**13 Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years**							
Lump-Sum Total						**Rs 168175827.47**		
	Provision for GST payments (in %) @						**18.0%**	
Amount reserved for GST payments						**345019540.96**		

Other Engineering Organisations
PRICE

Total	**2261794768.96**
Lumpsum for round off	**5231.04**
	TOTAL Rs 2261800000.00
	Rounded Total Rs 2,26,18,00,000
	Rupees Two Hundred Twenty Six Crore Eighteen Lakh Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Data Analysis

Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Muttar Collection System
1 Specification Code: 15.43.2

15.43 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:

15.43.2 Bituminous road

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 36 sqm consider a road 6 metres wide and 6 metres length wise 30 cm average depth = 10.80 cubic metre LABOUR: For cutting road taking out soling and metalling including sorting and screening				
0114	Beldar	Day	9.6	558.00	5356.80
0115	Coolie	Day	4.8	558.00	2678.40
9999	Sundries-Labour for stacking of serviceable material and disposal of unserviceable material within 50 metre lead	L.S	107.64	2.00	215.28
				TOTAL	8250.48
				Add Water Charges @ 1%	82.50
				TOTAL	8332.98
				Add CPOH @ 15%	1249.95
				TOTAL	9582.93
				Cost of 36.0 sqm	9582.93
				Cost per sqm	266.19
				Say	266.2

	Cost index **35.59 %**				94.74

Other Engineering Organisations PRICE

	Total with Cost index				360.94

2 Specification Code: od201716/2022_2023

od201716/2022_2023 :Cutting and removal of the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffice diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation. Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:

Details of cost for 36 sqm

Consider 6m wide and 6m length and 30cm average depth=10.8 cum

Code	Description	Unit	Quantity	Rate	Amount
0047	Concrete joint cutting machine	Day	0.50000	900.00	450.00
0069	Generator 250 KVA	hour	0.50000	350.00	175.00
9999	Sundries	L.S	200.00000	2.00	400.00
0114	Beldar	Day	5.00000	558.00	2790.00
0115	Coolie	Day	2.50000	558.00	1395.00
				TOTAL	5210.00
	cost for 36.0 sqm				5210.00
	cost for one sqm				144.72
	say				144.72

	Add Water Charges @ 1.0%				**1.44**
	Add CPOH @ 15.0%				**21.92**
	Cost index **35.59 %**				59.82
	Total with Cost index				227.92
	Say				227.92

Other Engineering Organisations PRICE

3 Specification Code: 16.83	

16.83 Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm LABOUR:				
0114	Beldar	Day	0.25	558.00	139.50
0115	Coolie	Day	1.0	558.00	558.00
9999	Sundries-	L.S	2.7	2.00	5.40
				TOTAL	702.90
				Add Water Charges @ 1%	7.03
				TOTAL	709.93
				Add CPOH @ 15%	106.49
				TOTAL	816.42
				Cost of 10.0 sqm	816.42
				Cost per sqm	81.64
				Say	81.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				29.06
	Total with Cost index				110.71

4 Specification Code: 15.2.2	

15.2 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.

15.2.2 Nominal concrete 1:4:8 leaner mix (including equivalent design mix)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	0.88	558.00	491.04
0115	Coolie	Day	0.55	558.00	306.90
9999	Sundries-	L.S	1.95	2.00	3.90
				TOTAL	801.84
				Add Water Charges @ 1%	8.02
				TOTAL	809.86
				Add CPOH @ 15%	121.48
				TOTAL	931.34
				Cost of 1.0 cum	931.34
				Say	931.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				331.47
	Total with Cost index				1262.82

5 Specification Code: 15.3

15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	2.65	558.00	1478.70
0115	Coolie	Day	0.72	558.00	401.76
9999	Sundries-	L.S	7.02	2.00	14.04

TOTAL	1894.50
Add Water Charges @ 1%	18.95
TOTAL	1913.45
Add CPOH @ 15%	287.02
TOTAL	2200.47
Cost of 1.0 cum	2200.47
Say	2200.45

	Cost index **35.59 %**				783.14
	Total with Cost index				2983.59

6 Specification Code: 15.9.2

15.9 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in- Charges:

15.9.2 In cement mortar

Other Engineering Organizations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	1.3	558.00	725.40
0115	Coolie	Day	1.04	558.00	580.32
9999	Sundries-	L.S	2.73	2.00	5.46
				TOTAL	1311.18
				Add Water Charges @ 1%	13.11
				TOTAL	1324.29
				Add CPOH @ 15%	198.64
				TOTAL	1522.93

Cost of 1.0 cum	1522.93
Say	1522.95

	Cost index **35.59 %**				542.02
	Total with Cost index				2064.97

7 Specification Code: 100.1.1

SUBHEAD : **100.0**

KWA APPROVED DATA

100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidatingeach deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :
All kinds of soil
(Ref. Item No. 2.10.1 of DSR)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 100 m3 Materials				
2.8.1	Rate as per item Number2.8.1 of SH: Earth Work (DSR)	cum	100.0	219.00	21900.00(A)
2.25	Rate as per item Number2.25 of SH: Earth Work (DSR)	cum	100.0	190.70	19070.00(A)
				TOTAL	40970.00

Cost of 100.0 cum	40970.00
Cost of 1 cum	409.70
Say	409.7

	Cost index **35.59 %**				145.81
	Total with Cost index				555.51

8 Specification Code: 100.1.2

SUBHEAD : 100.0

KWA APPROVED DATA

100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m
All kinds of soil
(Ref. Item No. 2.11 of DSR)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 100 m3 Materials				
2.8.1	Rate as per item Number2.8.1 of SH: Earth Work	cum	100.0	219.00	21900.00(A)
2.25	Rate as per item Number2.25 of SH: Earth Work	cum	100.0	190.70	19070.00(A)
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work	cum	100.0	78.45	7845.00
				TOTAL	48815.00

Cost of 100.0 cum	48815.00
Cost of 1 cum	488.15
Say	488.15

	Cost index **35.59 %**				173.73
	Total with Cost index				661.88

9 Specification Code: 100.1.3

SUBHEAD : **100.0**

KWA APPROVED DATA

100.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m
All kinds of soil
(Ref. Item No. 2.12 of DSR)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	(Ref. Item No. 2.12 of DSR) Details of Cost For 100 m3 Materials				
2.8.1	Rate as per item Number2.8.1 of SH: Earth Work (DSR)	cum	100.0	219.00	21900.00(A)

2.25	Rate as per item Number2.25 of SH: Earth Work (DSR)	cum	100.0	190.70	19070.00(A)
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift	cum	100.0	78.45	7845.00
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift	cum	100.0	78.45	7845.00(A)

TOTAL	56660.00
Cost of 100.0 cum	56660.00
Cost of 1 cum	566.60
Say	566.6

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				201.65
	Total with Cost index				768.25

10 Specification Code: 100.1.4

SUBHEAD : **100.0**

KWA APPROVED DATA

100.1.4 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m in depth but not exceeding 6 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 4.5m to 6.0m
All kinds of soil.
(Ref. Item No. 2.12 of DSR)

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 100 m3 Materials				
2.8.1	Rate as per item Number2.8.1 of SH: Earth Work (DSR)	cum	100.0	219.00	21900.00(A)
2.25	Rate as per item Number2.25 of SH: Earth Work (DSR)	cum	100.0	190.70	19070.00(A)
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift 1.5 m to 3 m	cum	100.0	78.45	7845.00
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift 3 m to 4.5 m	cum	100.0	78.45	7845.00(A)
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift 4.5 m to 6.0 m	cum	100.0	78.45	7845.00
				TOTAL	64505.00
				Cost of 100.0 cum	64505.00
				Cost of 1 cum	645.05
				Say	645.05

	Cost index **35.59 %**				229.57

Other Engineering Organisations PRICE

	Total with Cost index				874.62

11 Specification Code: 100.8.1

100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost for 10m Pole required for vertical Post = 6x1.65=9.90m				
KW14	Casuarina Pole girth 15cm to 24cm. Hire Charges of Casurania pole (25% of cost as hire) Quantity is taken as 1/4 of 9.9	metre	2.475	22.13	54.77
9999	Sundries-Carriage of Casurania pole	L.S	3.0	2.00	6.00
KW15	Red Coloured Flourescent caution tape	metre	21.2	1.28	27.14
0114	Beldar Labour	Day	0.2	558.00	111.60
				TOTAL	199.51
				Add Water Charges @ 1%	2.00
				TOTAL	201.51
				Add CPOH @ 15%	30.23
				TOTAL	231.74
				Cost of 10.0 metre	231.74
				Cost per metre	23.17
				Say	23.15

Other Engineering Organisations PRICE

	Cost index **35.59 %**				4.86
	Total with Cost index				28.01

12 Specification Code: 2.16.1

2.16 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).

2.16.1 Depth not exceeding 1.5m

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a trench 30m long and 1.5 m deep. Area = 2 x 30x 1.5 = 90 sqm. MATERIAL: The material can based four times on the same work and after use of material credit is give @ 75% of cost poling boards of				
1198	Second class kail wood in planks Second class kail wood in planks 90x0.038 = 3.42 cum = 3420 cudm Qty taken for cost of using once after deducting for credit = 3420x1/4x1/4 = 213.75 cudm Wallings 100mmx 100 mm of	10 cudm	213.75	260.00	5557.5
1197	Second class kail wood in scantling 4x30x0.10x1.10 = 1.20cum= 1200cudm Qty taken for cost of using once after deducting for credit = 1200x1/4x1/4 = 75 cudm	10 cudm	75.0	260.00	1950.0

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter long 2x17x1.50 = 51 m Qty taken for cost of using once after deducting for credit =51x1/4x 1/4=3.1875m CARRIAGE: Poling boards = 3.42 cum Walling = 1.20 cum. Balli struts : 3.14/4x(0.125)3x51= 0.63cum Total of carriage = 5.25x1/4 = 1.3125 cum	metre	3.1875	40.00	127.50
2204	Carriage of Timber	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	8741.97
Add Water Charges @ 1%	87.42
TOTAL	8829.39
Add CPOH @ 15%	1324.41
TOTAL	10153.80
Cost of 90.0 sqm	10153.80
Cost per sqm	112.82
Say	112.8

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				40.15
	Total with Cost index				152.95

13 Specification Code: 2.16.2

2.16 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area

timbered).

2.16.2 Depth exceeding 1.5 m but not exceeding 3 m

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a trenches 30 m long and 1.5m deep Area = 2x 30x1.5 = 90 sqm MATERIAL: The Material can be used four times on the same work and after use of material credit is given @ 75% of cost Poling boards of				
1198	Second class kail wood in planks 90x0.038 = 3.42 cum = 3420 cudm qty taken for cost of using once after deducting for credit = 3420x1/4x1/4 = 213.75 cudm Walings 100 mmx 100 mm of	10 cud m	213.75	260.00	5557.5
1197	Second class kail wood in scantling 4x30x0.10x0.10 =1.20 cum = 1200 cudm Qty taken for cost of using once after deducting for credit = 1200x1/4x1/4= 75 cudm	10 cud m	75.0	260.00	1950.0

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter and 1.50m long 2x17x1.50 = 51m Qty taken for cost of using once after deducting for credit=51x1/4x1/4=3.1875m CARRIAGE: Poling boards = 3.42 cum Waling = 1.20 cum Balli struts : 3.14/4 x (0.125) 3x51 = 0.63 cum Total of carriage = 5.25x/4 = 1.3125 cum	metre	3.1875	40.00	127.50
2204	Carriage of Timber	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	0.75	679.00	509.25
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-	L.S	40.43	2.00	80.86

TOTAL	9496.76
Add Water Charges @ 1%	94.97
TOTAL	9591.73
Add CPOH @ 15%	1438.76
TOTAL	11030.49
Cost of 90.0 sqm	11030.49
Cost per sqm	122.56
Say	122.55

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				43.62
	Total with Cost index				166.17

14 Specification Code: 2.16.3

2.16 Close timbering in trenches including strutting, shoring and packing cavities

(wherever required) complete (Measurements to be taken of the face area timbered).

2.16.3 Depth exceeding 3 m but not exceeding 4.5 m

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a trench 30 m long and 1.5m deep Area = 2x 30 x 1.5 = 90 sqm. MATERIAL: The Material can be used for times on the same work and after use of material credit is given @ 75% of cost Poling boards of				
1198	Second class kail wood in planks 90x0.038 = 3.42 cum = 340cudm Qty taken for cost of using once after deducting for credit=3420x1/4x1/4 =213.75 cudm Wallings 100mmx 100mm of	10 cud m	213.75	260.00	5557.5
1197	Second class kail wood in scantling 4x30x0.10x0.10 = 1.20 cum = 1200 dm3 Qty taken for cost of using once after deducting for credit = 1200x1/4x1/4 = 75 cudm	10 cud m	75.0	260.00	1950.0

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter and 1.5m long 2x17x1.5 =51m Qty taken for cost of using once after deducting for credit = 51x1/4x1/4 = 3.1875 m CARRIAGE: Poling boards = 3.42 cum Walling - = 1.20 cum. Balli struts:3.14/4x(0.125)3x51 = 0.63 cum Total of carriage = 5.25x1/4 = 1.3125 cum.	metre	3.1875	40.00	127.50
2204	Carriage of Timber LABOUR:	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	1.5	679.00	1018.50
0114	Beldar	Day	4.0	558.00	2232.00
9999	Sundries-	L.S	80.73	2.00	161.46

Other Engineering Organisations
PRICE

TOTAL	11202.61
Add Water Charges @ 1%	112.03
TOTAL	11314.64
Add CPOH @ 15%	1697.20
TOTAL	13011.84
Cost of 90.0 sqm	13011.84
Cost per sqm	144.58
Say	144.6

	Cost index **35.59 %**				51.46
	Total with Cost index				196.06

15 Specification Code: od203302/2022_2023

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od203302/2022_2023 :Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete. (Refernce KWA approved data no.100.6.1)

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.	sqm	1.00000	668.87	668.87
				TOTAL	668.87
				cost for one sqm	668.87
	say				668.87

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**6.68**
	Add CPOH @ 15.0%				**101.33**
	Cost index **35.59 %**				0.00
	Total with Cost index				776.89

	Say				776.89

16 Specification Code: 100.7.1

100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete.
NEW DATA (Prepared based on PHED SDB - Item No.1070

Code	Description	Unit	Quantity	Rate	Amount
0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges of Engine (Per Day) charges for cost of service of operating staff, cost of lubricating oil, diesel / petrol / kerosene oil, other consumables for running the plant and machinery and all the taxes.	Day	1.0	700.00	700.00
				TOTAL	700.00
				Add Water Charges @ 1%	7.00
				TOTAL	707.00
				Add CPOH @ 15%	106.05
				TOTAL	813.05
				Cost of 29.84 Kwh	813.05
				Cost per Kwh	27.25
				Say	27.25

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				9.70
	Total with Cost index				36.95

17 Specification Code: 100.7.2

100.7.2 Bailing out water with engine and pumpset above 5 HP upto 10 HP including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070

Code	Description	Unit	Quantity	Rate	Amount
0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges of Engine (Per Day) charges for cost of service of operating staff, cost of lubricating oil, diesel / petrol / kerosene oil, other consumables for running the plant and machinery and all the taxes.	Day	1.0	700.00	700.00
				TOTAL	700.00
				Add Water Charges @ 1%	7.00
				TOTAL	707.00
				Add CPOH @ 15%	106.05
				TOTAL	813.05
				Cost of 59.68 Kwh	813.05
				Cost per Kwh	13.62
				Say	13.6

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				4.84
	Total with Cost index				18.44

18 Specification Code: 60.2.7

60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible

Code	Description	Unit	Quantity	Rate	Amount
	1 Day				
0115	Coolie	Day	1.0	558.00	558.00
				TOTAL	558.00
				Add Water Charges @ 1%	5.58
				TOTAL	563.58
				Add CPOH @ 15%	84.54
				TOTAL	648.12
				Cost of 1.0 Day	648.12
				Cost per Day	648.12
				Say	648.1

	Cost index **35.59 %**				230.66
	Total with Cost index				878.76

Other Engineering Organisations
PRICE

19 Specification Code: od191120/2022_2023

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od191120/2022_2023 :Supply, Delivery and laying of 200mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 200mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 200mm dia ID SN 8 DWC pipe	metre	1.00000	417.00	417.00

MR	Laying pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 200 mm nominal outer dia pipes.(GWSSB SOR 22-23	metre	1.00000	33.00	33.00

				TOTAL	450.00
				cost for one metre	450.00
	say				450.00

	Add Water Charges @ 1.0%				**4.50**
	Add CPOH @ 15.0%				**68.17**
	Cost index **35.59 %**				0.00
	Total with Cost index				522.68
	Say				522.67

Other Engineering Organisations
PRICE

20 Specification Code: od191121/2022_2023

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od191121/2022_2023 :Supply, Delivery and laying of 250mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 250mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 250mm dia ID SN 8 DWC pipe (Rate taken from TWAD SoR 21-22)	metre	1.00000	680.00	680.00

MR	Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 250 mm nominal outer dia pipes. (GWSSB SOR 22-23)	metre	1.00000	42.00	42.00

				TOTAL	722.00
				cost for one metre	722.00
	say				722.00

	Add Water Charges @ 1.0%				**7.22**
	Add CPOH @ 15.0%				**109.38**
	Cost index **35.59 %**				0.00
	Total with Cost index				838.60
	Say				838.60

Other Engineering Organisations
PRICE

21 Specification Code: od191122/2022_2023

od191122/2022_2023 :Supply, Delivery and laying of 300mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 300mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 300mm dia ID SN 8 DWC pipe (Rate taken from TWAD SoR 21-22)	metre	1.00000	915.00	915.00

MR	Laying pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 300 mm nominal outer dia pipes.(GWSSB SOR 22-23	metre	1.00000	62.00	62.00

				TOTAL	977.00
				cost for one metre	977.00
	say				977.00

	Add Water Charges @ 1.0%				**9.77**
	Add CPOH @ 15.0%				**148.01**
	Cost index **35.59 %**				0.00
	Total with Cost index				1134.79
	Say				1134.79

Other Engineering Organisations
PRICE

22 Specification Code: od191126/2022_2023

od191126/2022_2023 :Suupplying conveying and laying pipes and specials ISI marked 400mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion cou[ler for 1 pipe of 6m = Rs 2000 (MR) For taking RAte of pipe work per meter cost of coupler is taken as 5000/6=833.33say 835.00

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 315mm dia PN8 PE 100 sewer pipes (REF 100.98.146)	per metre	1.00000	6806.14	6806.14

MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.9.13)	per metre	1.00000	367.90	367.90
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	535.00	535.00

				TOTAL	7709.04
				cost for one per metre	7709.04
	say				7709.04

	Add Water Charges @ 1.0%				**77.09**
	Add CPOH @ 15.0%				**1167.91**
	Cost index **35.59 %**				0.00
	Total with Cost index				8954.05
	Say				8954.05

Other Engineering Organisations
PRICE

23 Specification Code: od191127/2022_2023

od191127/2022_2023 :Suupplying conveying and laying pipes and specials ISI marked 450mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion cou[ler for 1 pipe of 6m = Rs 3100 (MR) For taking RAte of pipe work per meter cost of coupler is taken as 3100/6=516.67say 520

Code	Description	Unit	Quantity	Rate	Amount

MR	Cost of450mm dia PN8 PE 100 sewer pipes (KWA.98.147)	per metre	1.00000	7914.62	7914.62
MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.10.11	metre	1.00000	407.60	407.60
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	700.00	700.00

				TOTAL	9022.22
				cost for one per metre	9022.22
	say				9022.22

	Add Water Charges @ 1.0%				**90.22**
	Add CPOH @ 15.0%				**1366.86**
	Cost index **35.59 %**				0.00
	Total with Cost index				10479.31
	Say				10479.31

Other Engineering Organisations
PRICE

24 Specification Code: od204173/2022_2023

od204173/2022_2023 :Supplying conveying and laying pipes and specials ISI marked 500 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion cou[ler for 1 pipe of 6m = Rs 3100 (MR) For taking RAte of pipe work per meter cost of coupler is taken as 3100/6=516.67say 520

Code	Description	Unit	Quantity	Rate	Amount
MR	PE Pipe, PE100, PN8, 500mm dia, conforming to IS 4984/2016 (Ref 100.98.148)	metre	1.00000	10082.40	10082.40
MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.10.15	per metre	1.00000	893.54	893.54
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	1100.17	1100.17
				TOTAL	12076.11
				cost for one per metre	12076.11
	say				12076.11

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**120.76**
	Add CPOH @ 15.0%				**1829.53**
	Cost index **35.59 %**				0.00
	Total with Cost index				14026.40
	Say				14026.40

25 Specification Code: 7.1.1

7.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:

7.1.1 Cement mortar 1:6 (1 cement : 6 coarse sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL				
1157	Stone for masonry work	cum	1.0	1100.00	1100.00
1154	Through and bond stone size 24 x 24 x 39cm CARRIAGE:	100 nos	7.0	5000.00	350.0
2215	Carriage of Soling stone & masonry stone 7.00x24cmx39cm = 0.16 cum 1.00 cum + 0.16 cum. = 1.16 cum Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	1.16	122.08	141.61
3.11	Rate as per item Number3.11 of SH: Mortars LABOUR:	cum	0.33	3356.15	1107.53
0125	Mason (for plain stone work) 2nd class	Day	1.07	679.00	726.53
0114	Beldar	Day	1.07	558.00	597.06
0115	Coolie	Day	0.71	558.00	396.18
0101	Bhisti	Day	0.09	617.00	55.53
9999	Sundries-Cement concrete 1:6:12	L.S	45.76	2.00	91.52
9999	Sundries-	L.S	4.42	2.00	8.84
				TOTAL	4574.80
				Add Water Charges @ 1%	45.75
				TOTAL	4620.55
				Add CPOH @ 15%	693.08
				TOTAL	5313.63
				Cost of 1.0 cum	5313.63
				Cost per cum	5313.63
				Say	5313.65

Other Engineering Organisations PRICE

	Cost index **35.59 %**				1891.13
	Total with Cost index				7204.78

26 Specification Code: od191128/2022_2023

**od191128/2022_2023 :Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:
Cement mortar 1:6 (1 cement : 6 coarse sand) excluding cost of rubble. Rubble can be taken from the stacked qty obtained from dismantled work**

Details of cost for 1 cum

MATERIAL

Code	Description	Unit	Quantity	Rate	Amount
1154	Through and bond stone size 24 x 24 x 39cm CARRIAGE:	100 nos	7.00000	5000.00	350.00
2215	Soling stone & masonry stone 7.00x24cmx39cm = 0.16 cum 1.00 cum + 0.16 cum. = 1.16 cum Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	1.16000	122.08	141.61
3.11	Rate as per item number3.11of SH:Mortars LABOUR:	cum	0.33000	3356.15	1107.53
0125	Mason (for plain stone work) 2nd class 	Day	1.07000	679.00	726.53
0114	Beldar 	Day	1.07000	558.00	597.06
0115	Coolie 	Day	0.71000	558.00	396.18
0101	Bhisti 	Day	0.09000	617.00	55.53
9999	Sundries Cement concrete 1:6:12	L.S	45.76000	2.00	91.52
9999	Sundries 	L.S	4.42000	2.00	8.84
				TOTAL	3474.80
				cost for one cum	3474.80
	say				3474.80

	Add Water Charges @ 1.0%				**34.74**
	Add CPOH @ 15.0%				**526.43**

Other Engineering Organisations PRICE

	Cost index **35.59 %**				1436.40
	Total with Cost index				5472.39
	Say				5472.39

27 Specification Code: od191129/2022_2023

od191129/2022_2023 :construction of precast drain and cover slab, including cost of, concrete, centering and shuttering, reinforcements, and all other allied activities in including all tools and plants as per the requirements of the Engineer in charge as per the drawings
Rate analysis carried out for 10m length precast drain for the drawing attached

Code	Description	Unit	Quantity	Rate	Amount
5.2.2	Rate as per item number 5.2.2 of SH: Reinforced Cement Concrete	cum	5.00000	6955.49	34777.44
5.9.2	Rate as per item number 5.9.2 of SH: Reinforced Cement Concrete	sqm	56.00000	455.40	25502.54
5.22A.6	Rate as per item number 5.22A.6 of SH: Reinforced Cement Concrete	kg	410.00000	62.42	25591.91
				TOTAL	85871.89
	cost for 10.0 cum				85871.89
	cost for one cum				8587.19
	say				8587.19

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**85.87**
	Add CPOH @ 15.0%				**1300.95**
	Cost index **35.59 %**				3549.75
	Total with Cost index				13523.78
	Say				13523.78

28 Specification Code: 16.68

16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost of 10 sqm MATERIAL:				
8689	Interlocking C.C. paver block (60 mm thick, M-30) Beading Layer 50 mm thick	sqm	10.0	400.00	4000.00
0982	Coarse sand (zone III) = 10x0.050 = 0.50 cum	cum	0.5	1350.00	675.00
2203	Carriage of Coarse sand	cum	0.5	103.77	51.89
0983	Fine sand (zone IV)	cum	0.15	900.00	135.00
2261	Carriage of Fine sand (1 part badarpur sand : 2 parts jamuna sand Laying charges (Based on actual observation)	cum	0.15	103.77	15.57
0123	Mason (brick layer) Ist class	Day	0.5	738.00	369.00
0124	Mason (brick layer)2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
0115	Coolie	Day	0.5	558.00	279.00
				TOTAL	6422.96
				Add Water Charges @ 1%	64.23
				TOTAL	6487.19
				Add CPOH @ 15%	973.08
				TOTAL	7460.27

Other Engineering Organisations PRICE

Cost of 10.0 sqm	7460.27
Cost per sqm	746.03
Say	746.05

	Cost index **35.59 %**				265.52
	Total with Cost index				1011.57

29 Specification Code: 16.84

16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Beading layer 50mm thick				
0982	Coarse sand (zone III) Qty = 10x 0.05 = 0.50 cum	cum	0.5	1350.00	675.00
2203	Carriage of Coarse sand	cum	0.5	103.77	51.89
0983	Fine sand (zone IV)	cum	0.15	900.00	135.00
2261	Carriage of Fine sand (1 part badarpur sand : 2 parts jamuna sand LABOUR:	cum	0.15	103.77	15.57
0123	Mason (brick layer) Ist class	Day	0.5	738.00	369.00
0124	Mason (brick layer)2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
0115	Coolie	Day	0.5	558.00	279.00
				TOTAL	2422.96

Add Water Charges @ 1%	24.23
TOTAL	2447.19
Add CPOH @ 15%	367.08
TOTAL	2814.27
Cost of 10.0 sqm	2814.27
Cost per sqm	281.43
Say	281.45

	Cost index **35.59 %**				100.17
	Total with Cost index				381.62

30 Specification Code: od224799/2022_2023

od224799/2022_2023 :Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge

Details of cost for 10 cum

MATERIAL:

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
0982	Coarse sand (zone III)	cum	2.50000	1350.00	3375.00
2203	Coarse sand	cum	2.50000	103.77	259.43
0296	Stone Aggregate(single size): 12.5 mm nominal size	cum	7.50000	1350.00	10125.00
2202	Stone aggregate below 40 mm nominal size	cum	7.50000	103.77	778.28
0114	Beldar 	Day	0.89000	558.00	496.62
0115	Coolie 	Day	1.07000	558.00	597.06
0101	Bhisti	Day	0.89000	617.00	549.13
				TOTAL	16180.52
	cost for 10.0 cum				16180.52

	cost for one cum				1618.05
	say				1618.05

	Add Water Charges @ 1.0%				**16.18**
	Add CPOH @ 15.0%				**245.13**
	Cost index **35.59 %**				668.86
	Total with Cost index				2548.23
	Say				2548.23

31 Specification Code: od224756/2022_2023

od224756/2022_2023 :Supplying and filling in plinth with Stone dust under floors, including watering, ramming consolidating and dressing complete.
Details of cost for 10 cum
MATERIAL:

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
1159	Stone dust	cum	10.00000	1100.00	11000.00
2267	Stone dust	cum	10.00000	103.77	1037.70
0114	Beldar 	Day	0.89000	558.00	496.62
0115	Coolie 	Day	1.07000	558.00	597.06
0101	Bhisti 	Day	0.35000	617.00	215.95
				TOTAL	13347.33
	cost for 10.0 cum				13347.33
	cost for one cum				1334.73
	say				1334.73

	Add Water Charges @ 1.0%				**13.34**

	Add CPOH @ 15.0%				**202.21**
	Cost index **35.59 %**				551.74
	Total with Cost index				2102.04
	Say				2102.04

Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Muttar sewer network system

1 Specification Code: od209944/2022_2023

**od209944/2022_2023 :Construction of manhole of 1.2m diameter for an average depth of 1.3m (depth up to 1.5m) including, earth work in excavation by mechanical means of depth 0-1.5m including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.
**

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	9.56000	135.90	1299.20
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	4.06000	164.18	666.57
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	0.80000	2548.23	2038.58
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.80000	4678.17	3742.54
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	1.94000	5977.31	11595.98

5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	155.20000	62.42	9687.58
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	0.85000	212.91	180.97
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	12.33000	412.61	5087.48
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.22000	4678.17	1029.20
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	1.94000	2247.40	4359.96
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	6.21000	141.80	880.58
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	6.53000	124.50	812.99
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	9.42000	24.12	227.21
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	1.94000	52.13	101.13

Other Engineering Organisations
PRICE

				TOTAL	44578.97
				cost for one no	44578.97
	say				44578.97

	Add Water Charges @ 1.0%				**445.78**
	Add CPOH @ 15.0%				**6753.71**
	Cost index **35.59 %**				14166.96
	Total with Cost index				65945.44
	Say				65945.44

2 Specification Code: od209947/2022_2023

od209947/2022_2023 :Construction of manhole of 1.2m diameter for an average depth of 1.75m (depth 1.5m to 3m) including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	7.96000	135.90	1081.76
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	5.54000	164.18	909.56
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	0.80000	2548.23	2038.58
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.80000	4678.17	3742.54
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	2.33000	5977.31	13927.13
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	186.40000	62.42	11635.09
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	0.85000	212.91	180.97
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	16.28000	412.61	6717.29
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.22000	4678.17	1029.20
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	2.33000	2247.40	5236.44
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	7.46000	141.80	1057.83
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00

Other Engineering Organisations PRICE

MR	Anticorrosive bituminous paint-outside	sqm	8.80000	124.50	1095.60
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	9.42000	24.12	227.21
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	2.33000	52.13	121.46
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	6.03000	67.54	407.27

				TOTAL	52276.93
				cost for one no	52276.93
	say				52276.93

	Add Water Charges @ 1.0%				**522.76**
	Add CPOH @ 15.0%				**7919.95**
	Cost index **35.59 %**				16869.98
	Total with Cost index				77589.64
	Say				77589.64

Other Engineering Organisations
PRICE

3 Specification Code: od210970/2022_2023

od210970/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 2.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For

1.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	28.92000	135.90	3930.23
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	10.65000	164.18	1748.52
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	5.20000	5977.31	31082.01
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	416.00000	62.42	25966.72
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	31.56000	412.61	13021.97
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	5.20000	2247.40	11686.48
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	16.64000	141.80	2359.55
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	17.28000	124.50	2151.36
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	5.20000	52.13	271.08
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	18.32000	67.54	1237.33
				TOTAL	106196.43

Other Engineering Organisations
PRICE

				cost for one no	106196.43
	say				106196.43

	Add Water Charges @ 1.0%				**1061.96**
	Add CPOH @ 15.0%				**16088.75**
	Cost index **35.59 %**				35769.94
	Total with Cost index				159117.09
	Say				159117.09

4 Specification Code: od209956/2022_2023

od209956/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 3.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.

Office Engineering Organization PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	26.86000	135.90	3650.27
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	12.62000	164.18	2071.95

MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	5.89000	5977.31	35206.36
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	471.20000	62.42	29412.30
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	37.06000	412.61	15291.33
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	5.89000	2247.40	13237.19
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	18.85000	141.80	2672.93
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	20.42000	124.50	2542.29
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.16.1	Rate as per item number 2.16.1 of SH: Earth Work	sqm	14.14000	97.12	1373.28
2.16.2	Rate as per item number 2.16.2 of SH: Earth Work	sqm	14.14000	105.51	1491.91
2.16.3	Rate as per item number 2.16.3 of SH: Earth Work	sqm	2.36000	124.49	293.80
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	5.89000	52.13	307.05
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	16.26000	67.54	1098.20
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	5.66000	67.54	382.28

TOTAL	121772.32
cost for one no	121772.31

Other Engineering Organisations PRICE

	say				121772.31

	Add Water Charges @ 1.0%				**1217.72**
	Add CPOH @ 15.0%				**18448.50**
	Cost index **35.59 %**				41406.03
	Total with Cost index				182844.58
	Say				182844.58

5 Specification Code: od209957/2022_2023

od209957/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 3.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	30.39000	135.90	4130.00
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	14.58000	164.18	2393.74
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12

4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	6.58000	5977.31	39330.70
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	526.40000	62.42	32857.89
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	42.55000	412.61	17556.56
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	6.58000	2247.40	14787.89
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	21.06000	141.80	2986.31
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	23.56000	124.50	2933.22
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.16.1	Rate as per item number 2.16.1 of SH: Earth Work	sqm	14.14000	97.12	1373.28
2.16.2	Rate as per item number 2.16.2 of SH: Earth Work	sqm	14.14000	105.51	1491.91
2.16.3	Rate as per item number 2.16.3 of SH: Earth Work	sqm	7.07000	124.49	880.14
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	19.79000	67.54	1336.62
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	9.19000	67.54	620.69
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	6.58000	52.13	343.02

Other Engineering Organisations
PRICE

				TOTAL	135763.15
				cost for one no	135763.15
	say				135763.15

	Add Water Charges @ 1.0%				**1357.63**
	Add CPOH @ 15.0%				**20568.11**

	Cost index **35.59 %**				46386.91
	Total with Cost index				204075.81
	Say				204075.81

6 Specification Code: od209958/2022_2023

od209958/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 5.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	41.35000	135.90	5619.47
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	20.59000	164.18	3380.47
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	8.87000	5977.31	53018.74
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	709.60000	62.42	44293.23

4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	59.43000	412.61	24521.41
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	8.87000	2247.40	19934.44
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	28.38000	141.80	4024.28
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	32.99000	124.50	4107.26
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	49.48000	121.48	6010.83
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	30.75100	67.54	2076.92
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	20.15000	67.54	1360.93
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	9.55000	67.54	645.01
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	8.87000	52.13	462.39

Other Engineering Organisations
PRICE

				TOTAL	182196.56
				cost for one no	182196.56
	say				182196.56

	Add Water Charges @ 1.0%				**1821.96**
	Add CPOH @ 15.0%				**27602.77**
	Cost index **35.59 %**				62968.66
	Total with Cost index				274589.97
	Say				274589.97

7 Specification Code: od209959/2022_2023

od209959/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 5.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	44.87000	135.90	6097.83
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	22.55000	164.18	3702.26
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	9.56000	5977.31	57143.08
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	764.80000	62.42	47738.82
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	64.93000	412.61	26790.77
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	9.56000	2247.40	21485.14
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	30.59000	141.80	4337.66

Other Engineering Organisations PRICE

MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	36.13000	124.50	4498.19
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	54.19000	121.48	6583.00
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	9.56000	52.13	498.36
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	34.27000	67.54	2314.60
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	23.67000	67.54	1598.67
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	13.07000	67.54	882.75
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	2.47000	67.54	166.82

				TOTAL	196579.13
				cost for one no	196579.13
	say				196579.13

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**1965.79**
	Add CPOH @ 15.0%				**29781.73**
	Cost index **35.59 %**				68111.47
	Total with Cost index				296438.13
	Say				296438.13

8 Specification Code: od209960/2022_2023

od209960/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water

excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	37.82000	135.90	5139.74
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	18.63000	164.18	3058.67
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	8.18000	5977.31	48894.40
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	654.40000	62.42	40847.65
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	53.93000	412.61	22252.06
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	8.18000	2247.40	18383.73
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	26.18000	141.80	3712.32
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	29.85000	124.50	3716.33

Other Engineering Organisations
PRICE

MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	44.77000	121.48	5438.66
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	8.18000	52.13	426.42
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	27.22000	67.54	1838.44
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	16.62000	67.54	1122.51
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	6.02000	67.54	406.59

				TOTAL	167978.70
				cost for one no	167978.70
	say				167978.70

	Add Water Charges @ 1.0%				**1679.78**
	Add CPOH @ 15.0%				**25448.77**
	Cost index **35.59 %**				57893.94
	Total with Cost index				253001.21
	Say				253001.21

Other Engineering Organisations
PRICE

9 Specification Code: od209961/2022_2023

od209961/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 4.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine

and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	34.28000	135.90	4658.65
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	16.66000	164.18	2735.24
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.86
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	7.50000	5977.31	44829.83
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	600.00000	62.42	37452.00
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	48.43000	412.61	19982.70
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	7.50000	2247.40	16855.50
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	24.00000	141.80	3403.20
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	26.70000	124.50	3324.15
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.16.1	Rate as per item number 2.16.1 of SH: Earth Work	sqm	14.14000	97.12	1373.28
2.16.2	Rate as per item number 2.16.2 of SH: Earth Work	sqm	14.14000	105.51	1491.91

Other Engineering Organisations
PRICE

2.16.3	Rate as per item number 2.16.3 of SH: Earth Work	sqm	11.78000	124.49	1466.49
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	7.50000	52.13	390.98
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	23.68000	67.54	1599.35
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	13.08300	67.54	883.63
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	2.48300	67.54	167.70

				TOTAL	153355.79
				cost for one no	153355.78
	say				153355.78

	Add Water Charges @ 1.0%				**1533.55**
	Add CPOH @ 15.0%				**23233.40**
	Cost index **35.59 %**				52643.00
	Total with Cost index				230765.75
	Say				230765.75

Other Engineering Organisations
PRICE

10 Specification Code: od209950/2022_2023

od209950/2022_2023 :Construction of manhole of 1.2m diameter for an average depth of 2.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	19.71000	135.90	2678.59
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	7.65000	164.18	1255.98
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	0.86000	2548.23	2191.48
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.86000	4678.17	4023.23
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	3.59000	5977.31	21458.54
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	287.20000	62.42	17927.02
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	0.85000	212.91	180.97
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	21.78000	412.61	8986.65
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.22000	4678.17	1029.20
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	3.59000	2247.40	8068.17
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	11.49000	141.80	1629.28
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	12.02000	124.50	1496.49
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	9.42000	24.12	227.21
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	3.59000	52.13	187.15
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	11.12000	67.54	751.04
				TOTAL	74960.00
				cost for one no	74959.99

Other Engineering Organisations PRICE

	say				74959.99

	Add Water Charges @ 1.0%				**749.59**
	Add CPOH @ 15.0%				**11356.43**
	Cost index **35.59 %**				24847.17
	Total with Cost index				111913.20
	Say				111913.20

Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Muttar sewer network system
1 Specification Code: od217126/2022_2023

od217126/2022_2023 :Construction of manhole of 3.5m diameter for an average depth of 6.67m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 3.50m diameter.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	137.11000	135.90	18633.50
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	45.67000	164.18	7498.29

MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	2.83000	2548.23	7211.49
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	5.66000	4678.17	26478.47
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	22.21000	5977.31	132756.14
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1776.80000	62.42	110906.59
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	9.34000	212.91	1988.62
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	156.83000	412.61	64710.10
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	22.21000	2247.40	49914.75
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	71.07000	141.80	10077.68
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	81.72000	124.50	10174.14
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	96.21000	121.48	11687.67
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	22.21000	52.13	1157.83
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	108.82000	67.54	7349.92
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	80.53000	67.54	5439.15
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	52.24000	67.54	3528.39
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	23.95000	67.54	1617.63

				TOTAL	476853.89
				cost for one no	476853.90
	say				476853.90

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**4768.53**
	Add CPOH @ 15.0%				**72243.36**
	Cost index **35.59 %**				102381.29
	Total with Cost index				656247.10
	Say				656247.10

2 Specification Code: od217217/2022_2023

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od217217/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.97m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	82.56000	135.90	11220.06
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	32.50000	164.18	5335.99
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67

4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	16.77000	5977.31	100239.55
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1341.60000	62.42	83741.71
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	104.86000	412.61	43266.60
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	16.77000	2247.40	37688.90
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	53.66000	141.80	7608.96
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	56.27000	124.50	7005.62
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	16.77000	52.13	874.23
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	63.67900	67.54	4301.01
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	44.83000	67.54	3027.91
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	25.99000	67.54	1755.42
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	7.15900	67.54	483.53

Other Engineering Organisations
PRICE

				TOTAL	345180.53
				cost for one no	345180.51
	say				345180.51

	Add Water Charges @ 1.0%				**3451.80**
	Add CPOH @ 15.0%				**52294.84**
	Cost index **35.59 %**				77449.22

	Total with Cost index				478376.39
	Say				478376.39

3 Specification Code: od217127/2022_2023

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od217127/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.77m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	80.05000	135.90	10878.94
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	31.40000	164.18	5155.39
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	16.34000	5977.31	97669.31
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1307.20000	62.42	81594.49

4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	101.41000	412.61	41843.08
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	16.34000	2247.40	36722.52
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	52.29000	141.80	7414.69
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	54.38000	124.50	6770.31
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	16.34000	52.13	851.82
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	61.16000	67.54	4130.87
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	42.32000	67.54	2858.38
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	23.48000	67.54	1585.89
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	4.64700	67.54	313.87

Other Engineering Organisations
PRICE

				TOTAL	336420.60
				cost for one no	336420.58
	say				336420.58

	Add Water Charges @ 1.0%				**3364.20**
	Add CPOH @ 15.0%				**50967.71**
	Cost index **35.59 %**				75845.33
	Total with Cost index				466597.84
	Say				466597.84

4 Specification Code: od217128/2022_2023

File Uploaded

od217128/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 4.8m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	67.23000	135.90	9136.68
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	25.88000	164.18	4249.09
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	13.80000	5977.31	82486.93
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1104.00000	62.42	68910.89
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	84.12000	412.61	34709.01
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	13.80000	2247.40	31014.12

Other Engineering Organisations
PRICE

13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	44.16000	141.80	6261.86
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	45.24000	124.50	5632.38
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	13.80000	52.13	719.41
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	48.35600	67.54	3266.06
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	29.51600	67.54	1993.57
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	10.67600	67.54	721.08

				TOTAL	287732.12
				cost for one no	287732.11
	say				287732.11

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**2877.32**
	Add CPOH @ 15.0%				**43591.41**
	Cost index **35.59 %**				65859.92
	Total with Cost index				400060.78
	Say				400060.78

5 Specification Code: od217129/2022_2023

File Uploaded

od217129/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 4.7m including,

earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	66.60000	135.90	9051.06
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	25.52000	164.18	4189.98
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	14.03000	5977.31	83861.71
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1122.40000	62.42	70059.41
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	82.92000	412.61	34213.87
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	14.03000	2247.40	31531.02
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	44.90000	141.80	6366.79
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	44.30000	124.50	5515.35
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11

Other Engineering Organisations PRICE

MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	14.03000	52.13	731.40
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	47.72800	67.54	3223.64
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	28.88800	67.54	1951.15
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	10.04800	67.54	678.66

				TOTAL	290005.08
				cost for one no	290005.09
	say				290005.09

	Add Water Charges @ 1.0%				**2900.05**
	Add CPOH @ 15.0%				**43935.77**
	Cost index **35.59 %**				66988.05
	Total with Cost index				403828.97
	Say				403828.97

Other Engineering Organisations
PRICE

6 Specification Code: od217130/2022_2023

File Uploaded

od217130/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.17m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and

pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	72.51000	135.90	9854.24
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	28.10000	164.18	4613.58
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	15.05000	5977.31	89958.57
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1204.00000	62.42	75152.82
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	91.04000	412.61	37564.29
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	15.05000	2247.40	33823.37
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	48.16000	141.80	6829.06
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	48.73000	124.50	6066.89
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	15.05000	52.13	784.57

Other Engineering Organisations
PRICE

2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	53.63200	67.54	3622.41
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	34.79000	67.54	2349.79
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	15.95000	67.54	1077.29

				TOTAL	310327.92
				cost for one no	310327.91
	say				310327.91

	Add Water Charges @ 1.0%				**3103.27**
	Add CPOH @ 15.0%				**47014.67**
	Cost index **35.59 %**				70956.92
	Total with Cost index				431402.80
	Say				431402.80

Other Engineering Organisations
PRICE

7 Specification Code: od217131/2022_2023

File Uploaded

od217131/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.05m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount

2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	71.59200	135.90	9729.49
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	26.66000	164.18	4377.15
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	14.79000	5977.31	88404.47
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1183.20000	62.42	73854.50
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	88.97000	412.61	36710.18
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	14.79000	2247.40	33239.05
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	47.33000	141.80	6711.37
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	47.60000	124.50	5926.20
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	14.79000	52.13	771.02
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	52.75000	67.54	3562.84
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	33.91200	67.54	2290.48
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	15.07200	67.54	1017.99

TOTAL	305225.78
cost for one no	305225.77

Other Engineering Organisations
PRICE

	say				305225.77

	Add Water Charges @ 1.0%				**3052.25**
	Add CPOH @ 15.0%				**46241.70**
	Cost index **35.59 %**				69875.25
	Total with Cost index				424394.99
	Say				424394.99

8 Specification Code: od217132/2022_2023

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od217132/2022_2023 :Construction of manhole of 4m diameter for an average depth of 6.56m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 4m diameter.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	170.11000	135.90	23118.26
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	51.03000	164.18	8378.32

MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	3.56000	2548.23	9071.70
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	7.12000	4678.17	33308.60
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	30.63000	5977.31	183085.12
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	2450.40000	62.42	152952.22
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	12.29000	212.91	2616.72
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	177.12000	412.61	73082.01
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	30.63000	2247.40	68837.86
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	98.02000	141.80	13899.18
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	92.74000	124.50	11546.13
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	107.99000	121.48	13118.72
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	30.63000	52.13	1596.77
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	134.40300	67.54	9077.84
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	63.16500	67.54	4266.29
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	60.92000	67.54	4114.66
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	27.54500	67.54	1860.44

				TOTAL	619654.37
				cost for one no	619654.38
	say				619654.38

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**6196.54**
	Add CPOH @ 15.0%				**93877.63**
	Cost index **35.59 %**				143423.02
	Total with Cost index				863151.59
	Say				863151.59

9 Specification Code: od217133/2022_2023

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od217133/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 6.49m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	89.10000	135.90	12108.85
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	34.35000	164.18	5639.73
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67

4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	17.90000	5977.31	106993.92
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1432.00000	62.42	89384.42
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	113.85000	412.61	46975.99
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	17.90000	2247.40	40228.46
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	57.28000	141.80	8122.27
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	61.17000	124.50	7615.67
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	17.90000	52.13	933.14
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	70.33600	67.54	4750.63
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	51.49600	67.54	3478.14
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	32.65600	67.54	2205.65
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	13.81600	67.54	933.16

Other Engineering Organisations
PRICE

				TOTAL	368001.07
				cost for one no	368001.07
	say				368001.07

	Add Water Charges @ 1.0%				**3680.01**
	Add CPOH @ 15.0%				**55752.16**
	Cost index **35.59 %**				81590.50

	Total with Cost index				509023.75
	Say				509023.75

10 Specification Code: od217134/2022_2023

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od217134/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 6.69m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Sewer Engineering Organization
PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	91.61000	135.90	12449.97
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	36.46000	164.18	5986.16
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	18.33000	5977.31	109564.16
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1466.40000	62.42	91531.64

4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	117.31000	412.61	48403.63
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	18.33000	2247.40	41194.84
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	58.66000	141.80	8317.95
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	63.05000	124.50	7849.73
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	18.33000	52.13	955.56
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	72.72000	67.54	4911.65
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	53.88000	67.54	3639.16
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	35.04000	67.54	2366.67
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	16.20000	67.54	1094.18

Other Engineering Organisations
PRICE

				TOTAL	376896.34
				cost for one no	376896.34
	say				376896.34

	Add Water Charges @ 1.0%				**3768.96**
	Add CPOH @ 15.0%				**57099.79**
	Cost index **35.59 %**				83275.87
	Total with Cost index				521040.98
	Say				521040.98

11 Specification Code: od217135/2022_2023

File Uploaded

od217135/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	67.23000	135.90	9136.68
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	25.79000	164.18	4234.31
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	14.14000	5977.31	84519.22
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1131.20000	62.42	70608.70
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	83.78000	412.61	34568.72
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	11.78000	2247.40	26474.37

Other Engineering Organisations PRICE

13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	45.25000	141.80	6416.42
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	44.77000	124.50	5573.87
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	14.14000	52.13	737.13
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	48.98400	67.54	3308.48
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	30.14400	67.54	2035.99
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	11.30400	67.54	763.49

				TOTAL	287008.42
				cost for one no	287008.41
	say				287008.41

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**2870.08**
	Add CPOH @ 15.0%				**43481.77**
	Cost index **35.59 %**				67366.87
	Total with Cost index				400727.15
	Say				400727.15

12 Specification Code: od217136/2022_2023

File Uploaded

od217136/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 6.4m including,

earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	87.96000	135.90	11953.93
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	34.86000	164.18	5723.46
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	17.70000	5977.31	105798.45
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1416.00000	62.42	88385.71
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	112.29000	412.61	46332.31
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	17.70000	2247.40	39778.98
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	56.64000	141.80	8031.52
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	60.32000	124.50	7509.84
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11

Other Engineering Organisations PRICE

MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	17.70000	52.13	922.72
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	69.08000	67.54	4665.80
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	50.24000	67.54	3393.31
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	31.40000	67.54	2120.82
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	12.56000	67.54	848.33

				TOTAL	364096.22
				cost for one no	364096.21
	say				364096.21

	Add Water Charges @ 1.0%				**3640.96**
	Add CPOH @ 15.0%				**55160.57**
	Cost index **35.59 %**				80920.98
	Total with Cost index				503818.73
	Say				503818.73

Other Engineering Organisations
PRICE

13 Specification Code: od217137/2022_2023

File Uploaded

od217137/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.1m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the

outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	71.63000	135.90	9734.65
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	27.71000	164.18	4549.55
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.94
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	14.90000	5977.31	89061.98
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1192.00000	62.42	74403.79
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.79
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	89.83000	412.61	37065.03
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	14.90000	2247.40	33486.26
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	47.68000	141.80	6761.00
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	48.07000	124.50	5984.72
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.11
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	14.90000	52.13	776.75

Other Engineering Organizations PRICE

2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	52.75200	67.54	3562.97
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	33.91200	67.54	2290.48
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	15.07200	67.54	1017.99

				TOTAL	307326.21
				cost for one no	307326.20
	say				307326.20

	Add Water Charges @ 1.0%				**3073.26**
	Add CPOH @ 15.0%				**46559.91**
	Cost index **35.59 %**				70374.10
	Total with Cost index				427333.48
	Say				427333.48

Other Engineering Organisations
PRICE

14 Specification Code: od217138/2022_2023

File Uploaded

od217138/2022_2023 :Construction of manhole of 3m diameter for an average depth of 6.49m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of CI manhole cover of 560mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 3m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	112.76000	135.90	15324.29

2.25	Rate as per item number 2.25 of SH: Earth Work	cum	40.40000	164.18	6633.04
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	2.39000	2548.23	6090.27
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	4.78000	4678.17	22361.68
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	21.85000	5977.31	130604.31
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1748.00000	62.42	109108.91
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	6.79000	212.91	1445.69
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	134.32000	412.61	55422.18
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	21.85000	2247.40	49105.69
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	69.92000	141.80	9914.61
MR	Supplying and fixing 560mm dia CI manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	5465.93	5465.93
MR	Anticorrosive bituminous paint-outside	sqm	71.36000	124.50	8884.32
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	88.36000	121.48	10734.05
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	21.85000	52.13	1139.06
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	89.01900	67.54	6012.52
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	65.17000	67.54	4401.71
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	41.33000	67.54	2791.51
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	17.48000	67.54	1180.63

TOTAL	446878.00
cost for one no	446878.00

Other Engineering Organisations
PRICE

	say				446878.00

	Add Water Charges @ 1.0%				**4468.78**
	Add CPOH @ 15.0%				**67702.01**
	Cost index **35.59 %**				100400.35
	Total with Cost index				619449.15
	Say				619449.15

15 Specification Code: od219476/2022_2023

od219476/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.0m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	70.37000	135.90	9563.28
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	27.16000	164.18	4459.13
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.88000	4678.17	8794.96

5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	14.68000	5977.31	87746.91
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1174.40000	62.42	73306.05
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.77
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	88.10000	412.61	36350.94
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.88000	4678.17	8794.96
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	14.68000	2247.40	32991.83
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	46.98000	141.80	6661.76
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	47.12000	124.50	5866.44
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.04
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	14.68000	52.13	765.27
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	51.49600	67.54	3478.04
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	32.65600	67.54	2205.59
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	13.81600	67.54	933.13

Other Engineering Organisations PRICE

				TOTAL	300362.37
				cost for one no	300362.38
	say				300362.38

	Add Water Charges @ 1.0%				**3003.62**
	Add CPOH @ 15.0%				**45504.90**
	Cost index **35.59 %**				104827.17

	Total with Cost index				453698.08
	Say				453698.08

16 Specification Code: od218427/2022_2023

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od218427/2022_2023 :Providing nonclog submercible pumpset of suitable capacity (5 HP) in 20 nos lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size (200mm Dia) electrical installations such as adequate capacity generator set, cables, switch boxes,MCC panels, isolators ,float switches, and cost for connecting KSEB feeder lines from lift manholes integrating with nearby pumping stations and with STP, etc complete necessary for functioning of lifting stations all as directed by Engineer in charge For upto 3MLD (For Muttar STP)

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing nonclog submercible pumpset of suitable capacity (5 HP) in 20 nos lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size (200mm Dia) electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches, and cost for connecting KSEB feeder lines from lift manholes integrating with nearby pumping stations and with STP, etc complete necessary for functioning of lifting stations all as directed by Engineer in charge For upto 3MLD (For Muttar STP)	each	20.00000	394153.18	7883063.60
MR	Cost for connecting KSEB feeder lines from 20 nos lift manholesintegrating with nearby pumping stations and with STP including adequate capacity generator set etc complete. 	L.S	1.00000	15500000.00	15500000.00
				TOTAL	23383063.60
				cost for one set	23383063.60
	say				23383063.60

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**233830.63**
	Add CPOH @ 15.0%				**3542534.13**
	Cost index **35.59 %**				0.00
	Total with Cost index				27159428.37
	Say				27159428.37

Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 2+3B) and Wet-well 2 (Block 3A) with allied components as per standard specifications
1 Specification Code: od216181/2022_2023

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Other Engineering Organisations
PRICE

od216181/2022_2023 :Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 3A of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no

Code	Description	Unit	Quantity	Rate	Amount

MR	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 3A of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	no	1.00000	12937428.00	12937428.00
MR	compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches	set	1.00000	2000000.00	2000000.00
MR	Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 30 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years For 30 HP =30*18135*1.1615	set	4.00000	631914.08	2527656.32

Other Engineering Organisations PRICE

MR	Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 25 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years For 25 HP =25*18135*1.1615	set	1.00000	526595.06	526595.06

				TOTAL	17991679.38
	cost for 1.16 no				17991679.38
	cost for one no				15510068.43
	say				15510068.43

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**155100.68**
	Add CPOH @ 15.0%				**2349775.36**
	Cost index **35.59 %**				0.00
	Total with Cost index				18014944.48
	Say				18014944.48

2 Specification Code: od216182/2022_2023

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od216182/2022_2023 :Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 2 and 3B of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches, Construction of Control room integrally with that required for adjoining STP Components and Pumping main of 400 mm DI K9 class pipes to the adjoining inlet chamber of the STP with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no

Code	Description	Unit	Quantity	Rate	Amount
MR	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 2 and 3B of Muttar Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches, Construction of Control room integrally with that required for adjoining STP Components and Pumping main of 400 mm DI K9 class pipes to the adjoining inlet chamber of the STP with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	no	1.00000	7001842.00	7001842.00
MR	compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches,	set	1.00000	1000000.00	1000000.00

Other Engineering Organisations PRICE

MR	Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 10 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years MR for Submercible pumpset -Av Rs. 18135 per HP(based on KWA estimate approved rates)for 10 HP =Rs181350*11615	set	2.00000	210638.03	421276.06
MR	Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years MR for Submercible pumpset -Av Rs. 18135 per HP(based on KWA estimate approved rates)for 15 HP =Rs272025	set	2.00000	315957.04	631914.08

				TOTAL	9055032.14
	cost for 1.1615 no				9055032.14

Other Engineering Organisations PRICE

	cost for one no				7795981.18
	say				7795981.18

	Add Water Charges @ 1.0%				**77959.81**
	Add CPOH @ 15.0%				**1181091.14**
	Cost index **35.59 %**				0.00
	Total with Cost index				9055032.14
	Say				9055032.14

Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 2 nos for Muttar Collection system
1 Specification Code: 2.10.1.3

Other Engineering Organisations
PRICE

SUBHEAD : 2.0

EARTH WORK

2.10 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m:

2.10.1.3 Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 60 m length of a pipe of an average dia. say 450mm. Slope assumed 1 in 200. Earth work and filling- Minimum depth of trench = 0.75+0.45 =1.20m Average depth = (1.50+1.20)/2 = 1.35 m Width = 0.40 + 0.45 = 0.85 m 60x0.85x1.35 = 68.85 cum 5% for collars = 3.44 cum Total = 72.29 cum				
2.8.1	Rate as per item Number2.8.1 of SH: Earth Work	cum	72.29	219.00	15831.51(A)
2.25	Rate as per item Number2.25 of SH: Earth Work	cum	72.29	190.70	13785.70(A)

TOTAL	29616.00
Cost of 60.0 metre	29616.00
Cost of 1 metre	493.60
Say	493.6

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				175.67
	Total with Cost index				669.27

2 Specification Code: 100.7.1

100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete.
NEW DATA (Prepared based on PHED SDB - Item No.1070

Code	Description	Unit	Quantity	Rate	Amount

0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges of Engine (Per Day) charges for cost of service of operating staff, cost of lubricating oil, diesel / petrol / kerosene oil, other consumables for running the plant and machinery and all the taxes.	Day	1.0	700.00	700.00

TOTAL	700.00
Add Water Charges @ 1%	7.00
TOTAL	707.00
Add CPOH @ 15%	106.05
TOTAL	813.05
Cost of 29.84 Kwh	813.05
Cost per Kwh	27.25
Say	27.25

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				9.70
	Total with Cost index				36.95

3 Specification Code: 60.2.7

60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible

Code	Description	Unit	Quantity	Rate	Amount
	1 Day				
0115	Coolie	Day	1.0	558.00	558.00
				TOTAL	558.00
				Add Water Charges @ 1%	5.58
				TOTAL	563.58

Add CPOH @ 15%	84.54
TOTAL	648.12
Cost of 1.0 Day	648.12
Cost per Day	648.12
Say	648.1

	Cost index **35.59 %**				230.66
	Total with Cost index				878.76

4 Specification Code: 2.16.1

2.16 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).

2.16.1 Depth not exceeding 1.5m

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a trench 30m long and 1.5 m deep. Area = 2 x 30x 1.5 = 90 sqm. MATERIAL: The material can based four times on the same work and after use of material credit is give @ 75% of cost poling boards of				
1198	Second class kail wood in planks Second class kail wood in planks 90x0.038 = 3.42 cum = 3420 cudm Qty taken for cost of using once after deducting for credit = 3420x1/4x1/4 = 213.75 cudm Wallings 100mmx 100 mm of	10 cudm	213.75	260.00	5557.5

1197	Second class kail wood in scantling 4x30x0.10x1.10 = 1.20cum= 1200cudm Qty taken for cost of using once after deducting for credit = 1200x1/4x1/4 = 75 cudm	10 cud m	75.0	260.00	1950.0
0302	Safeda ballies 125 mm diameter long 2x17x1.50 = 51 m Qty taken for cost of using once after deducting for credit =51x1/4x 1/4=3.1875m CARRIAGE: Poling boards = 3.42 cum Walling = 1.20 cum. Balli struts : 3.14/4x(0.125)3x51= 0.63cum Total of carriage = 5.25x1/4 = 1.3125 cum	metre	3.1875	40.00	127.50
2204	Carriage of Timber	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

Other Engineering Organisations
PRICE

TOTAL	8741.97
Add Water Charges @ 1%	87.42
TOTAL	8829.39
Add CPOH @ 15%	1324.41
TOTAL	10153.80
Cost of 90.0 sqm	10153.80
Cost per sqm	112.82
Say	112.8

	Cost index **35.59 %**				40.15

	Total with Cost index				152.95

5 Specification Code: 100.14.7

SUBHEAD : **100.0**

KWA APPROVED DATA

100.14.7 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials :
400 mm dia Ductile Iron Class K-9 Pipes
Data derived from 18.72.21 in DAR

Code	Description	Unit	Quantity	Rate	Amount
	Details for 10metre Materials 400mm dia. pipes (in 5.5m lengths). Weight of 1m pipe = 94.80kg; Weight of 10m pipes - 94.80x10 = 948.00kg.				
2326	Carriage of Spun iron S & S pipes 400 mm dia Labour for laying	100 meter	10.0	2061.97	206.20
18.23	Rate as per item Number18.23 of SH: Water Supply	quintal	9.48	229.40	2174.71(A)
	AddWater Charges @ 1% except on A ie on (2380.91-2174.71=206.20004)				2.06
	TOTAL				2382.97
	AddCPOH @ 15% except on A ie on (2382.97-2174.71=208.26004)				31.24
	TOTAL				2414.00
	Cost of 10.0 metre				2414.00
	Cost of 1 metre				241.40
	Say				241.4

Other Engineering Organisations PRICE

	Cost index **35.59 %**				85.91
	Total with Cost index				327.31

6 Specification Code: 100.14.8

SUBHEAD : **100.0**

KWA APPROVED DATA

100.14.8 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials :
450 mm dia Ductile Iron Class K-9 Pipes
Data derived from 18.72.22 in DAR

Code	Description	Unit	Quantity	Rate	Amount
	Details for 10metre Materials 450mm dia. pipes (in 5.5m lengths). Weight of 1m pipe = 110.97kg; Weight of 10m pipes - 110.97x10 = 1109.70kg.				
2327	Carriage of Spun iron S & S pipes 450 mm dia Labour for laying	100 meter	10.0	2520.19	252.02
18.23	Rate as per item Number18.23 of SH: Water Supply	quintal	11.097	229.40	2545.65(A)
	AddWater Charges @ 1% except on A ie on (2797.67-2545.65=252.0201)				2.52
	TOTAL				2800.19
	AddCPOH @ 15% except on A ie on (2800.19-2545.65=254.5401)				38.18
	TOTAL				2838.50
	Cost of 10.0 metre				2838.50

Other Engineering Organisations
PRICE

Cost of 1 metre	283.85
Say	283.85

	Cost index **35.59 %**				101.02
	Total with Cost index				384.87

7 Specification Code: 18.30.9

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.9 400 mm diameter pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1381	Rubber insertions for 400 mm dia pipe joints	each	10.0	73.00	730.00
1962	Bolts and nuts 24 mm dia 85 mm long	each	160.0	28.00	4480.00
9977	Carriage of materialsLABOUR:	L.S	8.06	2.00	16.12
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0117	Assistant Fitter or 2nd class fitter	Day	0.5	679.00	339.50
0114	Beldar	Day	1.5	558.00	837.00
				TOTAL	6771.62
				Add Water Charges @ 1%	67.72
				TOTAL	6839.34
				Add CPOH @ 15%	1025.90
				TOTAL	7865.24
				Cost of 10.0 no	7865.24
				Cost of each	786.52

Other Engineering Organisations PRICE

Say	786.5

	Cost index **35.59 %**				279.92
	Total with Cost index				1066.42

8 Specification Code: 18.30.10

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.10 450 mm diameter pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1382	Rubber insertions for 450 mm dia pipe joints	each	10.0	92.00	920.00
1962	Bolts and nuts 24 mm dia 85 mm long	each	200.0	28.00	5600.00
9977	Carriage of materialsLABOUR:	L.S	8.06	2.00	16.12
0116	Fitter(grade1)	Day	0.6	738.00	442.80
0117	Assistant Fitter or 2nd class fitter	Day	0.6	679.00	407.40
0114	Beldar	Day	1.7	558.00	948.60
				TOTAL	8334.92
				Add Water Charges @ 1%	83.35
				TOTAL	8418.27
				Add CPOH @ 15%	1262.74
				TOTAL	9681.01
				Cost of 10.0 no	9681.01
				Cost of each	968.10
				Say	968.1

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				344.55
	Total with Cost index				1312.65

9 Specification Code: 18.70.7

18.70 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:

18.70.7 400 mm dia pipes

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 50 joints MATERIAL:				
7673	Rubber Gaskets conforming to I.S. 5382 of S.B.R quality 400 mm dia LABOUR:	each	50.0	230.00	11500.00
0116	Fitter(grade1)	Day	4.0	738.00	2952.00
0117	Assistant Fitter or 2nd class fitter	Day	4.0	679.00	2716.00
0114	Beldar	Day	8.0	558.00	4464.00
				TOTAL	21632.00
				Add Water Charges @ 1%	216.32
				TOTAL	21848.32
				Add CPOH @ 15%	3277.25
				TOTAL	25125.57
				Cost of 50.0 joint	25125.57
				Cost per joint	502.51
				Say	502.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				178.84
	Total with Cost index				681.34

10 Specification Code: 18.70.8

18.70 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:

18.70.8 450 mm dia pipes

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 50 joints MATERIAL:				
7674	Rubber Gaskets conforming to I.S. 5382 of S.B.R quality 450 mm dia LABOUR:	each	50.0	270.00	13500.00
0116	Fitter(grade1)	Day	4.5	738.00	3321.00
0117	Assistant Fitter or 2nd class fitter	Day	4.5	679.00	3055.50
0114	Beldar	Day	9.0	558.00	5022.00
				TOTAL	24898.50
				Add Water Charges @ 1%	248.99
				TOTAL	25147.49
				Add CPOH @ 15%	3772.12
				TOTAL	28919.61
				Cost of 50.0 joint	28919.61
				Cost per joint	578.39
				Say	578.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				205.85
	Total with Cost index				784.25

11 Specification Code: 18.83.9

18.83 Labour for cutting C.I. pipe with steel saw.

18.83.9 400 mm diameter C.I. pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one cut LABOUR:				
0116	Fitter(grade1)	Day	0.4	738.00	295.20
0114	Beldar	Day	0.4	558.00	223.20
9999	Sundries-	L.S	12.48	2.00	24.96
				TOTAL	543.36
				Add Water Charges @ 1%	5.43
				TOTAL	548.79
				Add CPOH @ 15%	82.32
				TOTAL	631.11
				Cost of 1.0 Each Cut	631.11
				Cost per Each Cut	631.11
				Say	631.1

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				224.61
	Total with Cost index				855.71

12 Specification Code: 18.83.10

18.83 Labour for cutting C.I. pipe with steel saw.

18.83.10 450 mm diameter C.I. pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one cut LABOUR:				
0116	Fitter(grade1)	Day	0.45	738.00	332.10

0114	Beldar	Day	0.45	558.00	251.10
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	610.24
Add Water Charges @ 1%	6.10
TOTAL	616.34
Add CPOH @ 15%	92.45
TOTAL	708.79
Cost of 1.0 each	708.79
Cost per each	708.79
Say	708.8

	Cost index **35.59 %**				252.26
	Total with Cost index				961.06

Other Engineering Organisations
PRICE

13 Specification Code: 100.35.7

SUBHEAD : **100.0**

KWA APPROVED DATA

100.35.7 Testing 400mm DI/CI pipeline with potable water to the required test pressure.
400 mm dia
Observed Data derived from item no.1026 of PHED DATA

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 150 m				
KW8	Cost of Potable Water	Kilo litre	18.8	60.00	1128.00

100.99.59	Rate as per item Number100.99.59 of SH: KWA Approved Data Cost of water required for filling the pipeline including conveyance charges for the water to the site of testing (without w/c&CPOH)	Kilo litre	18.8	73.20	1376.16
100.99.69	Rate as per item Number100.99.69 of SH: KWA Approved Data Hire charges for 85mm long 24mm bolts &nuts (1/8 of the cost)	each	32.0	3.50	112.00
0116	Fitter(grade1) for fixing Dummy plates etc & connecting the pipeline to the pump delivery	Day	3.0	738.00	2214.00
0114	Beldar for assisting	Day	3.0	558.00	1674.00
100.99.45	Rate as per item Number100.99.45 of SH: KWA Approved Data Hire charges for rubber packing (1/4 of the actual cost) (rubber insertions for 400mm dia pipe joints - 2 nos @Rs 73/E)	each	2.0	18.25	36.50
18.70.7	Rate as per item Number18.70.7 of SH: Water Supply **Cost of providing 2nos joints (lead, cement or rubber ring joints as the case may be) for fitting the tailpiece vide corresponding item of the schedule	joint	2.0	502.50	1005.00(A)
0011	Hire charges of Pump set of capacity 4000 litres/hour	Day	0.5	700.00	350.00
9999	Sundries - Hire charges for reciprocating pumps for building up pressure to the required test pressure	L.S	100.0	2.00	200.00

Other Engineering Organisations
PRICE

9999	Sundries - Hire charges for pressure gauge etc.	L.S	25.0	2.00	50.00
100.99.70.a	Rate as per item Number100.99.70.a of SH: KWA Approved Data **Dismantling the lead, rubber ring or cement joint etc. & stacking materials for future use (Adopt 50% of the cost of jointing)	each	2.0	251.25	502.50(A)

AddWater Charges @ 1% except on A ie on (8648.16-1507.5=7140.66)	71.41
TOTAL	8719.57
AddCPOH @ 15% except on A ie on (8719.57-1507.5=7212.07)	1081.81
TOTAL	9802.50
Cost of 150.0 metre	9802.50
Cost of 1 metre	65.35
Say	65.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				20.14
	Total with Cost index				85.49

14 Specification Code: 100.35.8

SUBHEAD : **100.0**

KWA APPROVED DATA

100.35.8 Testing 450mm DI/CI pipeline with potable water to the required test pressure.
450 mm dia
Observed Data derived from item no.1027 of PHED DATA

Code	Description	Unit	Quantity	Rate	Amount

	Details of Cost For 150 m				
KW8	Cost of Potable Water	Kilo litre	24.0	60.00	1440.00
100.99.59	Rate as per item Number100.99.59 of SH: KWA Approved Data Cost of water required for filling the pipeline including conveyance charges for the water to the site of testing (without w/c&CPOH)	Kilo litre	24.0	73.20	1756.80
100.99.71	Rate as per item Number100.99.71 of SH: KWA Approved Data Hire charges for 85mm long 24mm bolts &nuts (1/8 of the cost)	each	40.0	3.50	140.00
0116	Fitter(grade1) Fitter (Grade1) for fixing Dummy plates etc & connecting the pipeline to the pump delivery	Day	3.0	738.00	2214.00
0114	Beldar for assisting	Day	3.0	558.00	1674.00
100.99.46	Rate as per item Number100.99.46 of SH: KWA Approved Data Hire charges for rubber packing (1/4 of the actual cost) (rubber insertions for 450mm dia pipe joints - 2 nos @Rs 92/E)	each	2.0	23.00	46.00
18.70.8	Rate as per item Number18.70.8 of SH: Water Supply **Cost of providing 2nos joints (lead, cement or rubber ring joints as the case may be) for fitting the tailpiece vide corresponding item of the schedule	joint	2.0	578.40	1156.80(A)

Other Engineering Organisations
PRICE

0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges for Oil engine driven pump sets for filling the main with water	Day	0.5	700.00	350.00
9999	Sundries - Hire charges for reciprocating pumps for building up pressure to the required test pressure	L.S	100.0	2.00	200.00
9999	Sundries - Hire charges for pressure gauge etc.	L.S	25.0	2.00	50.00
100.99.72	Rate as per item Number100.99.72 of SH: KWA Approved Data **Dismantling the lead, rubber ring or cement joint etc. & stacking materials for future use (Adopt 50% of the cost of jointing)	each	2.0	289.20	578.40(A)

Other Engineering Organisations
PRICE

AddWater Charges @ 1% except on A ie on (9606.0-1735.2001=7870.8)	78.71
TOTAL	9684.71
AddCPOH @ 15% except on A ie on (9684.71-1735.2001=7949.51)	1192.43
TOTAL	10875.00
Cost of 150.0 metre	10875.00
Cost of 1 metre	72.50
Say	72.5

	Cost index **35.59 %**				21.83
	Total with Cost index				94.33

15	Specification Code: 100.98.121

SUBHEAD 100.0

KWA APPROVED DATA

100.98.121

Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia.

Code	Description	Unit	Quantity	Rate	Amount
7657	Ductile Iron class K - 9 pipe Conforming to I.S. 8329 - 400 mm dia	metre	1.0	4300.00	4300.00
				TOTAL	4300.00
				Add Water Charges @ 1%	43.00
				TOTAL	4343.00
				Add CPOH @ 15%	651.45
				Costof 1.0 metre	4994.45
				Cost of 1 metre	4994.45
				Say	4994.45

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				.00
	Total with Cost index				5377.35

16	Specification Code: 100.98.122

SUBHEAD 100.0

KWA APPROVED DATA

100.98.122

Supply of DI K9 Pipe Conforming to IS 8329/2000, 450mm Dia.

Code	Description	Unit	Quantity	Rate	Amount

7658	Ductile Iron class K - 9 pipe Conforming to I.S. 8329- 450 mm dia	metre	1.0	5000.00	5000.00
				TOTAL	5000.00
				Add Water Charges @ 1%	50.00
				TOTAL	5050.00
				Add CPOH @ 15%	757.50
				Costof 1.0 metre	5807.50
				Cost of 1 metre	5807.50
				Say	5807.5

	Cost index **35.59 %**				.00
	Total with Cost index				6420.75

17 Specification Code: 18.69.1

Other Engineering Organisations
PRICE

SUBHEAD : **18.0**

WATER SUPPLY

18.69 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :

18.69.1 Upto 600 mm dia

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL:				
7684	Ductile Iron specials suitable for mechanical jointing as per I.S. 9523 utp 600 mm dia	quintal	1.0	13050.00	13050.00
2309	Carriage of Cast iron fittings Labour for laying	tonne	0.1	92.24	9.22

18.24	Rate as per item Number18.24 of SH: Water Supply	quintal	1.0	426.70	426.70(A)

AddWater Charges @ 1% except on A ie on (13485.92-426.7=13059.22)	130.59
TOTAL	13616.51
AddCPOH @ 15% except on A ie on (13616.51-426.7=13189.81)	1978.47
TOTAL	15595.00
Cost of 1.0 quintal	15595.00
Say	15595.0

	Cost index **35.59 %**				5550.26
	Total with Cost index				21145.26

Other Engineering Organisations
PRICE

18 Specification Code: od220746/2022_2023

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**od220746/2022_2023 :Providing, laying and fixing C.I. sluice valves (with cap) and connecting lead dwc pipe of 250mm dia to the nearest manhole considering an average distance. all completme with bolts, nuts, rubber installation etc. cost include all necessary specials, labour ,material,etc all complete.
250mm dia** for 10 sluice valve

Code	Description	Unit	Quantity	Rate	Amount
3321	C.I. sluice valve (with caps) class II : 250 mm dia	each	10.00000	14500.00	145000.00
2309	Cast iron fittings	tonne	2.30000	92.24	212.15
18.24	Rate as per item number 18.24 of SH: Water Supply	quintal	22.99000	367.37	8445.83
18.30.6	Rate as per item number 18.30.6 of SH: Water Supply	no	20.00000	362.29	7245.80
MR	providing and suppliying of DWC 250mm dia pipe (rate from SOR 22 23 GWSSB)	metre	200.00000	1004.00	200800.00

MR	laying of DWC 250mm dia pipe (rate from SOR 22 23 GWSSB)	metre	200.00000	42.00	8400.00
9999	Sundries	L.S	300.00000	2.00	600.00

				TOTAL	370703.78
	cost for 10.0 no				370703.78
	cost for one no				37070.38
	say				37070.38

	Add Water Charges @ 1.0%				**370.70**
	Add CPOH @ 15.0%				**5616.16**
	Cost index **35.59 %**				6676.20
	Total with Cost index				49733.46
	Say				49733.46

Other Engineering Organisations
PRICE

19 Specification Code: od220773/2022_2023

**od220773/2022_2023 :Supplying and fixing C.I double acting air valve of approved quality with bolts, nuts, rubber placing including cost of air valves, specials, labour, hire charges etc. complete
100 mm dia**
Details of cost for one no.
MATERIAL:

Code	Description	Unit	Quantity	Rate	Amount
7417	Double acting air valve 100 mm 	each	10.00000	5910.00	59100.00
9977	Carriage of air valves	L.S	26.00000	2.00	52.00
9999	Sundries Labour for laying double acting air valve Providing flanged joints to double acting air valves with bolts, nuts and rubber insertion etc.	L.S	52.00000	2.00	104.00
18.30.2	Rate as per item number18.30.2of SH:Water Supply 	no	10.00000	198.06	1980.63

MR	Sundries for specials (2%)	L.S	1.00000	118.20	118.20

				TOTAL	61354.83
	cost for 10.0 no				61354.83
	cost for one no				6135.48
	say				6135.48

	Add Water Charges @ 1.0%				**61.35**
	Add CPOH @ 15.0%				**929.52**
	Cost index **35.59 %**				2531.38
	Total with Cost index				9657.75
	Say				9657.75

20 Specification Code: 5.2.2

Other Engineering Organisations
PRICE

5.2: Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :

5.2.2 1:1.5:3(1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 9.18 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	5.2326	1350.00	7064.01
0297	Stone Aggregate(single size): 10 mm nominal size	cum	2.5704	1350.00	3470.04
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	7.803	103.77	809.72

0982	Coarse sand (zone III)	cum	3.9015	1350.00	5267.03
2203	Carriage of Coarse sand	cum	3.9015	103.77	404.86
0367	Portland Cement (0.2833 cum)	tonne	3.672	4940.00	18139.68
2209	Carriage of Cement LABOUR:	tonne	3.672	92.24	338.71
0114	Beldar	Day	11.29	558.00	6299.82
0115	Coolie	Day	7.53	558.00	4201.74
0101	Bhisti	Day	8.26	617.00	5096.42
0123	Mason (brick layer) Ist class	Day	0.92	738.00	678.96
0124	Mason (brick layer)2nd class	Day	0.92	679.00	624.68
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.64	800.00	512.00
0012	Vibrator (Needle type 40 mm)	Day	0.64	370.00	236.80
9999	Sundries-	L.S	131.82	2.00	263.64
9999	Sundries-Extra labour for lifting of material up to floor V level: 0.75x9. 18x2.5	L.S	420.03	2.00	840.06
0115	Coolie	Day	17.21	558.00	9603.18

Other Engineering Organisations PRICE

TOTAL	63851.35
Add Water Charges @ 1%	638.51
TOTAL	64489.86
Add CPOH @ 15%	9673.48
TOTAL	74163.34
Cost of 9.18 cum	74163.34
Cost per cum	8078.79
Say	8078.8

	Cost index **35.59 %**				2875.24
	Total with Cost index				10954.04

21 Specification Code: od191113/2022_2023

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od191113/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

22 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

23 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

Other Engineering Organisations
PRICE

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86
				TOTAL	1647.25
				Cost of 10.0 sqm	1647.25
				Cost per sqm	164.72
				Say	164.7

Other Engineering Organisations PRICE

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

24 Specification Code: 50.2.25.1

50.2.25.1 Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one each				
0979	Royalty for good earth	cum	1.0	40.00	40.00
2241	Carriage of Good earth	cum	1.0	129.71	129.71
0128	Mate	Day	0.02	617.00	12.34
0115	Coolie	Day	0.25	558.00	139.50
0101	Bhisti	Day	0.02	617.00	12.34
				TOTAL	333.89
				Add Water Charges @ 1%	3.34
				TOTAL	337.23
				Add CPOH @ 15%	50.58
				TOTAL	387.81
				Cost of 1.0 cum	387.81
				Cost per cum	387.81
				Say	387.8

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				138.02
	Total with Cost index				525.82

25 Specification Code: 51.2.3	

51.2.3 Filling with Quarry Muck

Filling up low lying and water logged areas with local material/ quarry muck, spreading in layers, leveling the top at site and consolidation by ramming, etc complete for improving the CBR value of subgrade

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 300 cum Materials				
MR1209	Cost of quarry muck Labour	cum	300.0	750.00	225000.00
0128	Mate	Day	0.4	617.00	246.80
0139	Skilled Beldar (for floor rubbing etc.)	Day	2.0	617.00	1234.00
0114	Beldar	Day	8.0	558.00	4464.00
				TOTAL	230944.80
				Add Water Charges @ 1%	2309.45
				TOTAL	233254.25
				Add CPOH @ 15%	34988.14
				TOTAL	268242.39
				Cost of 300.0 cum	268242.39
				Cost per cum	894.14
				Say	894.15

	Cost index **35.59 %**				8.19
	Total with Cost index				902.34

Other Engineering Organisations PRICE

26 Specification Code: od211147/2022_2023

od211147/2022_2023 :CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 350mm.

Code	Description	Unit	Quantity	Rate	Amount
MR	CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 350mm.	each	1.00000	43074.90	43074.90
				TOTAL	43074.90
				cost for one each	43074.90
	say				43074.90

	Add Water Charges @ 1.0%				**430.74**
	Add CPOH @ 15.0%				**6525.84**
	Cost index **35.59 %**				0.00
	Total with Cost index				50031.50
	Say				50031.50

Other Engineering Organisations
PRICE

27 Specification Code: od221313/2022_2023

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od221313/2022_2023 :Construction valve chamber of suitable size for air valves and Scour valves in the pumping mains includign eartwprk exacavation by manually/mechnaically, backfilling the trenhes ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggreagates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form waork and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplyimg and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete

Code	Description	Unit	Quantity	Rate	Amount
MR	Construction valve chamber of suitable size for 7nos air valves and 2 nos Scour valves in the pumping mains includign eartwprk exacavation by manually/mechnaically, backfilling the trenhes ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggreagates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form waork and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplyimg and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete 9 Nos for Muttar Pumping mains	job	1.00000	960000.00	960000.00
				TOTAL	960000.00
	cost for 1.1615 set				960000.00
	cost for one set				826517.43
	say				826517.43

	Add Water Charges @ 1.0%				**8265.17**
	Add CPOH @ 15.0%				**125217.39**
	Cost index **35.59 %**				0.00
	Total with Cost index				959999.99
	Say				959999.99

Laying of pipes under NH 66 by HDD method to Muttar STP-1
1 Specification Code: od218400/2022_2023

Other Engineering Organisations
PRICE

od218400/2022_2023 :Drilling of 500mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 400mm dia M.S casing pipe of minimum 6mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	5439.00	5439.00
				TOTAL	5439.00
				cost for one metre	5439.00
	say				5439.00

	Add Water Charges @ 1.0%				**54.39**
	Add CPOH @ 15.0%				**824.00**
	Cost index **35.59 %**				0.00
	Total with Cost index				6317.40
	Say				6317.40

Other Engineering Organisations
PRICE

2 Specification Code: od218401/2022_2023

od218401/2022_2023 :Drilling of 900mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 800mm dia M.S casing pipe of minimum 12mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	18142.00	18142.00
				TOTAL	18142.00
				cost for one metre	18142.00
	say				18142.00

	Add Water Charges @ 1.0%				**181.42**
	Add CPOH @ 15.0%				**2748.51**
	Cost index **35.59 %**				-0.01
	Total with Cost index				21071.93
	Say				21071.93

Laying of pipes under railway lines by HDD method to Muttar STP -2

1 Specification Code: od218400/2022_2023

od218400/2022_2023 :Drilling of 500mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 400mm dia M.S casing pipe of minimum 6mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

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Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	5439.00	5439.00
				TOTAL	5439.00
				cost for one metre	5439.00
	say				5439.00

	Add Water Charges @ 1.0%				**54.39**
	Add CPOH @ 15.0%				**824.00**
	Cost index **35.59 %**				0.00
	Total with Cost index				6317.40
	Say				6317.40

2 Specification Code: od218401/2022_2023

od218401/2022_2023 :Drilling of 900mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 800mm dia M.S casing pipe of minimum 12mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	18142.00	18142.00
				TOTAL	18142.00
				cost for one metre	18142.00
	say				18142.00

	Add Water Charges @ 1.0%				**181.42**
	Add CPOH @ 15.0%				**2748.51**
	Cost index **35.59 %**				-0.01
	Total with Cost index				21071.93
	Say				21071.93

Other Engineering Organisations
PRICE

3 Specification Code: od218406/2022_2023

od218406/2022_2023 :Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	9166.00	9166.00
				TOTAL	9166.00

				cost for one metre	9166.00
	say				9166.00

	Add Water Charges @ 1.0%				**91.66**
	Add CPOH @ 15.0%				**1388.64**
	Cost index **35.59 %**				0.00
	Total with Cost index				10646.31
	Say				10646.31

ROAD RESTORATION CHARGES
1 Specification Code: od209801/2022_2023

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Other Engineering Organisations
PRICE

od209801/2022_2023 :Road Restoration Charges for BM&BC as per the directions of Engineer (PWD Road)
G.O.(Ms)No.59/2020/PWD Dated, Thiruvananthapuram, 30/07/2020 Rs 4069.51 per Sqm including GST

Code	Description	Unit	Quantity	Rate	Amount
MR	RR charges vide GO of PWD Roads	sqm	1.00000	2726.69	2726.69
				TOTAL	2726.69
				cost for one per sqm	2726.69
	say				2726.69

	Add Water Charges @ 1.0%				**27.26**
	Add CPOH @ 15.0%				**413.09**
	Cost index **35.59 %**				0.00
	Total with Cost index				3167.05
	Say				3167.05

2 Specification Code: od209802/2022_2023

File Uploaded

od209802/2022_2023 :Road Restoration Charges for CC roads as per the directions of Engineer (PWD Road) G.O.(Ms)No.59/2020/PWD Dated, Thiruvananthapuram, 30/07/2020 Rs 5473.44 per Sqm including GST

Code	Description	Unit	Quantity	Rate	Amount
MR	RR charges vide GO of PWD Roads (Rate without GST, CPOH and water charges)	sqm	1.00000	3612.47	3612.47
				TOTAL	3612.47
				cost for one per sqm	3612.47
	say				3612.47

	Add Water Charges @ 1.0%				**36.12**
	Add CPOH @ 15.0%				**547.28**
	Cost index **35.59 %**				0.00
	Total with Cost index				4195.88
	Say				4195.88

Other Engineering Organisations PRICE

Household Connection
1 Specification Code: od191098/2022_2023

File Uploaded

od191098/2022_2023 :Carrying out Household Survey for Sewerage System including all Preparatory Works, Tool Preparation, Data Collection Charges, Interviews, Data Entry, Field level monitoring, Data Verification all allied works

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of Household Survey for Sewerage system	each	1.00000	64.06	64.06

				TOTAL	64.06
				cost for one each	64.06
	say				64.06

	Add Water Charges @ 1.0%				**0.64**
	Add CPOH @ 15.0%				**9.70**
	Cost index **35.59 %**				0.00
	Total with Cost index				74.41
	Say				74.41

2 Specification Code: od220827/2022_2023

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od220827/2022_2023 :Providing sewer connection to the existing households and commercialunits including the cost for all suppying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works,Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge

Code	Description	Unit	Quantity	Rate	Amount

Other Engineering Organisations PRICE

MR	Providing sewer connection to the existing households and commercialunits including the cost for all suppying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works,Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge	no	1.00000	14900.62	14900.62

Other Engineering Organisations
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				TOTAL	14900.62
	cost for 1.1615 no				14900.62
	cost for one no				12828.77
	say				12828.77

	Add Water Charges @ 1.0%				**128.28**
	Add CPOH @ 15.0%				**1943.55**
	Cost index **35.59 %**				0.00
	Total with Cost index				14900.62
	Say				14900.62

3 Specification Code: od209948/2022_2023

od209948/2022_2023 :Suupplying conveying and laying pipes and specials ISI marked 160mm dia uPVC SN8 pipes having including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 160 mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of uPVC SN8 sewer pipes (MR)	per metre	1.00000	706.00	706.00
MR	Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (KWA 100.9.11)	per metre	1.00000	98.65	98.65
MR	5 % for specials, Jointnig materials Solvent cement	L.S	1.00000	40.23	40.23
				TOTAL	844.88
				cost for one per metre	844.88
	say				844.88

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**8.44**
	Add CPOH @ 15.0%				**127.99**
	Cost index **35.59 %**				0.00
	Total with Cost index				981.33
	Say				981.33

4 Specification Code: od217343/2022_2023

od217343/2022_2023 :Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly

soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m. TWAD	metre	1.00000	441.00	441.00
				TOTAL	441.00
				cost for one metre	441.00
	say				441.00

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	Add Water Charges @ 1.0%				**4.41**
	Add CPOH @ 15.0%				**66.81**
	Cost index **35.59 %**				0.00
	Total with Cost index				512.22
	Say				512.22

Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements

1 Specification Code: od191082/2022_2023

od191082/2022_2023 :Providing Advanced odor control mechanism as directed including supplying, erecting and testing cost of all materials, labour and conveyence charges, hire for tools and equipments etc complte all per the directions of Engineer in charge

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing Advanced odor control mechanism	no	1.00000	172191.13	172191.13
				TOTAL	172191.13
				cost for one each	172191.13
	say				172191.13

	Add Water Charges @ 1.0%				**1721.91**
	Add CPOH @ 15.0%				**26086.95**
	Cost index **35.59 %**				0.00
	Total with Cost index				200000.00
	Say				200000.00

2 Specification Code: od191083/2022_2023

Other Engineering Organisations
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**od191083/2022_2023 :Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank
shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of
5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance,
Entry tax, RTO registration , Temporary registration etc. complete**

Code	Description	Unit	Quantity	Rate	Amount
MR	Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete	no	1.00000	4556258.00	4556258.00

				TOTAL	4556258.00
	cost for 1.1615 no				4556258.00
	cost for one no				3922736.12
	say				3922736.12

	Add Water Charges @ 1.0%				**39227.36**
	Add CPOH @ 15.0%				**594294.52**
	Cost index **35.59 %**				0.00
	Total with Cost index				4556258.00
	Say				4556258.00

Other Engineering Organisations
PRICE

3 Specification Code: od209980/2022_2023

od209980/2022_2023 :Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR

Code	Description	Unit	Quantity	Rate	Amount

MR	Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR	set	1.00000	862597.00	862597.00

				TOTAL	862597.00
	cost for 1.1615 set				862597.00
	cost for one set				742657.77
	say				742657.77

	Add Water Charges @ 1.0%				**7426.57**
	Add CPOH @ 15.0%				**112512.65**
	Cost index **35.59 %**				0.00
	Total with Cost index				862597.00
	Say				862597.00

Other Engineering Organisations
PRICE

4 Specification Code: od209981/2022_2023

od209981/2022_2023 :Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	Flushing Tanker Vehicle shall be given to Flush sewers whenever necessary and access narrow roads – Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.	set	1.00000	890423.00	890423.00
				TOTAL	890423.00
	cost for 1.1615 set				890423.00
	cost for one set				766614.72
	say				766614.72

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**7666.14**
	Add CPOH @ 15.0%				**116142.13**
	Cost index **35.59 %**				0.00
	Total with Cost index				890423.00
	Say				890423.00

5 Specification Code: od222611/2022_2023

od222611/2022_2023 :Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with Collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications	set	1.00000	20000.00	20000.00
				TOTAL	20000.00
	cost for 1.1615 set				20000.00
	cost for one set				17219.11
	say				17219.11

	Add Water Charges @ 1.0%				**172.19**
	Add CPOH @ 15.0%				**2608.69**
	Cost index **35.59 %**				0.00
	Total with Cost index				20000.00
	Say				20000.00

Other Engineering Organisations
PRICE

6 Specification Code: od222612/2022_2023

**od222612/2022_2023 :Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for
dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting
purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.**

Code	Description	Unit	Quantity	Rate	Amount
MR	Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.	set	1.00000	6000000.00	6000000.00
				TOTAL	6000000.00
	cost for 1.1615 set				6000000.00
	cost for one set				5165733.96
	say				5165733.96

	Add Water Charges @ 1.0%				**51657.33**
	Add CPOH @ 15.0%				**782608.69**
	Cost index **35.59 %**				0.00
	Total with Cost index				5999999.99
	Say				5999999.99

Other Engineering Organisations PRICE

Other Engineering Organisations
P R I C E

Steel Sheet Shoring to depths upto 4.5 to 6

1 Providing steel sheet shoring to the sides of the trenches above 4.5 upto a depths of 6 m using 6mm M.S.sheet 0.5m wide, stiffened on edges with 50mmx50mmx6mm MSangles driving down vertically on either side one after another in line and level with suitable pile driving equipments and accessories to a maximum depth of 0.50M below the bottom of the proposed excavation 0.5M above ground level suitably braced by horizontal walling pieces at 75x150mmx8mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.

Details of cost for 1 Sqm

Code	Description	unit	Quantity	Rate	Amount	
Subdata 2	Hire charges of MS sheet (1/20 of cost)	Sqm	1	146.21	146.2096	
Subdata 3	Hire charges of MS angles (1/20 of cost)	Sqm	1	19.03	19.03	
Subdata 4	Hire charges for Walling Pieces (1/25 THE OF THE COST	Sqm	1	10.96	10.96166	
Subdata 5	Fabricating MS sheet 0.5 m wide 7 m long stiffened on 3 edges (1/20 cost as	Sqm	1	42.34	42.34364	
Subdata 6	Driving down the sheet pile and shoring.	Sqm	1	86.61	86.61306	
Subdata 7	Dismantling the sheet pile after use, cleaning and stacking properly	Sqm	1	43.31	43.30653	
Subdata 8	Labour charges for rectifying the damages of sheet piles during driving down & Protective measures such as hard wood coping etc for steel sheet.	Sqm	1	21.34	21.33748	
					369.802	
	Cost Index		35.59%		131.61	
	Total per Sqm				**501.41**	**/ Sqm**
	Sub datas					
	(Ref KWA OD 100.6.1)					
	10 m length AMS sheet					
A	Area of sheet=10*2(1.5+.5+.5)		50	m2		
	Weight of 6 mm sheet 70 m2=70x47.10 Kg/m2=		2355	Kg		
	Total weight including 5 % wastage		2473	Kg		
B	Angle 50*50*6mm-Weight		4.5	Kg/m		
	No. of verticals for 10 m @ .5m intervals					
	21 nosx 3.5 m =73.5m		73.5			
	Horizontal required at top only 1no=10m					
	Total length = 83 m		751.5			
	Total weight including 5 % wastage		789			
C	Walling pieces					
	No. of walling pieces required for one side= 3 Nos					
	Total length of 150x75x8mm angles as walling pieces on both sides=2x2x10m= 40 m					
	Weight of walling pieces required = 40 x 13.7 Kg/m		548			
	Screw jack type struts					

	Struts provided at 1.50 m intervals					
	No. of struts required=3x10/1.5=		20			
1	Subdatsa					
100.6.51	Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. (excluding cost of materials)					
2	Ref 100.6.S.2 Hire charges of MS sheet (1/20 of cost)					
	Details of cost for 80 m2.					
1010	Mild Steel plates (1/20 of Rs 4800)	41.96	Qtl	240	10070.4	
	Add Water Charges 1%				100.704	
	Total				10171.1	
	Add CPOH 15%				1525.666	
	Cost for 80 M2				11696.77	
	Cost per sqm				146.21	/ Sqm
3	Ref 100.6.S.3 Hire charges of MS angles (1/20 of cost)					
	Details of cost for 80 m2.					
1007	Structural steel such as tees, angles,channels and R.S. joists RS	7	Qtl	188.75	1321.25	
	Add Water Charges 1%				13.21	
	Total				1334.46	
	Add CPOH 15%				200.17	
	Cost for 80m2				1534.63	
	Cost per Sq m				19.1829	
4	Ref 100.6.S.4 Hire charges for Walling Pieces (1/25 THE OF THE COST)					
	Details of cost for 80 m2.					
1007	Structural steel such as tees, angles,channels and R.S. joists RS	5	qtl	151	755	
	Add Water Charges 1%				7.55	
	Total				762.55	
	Add CPOH 15%				114.38	
	Cost for 80m2				876.93	
	Cost per Sq m				10.96	/Sqm
5	Ref 100.6.S.5 Fabricating MS sheet 0.5 m wide 7 m long stiffened on 3 edges (1/20 cost as pe					
	Details of cost for 80 m2.					
100.6.S.1	Rate as per item Number100.6.S.1 of SH:					
	KWA Approved Data	4704	kg	0.62	2916.48	
	Add Water Charges 1%				29.16	
	Total				2945.64	
	Add CPOH 15%				441.85	
	Cost for 80m2				3387.49	
	Cost per Sq m				42.34	/Sqm
6	Ref 100.6.5.6 Driving down the sheet pile and shoring.					
	Details of cost for 80m2					

115	Coolie For conveying from stack, driving down the sheet piles.	5	Day	368	1840	
115	Coolie For assisting	3	Day	368	1104	
116	Fitter(grade1) For fixing walling pieces,screw jacks and struts	2	Day	487	974	
9999	Sundries-Hire charges for winch, pully block, shear leg and other equipment	100	LS	1.73	173	
115	Coolie For assembling, erecting and polishing the derrick including shifting of derrick and other equipment	5	Day	368	1840	
9999	Sundries-	20	LS	1.73	34.6	
	Total				5965.6	
	Add Water Charges 1%				59.66	
	Total				6025.26	
	Add CPOH 15%				903.79	
	Cost for 80m2				6929.04	
	Cost per Sq m				86.61	/Sqm
7	Ref. 100.6S.7Dismantling the sheet pile after use, cleaning and stacking properly (50% of Driving down the sheet pile and shoring)					
	Details or 1 Sq. m					
	Appd data vide Subdata 6 50% of Rs		0.5	86.61	43.31	
8	Ref. 100.6.S.8 Labour charges for rectifying the damages of sheet piles during driving down & Protective measures such as hard wood coping etc for steel sheet.					
	Cost for 80 Sq.m					
102	Blacksmith Labour charges for rectifying the damages of sheet piles during driving down	3	Day	487	1461	
9999	Sundries-Protective measures such as hard wood coping etc for steel sheet	5	LS	1.73	8.65	
					1469.65	
	Add Water Charges 1%				14.70	
	Total				1484.35	
	Add CPOH 15%				222.65	
	Cost for 80m2				1707.00	
	Cost per Sq m				21.34	/Sqm

3.2 C.I.D.JOINTS AS PER IS 8794 / 1988

Sl.No	Description	Unit	Rate for 2021 -22 in Rupees
I	**Class 15**		
1	80mm	Each	432.00
2	100mm	Each	542.00
3	125mm	Each	683.00
4	150mm	Each	875.00
5	200mm	Each	1273.00
6	250mm	Each	1656.00
7	300mm	Each	1998.00
8	350mm	Each	3361.00
9	400mm	Each	4191.00
10	450mm	Each	5033.00
II	**Class 20**		
1	80mm	Each	443.00
2	100mm	Each	549.00
3	125mm	Each	737.00
4	150mm	Each	887.00
5	200mm	Each	1353.00
6	250mm	Each	1783.00
7	300mm	Each	1950.00
8	350mm	Each	3576.00
9	400mm	Each	4292.00
10	450mm	Each	5070.00

Note : 1) The above rates are basic rates inclusive of transportation charges anywhere in Tamilnadu.
2) GST extra applicable as per GO

WIN POLYMER

22, SRINIVASA PERUMAL KOIL STREET
MADHAVARAM, CHENNAI - 600060
Phone No : 9047122222 , 9047474000
GSTIN: 33ATJPD7327H1ZT
State: TAMILNADU State Code: 33

HO : 790/5, THENGANKUZHIVILAI, KANCHIRACODE
KANCHIRACODE PO., MARTHANDAM
KK DIST, TAMILNADU-629155

Buyer Details
ANTEA GROUP
40/157 FIRST FLOOR
KUDIYIRICKAL BUILDING,
PALARIVATTOM, KOCHI - 682025
Phone: 9447010816 State: KERALA
GSTIN: State Code:32

Quotation No: MQU3

Quotation Date: 06/04/2022

Sl.	Description of Goods	HSN/SAC	Quantity	Rate	Taxable Amount
1	150MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	424.91	424.91
2	200MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	555.98	555.98
3	250MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	835.02	835.02
4	300MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	1,136.48	1,136.48
			4	Total	2,952.39

Bank Details:
A/C Name: WIN POLYMER
Bank Name: UNION BANK OF INDIA
Ac/No: 510101006595706
IFSC Code: UBIN0912638
Branch: MARTHANDAM

TOTAL VALUE: 2,952.39

Terms & Condition:
1. Goods once sold cannot be taken back.
2. Interest @18% p.a will be charged if the payment is not made in stipulated time.
3. We are not responsible for any breakage during transit. 4. E & OE.
5. GST Extra Chargable & Delivery Charges Extra

For WIN POLYMER

Buyer Signature

Authorised Signatory

QUOTATION -4998

Date 07/04/2022
Valid Until 09/04/2022

VEERESH PIPES

VEERESH PIPES

NO. 2574/1
5TH MAIN ROAD
MCC 'A' BLOCK
Davanagere, Karnataka (KA - 29), PIN Code 577004, India
veereshpipes@gmail.com
GSTIN: 29AAUFV5460F1ZJ

Quote to:

ANTEA GROUP
40/157, First Floor, Kudiyirickal Building, Palarivattom
Kochi, Kerala (KL - 32), PIN Code 682025, India
9447010816
Place of Supply: KL (32)

Ship to:

ANTEA GROUP
40/157, First Floor, Kudiyirickal Building, Palarivattom
Kochi, Kerala (KL - 32), PIN Code 682025, India
9447010816
Mrs. Renuka Menon, Procurement / Contract Expert & Project Management

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY UOM	UNIT PRICE	IGST	AMOUNT
1	**150mm ID SN8 ISI DWC HDPE Pipe Confirming to IS: 16098 Part II**	3917	1 Meter	251.00	45.18 18.00%	296.18
2	**200mm ID SN8 ISI DWC HDPE Pipe Confirming to IS: 16098 Part II**	3917	1 Meter	440.00	79.20 18.00%	519.20
3	**250mm ID SN8 ISI DWC HDPE Pipe Confirming to IS: 16098 Part II**	3917	1 Meter	780.00	140.40 18.00%	920.40
4	**300mm ID SN8 ISI DWC HDPE Pipe Confirming to IS: 16098 Part II**	3917	1 Meter	1,015.00	182.70 18.00%	1,197.70
		@18%	4.00	2486.00	447.48	2933.48
	TOTAL			2486.00	447.48	2933.48

Total: ₹ Two Thousand Nine Hundred Thirty Three Only

AUTHORIZED SIGNATORY

TOTAL BEFORE TAX	₹ 2,486.00
TOTAL TAX AMOUNT	447.48
ROUNDED OFF	(-) 0.48
TOTAL AMOUNT	₹ 2,933

Note:

1. The Above Pipe Confirming to IS: 16098 Part II as per Latest Amendements
2. Standard Length of Pipe: 6 meter
3. Payment: 100% Advance along With PO
4. Transportation: F.O.R Site at Singe Point Only & Unloading At Your Scope
5. Rates are based on Today's Raw Material Price & Rates on Price Variation Basis
6. NEFT / RTGS Details: Bank Name: Karnataka Bank Ltd., Account Name: VEERESH PIPES, Account Number: 1822000100190001, IFSC Code: KARB0000182, Branch: Davanagere Main, Account Type: Current Account
7. RATES VALID FOR 2 DAYS ONLY

3.2 C.I.D.JOINTS AS PER IS 8794 / 1988

Sl.No	Description	Unit	Rate for 2021 -22 in Rupees
I	**Class 15**		
1	80mm	Each	432.00
2	100mm	Each	542.00
3	125mm	Each	683.00
4	150mm	Each	875.00
5	200mm	Each	1273.00
6	250mm	Each	1656.00
7	300mm	Each	1998.00
8	350mm	Each	3361.00
9	400mm	Each	4191.00
10	450mm	Each	5033.00
II	**Class 20**		
1	80mm	Each	443.00
2	100mm	Each	549.00
3	125mm	Each	737.00
4	150mm	Each	887.00
5	200mm	Each	1353.00
6	250mm	Each	1783.00
7	300mm	Each	1950.00
8	350mm	Each	3576.00
9	400mm	Each	4292.00
10	450mm	Each	5070.00

Note : 1) The above rates are basic rates inclusive of transportation charges anywhere in Tamilnadu.
2) GST extra applicable as per GO

WIN POLYMER

22, SRINIVASA PERUMAL KOIL STREET
MADHAVARAM, CHENNAI - 600060
Phone No : 9047122222 , 9047474000
GSTIN: 33ATJPD7327H1ZT
State: TAMILNADU State Code: 33

HO : 790/5, THENGANKUZHIVILAI, KANCHIRACODE
KANCHIRACODE PO., MARTHANDAM
KK DIST, TAMILNADU-629155

Buyer Details
ANTEA GROUP
40/157 FIRST FLOOR
KUDIYIRICKAL BUILDING,
PALARIVATTOM, KOCHI - 682025
Phone: 9447010816 State: KERALA
GSTIN: State Code:32

Quotation No: MQU3

Quotation Date: 06/04/2022

Sl.	Description of Goods	HSN/SAC	Quantity	Rate	Taxable Amount
1	150MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	424.91	424.91
2	200MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	555.98	555.98
3	250MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	835.02	835.02
4	300MM SN8 DOUBLE WALL CORRUGATED PIPE	39172190	1 MTR	1,136.48	1,136.48
			4	Total	2,952.39

Bank Details:
A/C Name: WIN POLYMER
Bank Name: UNION BANK OF INDIA
Ac/No: 510101006595706
IFSC Code: UBIN0912638
Branch: MARTHANDAM

TOTAL VALUE: 2,952.39

Terms & Condition:
1. Goods once sold cannot be taken back.
2. Interest @18% p.a will be charged if the payment is not made in stipulated time.
3. We are not responsible for any breakage during transit. 4. E & OE.
5. GST Extra Chargable & Delivery Charges Extra

For WIN POLYMER

Buyer Signature

Authorised Signatory

QUOTATION -4998

Date 07/04/2022
Valid Until 09/04/2022

VEERESH PIPES

VEERESH PIPES

NO. 2574/1
5TH MAIN ROAD
MCC 'A' BLOCK
Davanagere, Karnataka (KA - 29), PIN Code 577004, India
veereshpipes@gmail.com
GSTIN: 29AAUFV5460F1ZJ

Quote to:

ANTEA GROUP
40/157, First Floor, Kudiyirickal Building, Palarivattom
Kochi, Kerala (KL - 32), PIN Code 682025, India
9447010816
Place of Supply: KL (32)

Ship to:

ANTEA GROUP
40/157, First Floor, Kudiyirickal Building, Palarivattom
Kochi, Kerala (KL - 32), PIN Code 682025, India
9447010816
Mrs. Renuka Menon, Procurement / Contract Expert & Project Management

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY UOM	UNIT PRICE	IGST	AMOUNT
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4	**300mm ID SN8 ISI DWC HDPE Pipe Confirming to IS: 16098 Part II**	3917	1 Meter	1,015.00	182.70 18.00%	1,197.70
		@18%	4.00	2486.00	447.48	2933.48
	TOTAL			2486.00	447.48	2933.48

Total: ₹ Two Thousand Nine Hundred Thirty Three Only

AUTHORIZED SIGNATORY

TOTAL BEFORE TAX	₹ 2,486.00
TOTAL TAX AMOUNT	447.48
ROUNDED OFF	(-) 0.48
TOTAL AMOUNT	₹ 2,933

Note:

1. The Above Pipe Confirming to IS: 16098 Part II as per Latest Amendements
2. Standard Length of Pipe: 6 meter
3. Payment: 100% Advance along With PO
4. Transportation: F.O.R Site at Singe Point Only & Unloading At Your Scope
5. Rates are based on Today's Raw Material Price & Rates on Price Variation Basis
6. NEFT / RTGS Details: Bank Name: Karnataka Bank Ltd., Account Name: VEERESH PIPES, Account Number: 1822000100190001, IFSC Code: KARB0000182, Branch: Davanagere Main, Account Type: Current Account
7. RATES VALID FOR 2 DAYS ONLY

DETAILED ESTIMATE FOR RCC LIFT MH at From MH depth of 5.97 m and Dia of 2.5 m

Sl No	Description	Nos	L	B
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL			
a	First depth of 2 m	1 x (π/4)	3.9	3.9
a	First depth of 2 m 0 to 1.5m	1 x (π/4)	3.9	3.9
	1.5m to 3m		3.9	3.9
	3m to 4.5m		3.9	3.9
	4.5m to 6m		3.9	3.9
	6m to 7.5m		3.9	3.9
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge			
		1 x (π/4)	3.9	3.9
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge			
		1 x (π/4)	3.9	3.9
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge			
	Below GL			
a	**Upto 1.5 m**			
i	Cover slab	1 x (π/4)	2.9	2.9
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6
ii	Side wall	1 x π	2.70	0.2
iii	Base slab	1 x (π/4)	3.3	3.3

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge			
	@ 80 kg/cum of RCC volume			
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)			
A	**Plane surface**			
a	**From 0m to 3.3 m**			
	At 0.55 m height from base slab			
	Cover slab bottom	1 x (π/4)	2.50	2.5
	Deduct for manhole cover	1 x (π/4)	0.6	0.6
B	**Curved surface**			
a	**From 0 m to 3.3 m**			
i	Cover slab sides	1 x π	2.9	
	Add for MH cover Sides	1 x π	0.6	
ii	Side wall inner & outer sides	2 x π	2.70	
iii	Base slab sides	1 x π	3.3	
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge			
i	Base slab portion	1 x π	3.6	0.3
ii	Side wall portion	1 x π	3.4	0.5
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.			
	0 m to 6.25 m	1 x π	3.9	
	Above 2 m upto 4 m			
	Above 4 m upto 6 m			

9	Extra for providing sulphate resistant cement for the structures above plinth level.			
10	Finishing with epoxy paint for steel	1 x 1	1108	
11	Anticorrosive bituminous paint-outside	1 x π	2.9	
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1		
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68	

to

D	Quan
1.5	
1.5	17.92
1.5	17.92
1.5	17.92
1.5	17.92
0.57	6.81
6.57	78.49
0.15	1.79
0.15	1.79
0.25	1.65
0.25	-0.07
5.72	9.7
0.3	2.57
	13.85

	1108
	4.91
	-0.28
	4.63
0.25	2.28
0.25	0.47
5.72	97.04
0.3	3.11
Total	**102.9**
0.3	1.02
5.72	30.55
	31.57
6.25	76.58

	13.85
0.04	44.32
5.77	52.57
	1
	10.68

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DETAILED ESTIMATE FOR RCC LIFT MH at From MH depth of 5.77 m and Dia of 2.5 m

Sl No	Description	Nos	L	B
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL			
a	First depth of 2 m	1 x (π/4)	3.9	3.9
a	First depth of 2 m 0 to 1.5m	1 x (π/4)	3.9	3.9
	1.5m to 3m		3.9	3.9
	3m to 4.5m		3.9	3.9
	4.5m to 6m		3.9	3.9
	6m to 7.5m		3.9	3.9
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge			
		1 x (π/4)	3.9	3.9
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge			
		1 x (π/4)	3.9	3.9
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge			
	Below GL			
a	**Upto 1.5 m**			
i	Cover slab	1 x (π/4)	2.9	2.9
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6
ii	Side wall	1 x π	2.70	0.2
iii	Base slab	1 x (π/4)	3.3	3.3

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge			
	@ 80 kg/cum of RCC volume			
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)			
A	**Plane surface**			
a	**From 0m to 3.3 m**			
	At 0.55 m height from base slab			
	Cover slab bottom	1 x (π/4)	2.50	2.5
	Deduct for manhole cover	1 x (π/4)	0.6	0.6
B	**Curved surface**			
a	**From 0 m to 3.3 m**			
i	Cover slab sides	1 x π	2.9	
	Add for MH cover Sides	1 x π	0.6	
ii	Side wall inner & outer sides	2 x π	2.70	
iii	Base slab sides	1 x π	3.3	
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge			
i	Base slab portion	1 x π	3.6	0.3
ii	Side wall portion	1 x π	3.4	0.5
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.			
	0 m to 6.25 m	1 x π	3.9	
	Above 2 m upto 4 m			
	Above 4 m upto 6 m			

9	Extra for providing sulphate resistant cement for the structures above plinth level.			
10	Finishing with epoxy paint for steel	1 x 1	1080.8	
11	Anticorrosive bituminous paint-outside	1 x π	2.9	
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1		
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68	

to

D	Quan
1.5	
1.5	17.92
1.5	17.92
1.5	17.92
1.5	17.92
0.37	4.42
6.37	76.1
0.15	1.79
0.15	1.79
0.25	1.65
0.25	-0.07
5.52	9.36
0.3	2.57
	13.51

	1080.8
	4.91
	-0.28
	4.63
0.25	2.28
0.25	0.47
5.52	93.64
0.3	3.11
Total	**99.5**
0.3	1.02
5.52	29.48
	30.5
6.25	76.58

	13.51
0.04	43.23
5.77	52.57
	1
	10.68

ıtity	
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cum	
cum	5.33.1

KG	5.22.6
sqm	
sqm	
sqm	4.3.1
sqm	
sqm	
sqm	
sqm	
sqm	5.9.5
cum	
cum	
cum	2.25
sqm	2.17.2

cum	mr
sqm	13.52.1
sqm	

DETAILED ESTIMATE FOR RCC LIFT MH at From to Manhole Type							
MH depth of 4.8 m and Dia of 2.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	0.9	10.75	
			3.9	3.9	0	0	
					5.4	64.51	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	4.55	7.72	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						11.87	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					949.6	KG

6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer - in-charge(Retrieved Materials should be taken back by						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		4.55	77.19	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**83.05**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	4.55	24.3	cum
						25.32	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					11.87	cum
10	Finishing with epoxy paint for steel	1 x 1	949.6		0.04	37.98	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		4.80	43.73	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour	1 x 1				1	

13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From To to

MH depth of 4.7 m and Dia of 2.5 m

Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	0.8	9.56	
					5.3	63.32	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	4.45	7.55	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						11.7	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					936	KG

6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		4.45	75.49	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**81.35**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	4.45	23.77	cum
						24.79	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					11.7	cum
10	Finishing with epoxy paint for steel	1 x 1	936		0.04	37.44	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		4.70	42.82	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From 2 to 3							
MH depth of 5.17 m and Dia of 2.5 m							
Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.27	15.17	
			3.9	3.9	0	0	
					5.77	68.93	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	4.92	8.35	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						12.5	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1000	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						

a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		4.92	83.47	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**89.33**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	4.92	26.28	cum
						27.3	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					12.5	cum
10	Finishing with epoxy paint for steel	1 x 1	1000		0.04	40	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		5.17	47.1	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From DERDMH37 to L							
MH depth of 5.05 m and Dia of 2.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.15	13.74	
			3.9	3.9	0	0	
					5.65	67.5	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	4.8	8.14	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						12.29	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					983.2	KG

6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		4.8	81.43	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**87.29**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	4.8	25.64	cum
						26.66	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					12.29	cum
10	Finishing with epoxy paint for steel	1 x 1	983.2		0.04	39.33	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		5.05	46.01	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From DERDMH37 to L							
MH depth of 6.56 m and Dia of 4 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	5.4	5.4	1.5	34.35	cum
			5.4	5.4	1.5	34.35	
			5.4	5.4	1.5	34.35	
			5.4	5.4	1.5	34.35	
			5.4	5.4	1.16	26.57	
					7.16	163.970	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	5.4	5.4	0.15	3.44	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	5.4	5.4	0.15	3.44	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	4.4	4.4	0.25	3.8	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	4.20	0.2	6.31	16.65	cum.
iii	Base slab	1 x (π/4)	4.8	4.8	0.3	5.43	cum
						25.81	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					2064.8	KG

6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	4.00	4		12.57	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						12.29	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	4.4		0.25	3.46	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	4.20		6.31	166.52	sqm
iii	Base slab sides	1 x π	4.8		0.3	4.52	sqm
					Total	**174.97**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	5.1	0.3	0.3	1.44	cum
ii	Side wall portion	1 x π	4.9	0.5	6.31	48.57	cum
						50.01	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	5.4		6.25	106.03	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					25.81	cum
10	Finishing with epoxy paint for steel	1 x 1	2064.8		0.04	82.59	sqm
11	Anticorrosive bituminous paint-outside	1 x π	4.4		6.56	90.68	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From DERDMH37 to L							
MH depth of 6.49 m and Dia of 2.5 m							
Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.09	13.02	
					7.09	84.7	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	6.24	10.59	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						14.74	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1179.2	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						

	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		6.24	105.86	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**111.72**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	6.24	33.33	cum
						34.35	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					14.74	cum
10	Finishing with epoxy paint for steel	1 x 1	1179.2		0.04	47.17	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		6.49	59.13	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From to							
MH depth of 6.69 m and Dia of 2.5 m							
Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5		cum
a	First depth of 2 m 0 to 1.5m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
	1.5m to 3m		3.9	3.9	1.5	17.92	
	3m to 4.5m		3.9	3.9	1.5	17.92	
	4.5m to 6m		3.9	3.9	1.5	17.92	
	6m to 7.5m		3.9	3.9	1.29	15.41	
					7.29	87.09	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	6.44	10.93	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						15.08	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1206.4	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						

	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		6.44	109.25	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**115.11**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	6.44	34.39	cum
						35.41	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					15.08	cum
10	Finishing with epoxy paint for steel	1 x 1	1206.4		0.04	48.26	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		6.69	60.95	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From DERDMH37 to L							
MH depth of 4.75 m and Dia of 2.5 m							
Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
			3.9	3.9	1.5	17.92	
			3.9	3.9	1.5	17.92	
			3.9	3.9	0.85	10.15	
			3.9	3.9	0	0	
					5.35	63.91	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	4.50	7.63	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						11.78	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					942.4	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						

	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		4.5	76.34	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**82.2**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	4.50	24.03	cum
						25.05	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					11.78	cum
10	Finishing with epoxy paint for steel	1 x 1	942.4		0.04	37.7	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		4.75	43.28	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From to							
MH depth of 6.69 m and Dia of 2.5 m							
Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5		cum
a	First depth of 2 m 0 to 1.5m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
	1.5m to 3m		3.9	3.9	1.5	17.92	
	3m to 4.5m		3.9	3.9	1.5	17.92	
	4.5m to 6m		3.9	3.9	1.5	17.92	
	6m to 7.5m		3.9	3.9	1.29	15.41	
					7.29	87.09	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	6.44	10.93	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						15.08	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1206.4	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						

	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		6.44	109.25	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**115.11**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	6.44	34.39	cum
						35.41	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					15.08	cum
10	Finishing with epoxy paint for steel	1 x 1	1206.4		0.04	48.26	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		6.69	60.95	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From to							
MH depth of 5.1 m and Dia of 2.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	3.9	3.9	1.5		cum
a	First depth of 2 m 0 to 1.5m	1 x (π/4)	3.9	3.9	1.5	17.92	cum
	1.5m to 3m		3.9	3.9	1.5	17.92	
	3m to 4.5m		3.9	3.9	1.5	17.92	
	4.5m to 6m		3.9	3.9	1.2	14.34	
	6m to 7.5m		3.9	3.9	0	0	
					5.7	68.1	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	3.9	3.9	0.15	1.79	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	2.9	2.9	0.25	1.65	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	2.70	0.2	4.85	8.23	cum.
iii	Base slab	1 x (π/4)	3.3	3.3	0.3	2.57	cum
						12.38	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					990.4	KG

6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	2.9		0.25	2.28	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	2.70		4.85	82.28	sqm
iii	Base slab sides	1 x π	3.3		0.3	3.11	sqm
					Total	**88.14**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	3.6	0.3	0.3	1.02	cum
ii	Side wall portion	1 x π	3.4	0.5	4.85	25.9	cum
						26.92	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	3.9		6.25	76.58	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					12.38	cum
10	Finishing with epoxy paint for steel	1 x 1	990.4		0.04	39.62	sqm
11	Anticorrosive bituminous paint-outside	1 x π	2.9		5.10	46.46	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at From to							
MH depth of 6.49 m and Dia of 3 m							
Sl No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (π/4)	4.4	4.4	1.5		cum
a	First depth of 2 m 0 to 1.5m	1 x (π/4)	4.4	4.4	1.5	22.81	cum
	1.5m to 3m		4.4	4.4	1.5	22.81	
	3m to 4.5m		4.4	4.4	1.5	22.81	
	4.5m to 6m		4.4	4.4	1.5	22.81	
	6m to 7.5m		4.4	4.4	1.09	16.57	
					7.09	107.81	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (π/4)	4.4	4.4	0.15	2.28	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (π/4)	4.4	4.4	0.15	2.28	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (π/4)	3.4	3.4	0.25	2.27	cum
	Deduct for C.I manhole cover	1 x (π/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x π	3.20	0.2	6.24	12.55	cum.
iii	Base slab	1 x (π/4)	3.8	3.8	0.3	3.4	cum
						18.15	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1452	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						

a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (π/4)	3.00	3		7.07	sqm
	Deduct for manhole cover	1 x (π/4)	0.6	0.6		-0.28	sqm
						6.79	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x π	3.4		0.25	2.67	sqm
	Add for MH cover Sides	1 x π	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x π	3.20		6.24	125.46	sqm
iii	Base slab sides	1 x π	3.8		0.3	3.58	sqm
					Total	**132.18**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x π	4.1	0.3	0.3	1.16	cum
ii	Side wall portion	1 x π	3.9	0.5	6.24	38.23	cum
						39.39	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x π	4.4		6.25	86.39	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					18.15	cum
10	Finishing with epoxy paint for steel	1 x 1	1452		0.04	58.08	sqm
11	Anticorrosive bituminous paint-outside	1 x π	3.4		6.49	69.32	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

7.09

LIFT MANHOLES ESTIMATE upto 3MLD						
1	Cost of nonclog submercible pumpset (5 HP) 1No (KWA Rate)	1	5	Nos @ Rs /hp	22668.75	113343.75
2	Electrical works, cabling panel box integrating with STP	1	1	LS	60000	60000
3	Byepass arrangements	1				
4	Supplyig and Laying DWC 200mm dia	26.4		per m	856.97	22587.281
5	Automation of Lift Manhole to ontegrate with STP	1	1	Set	150000	150000
5	cost of Interconnections, specialsand Unforeseen Items if any					43222.15
						389153.18

Sewerage Scheme- Construction of wet well 2 (Block 3A) , Grit /Screen Chamber and connected works at Muttar STP

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Colletion well 7m dia**	10951135.73
2	**Grit/Screen Chamber 3m dia**	1492230.51
3	**Silt Pit 1.5mx1.5mx1.2m**	97592.72
4	**Valve chamber 2.4mx3.9mx2.2m**	356336.82
5	**SILT RAISER ARRANGEMENTS**	40132.64
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**12937428.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 12937428.00
		Rounded Total Rs 1,29,37,428
	Rupees One Crore Twenty Nine Lakh Thirty Seven Thousand Four Hundred and Twenty Eight Only	

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 2 (Block 3A) , Grit /Screen Chamber and connected works at Muttar STP

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

1 Colletion well 7m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	157.000 cum
	Say 157.000 cum @ Rs 214.03 / cum	**Rs 33602.71**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	39.250 cum
	Say 39.250 cum @ Rs 106.37 / cum	**Rs 4175.02**
3	od213480/2022_2023 Sinking wells above 6.0 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (for 7m diameter)	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 47748.85 / metre	**Rs 47748.85**
4	od213481/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m(for 7m diameter)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 50521.07 / metre	**Rs 75781.61**
5	od213484/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m(for 7m diameter)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 53289.85 / metre	**Rs 79934.78**

Other Engineering Organisations PRICE

6	od213485/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m(for 7m diameter)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 56057.29 / metre	**Rs 84085.94**
7	od213625/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m(for 7m diameter)	
	Net Total Quantity	0.290 metre
	Say 0.290 metre @ Rs 58826.57 / metre	**Rs 17059.71**
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	323.587 sqm
	Say 323.587 sqm @ Rs 249.69 / sqm	**Rs 80796.44**
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	247.080 cum
	Say 247.080 cum @ Rs 9413.54 / cum	**Rs 2325897.46**
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	25.120 cum
	Say 25.120 cum @ Rs 11065.64 / cum	**Rs 277968.88**

Other Engineering Organisations PRICE

11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	272.200 cum
	Say 272.200 cum @ Rs 82.10 / cum	**Rs 22347.62**
12	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	272.200 cum
	Say 272.200 cum @ Rs 1916.05 / cum	**Rs 521548.81**
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	9.617 cum
	Say 9.617 cum @ Rs 7990.86 / cum	**Rs 76848.10**
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	477.594 kilogram
	Say 477.594 kilogram @ Rs 101.29 / kilogram	**Rs 48375.50**
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	85.911 cum
	Say 85.911 cum @ Rs 7211.15 / cum	**Rs 619517.11**
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	33480.576 kilogram
	Say 33480.576 kilogram @ Rs 98.30 / kilogram	**Rs 3291140.62**
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	1700.814 sqm
	Say 1700.814 sqm @ Rs 223.32 / sqm	**Rs 379825.78**

Other Engineering Organisations
PRICE

18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	231.670 sqm
	Say 231.670 sqm @ Rs 542.29 / sqm	**Rs 125632.32**
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	53.380 sqm
	Say 53.380 sqm @ Rs 401.21 / sqm	**Rs 21416.59**
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	80.070 cum
	Say 80.070 cum @ Rs 258.57 / cum	**Rs 20703.70**
21	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	540.465 cum
	Say 540.465 cum @ Rs 606.82 / cum	**Rs 327964.97**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	30.000 each
	Say 30.000 each @ Rs 545.00 / each	**Rs 16350.00**
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	83.399 sqm
	Say 83.399 sqm @ Rs 45.29 / sqm	**Rs 3777.14**
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	

Other Engineering Organisations
PRICE

	Net Total Quantity	1698.599 kg
	Say 1698.599 kg @ Rs 119.79 / kg	**Rs 203475.17**
25	od215736/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
	Net Total Quantity	63.585 sqm
	Say 63.585 sqm @ Rs 35309.60 / sqm	**Rs 2245160.92**
	2 Grit/Screen Chamber 3m dia	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	40.836 cum
	Say 40.836 cum @ Rs 214.03 / cum	**Rs 8740.13**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	10.209 cum
	Say 10.209 cum @ Rs 106.37 / cum	**Rs 1085.93**
3	od213479/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 10859.75 / metre	**Rs 10859.75**
4	od213482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 11469.39 / metre	**Rs 17204.09**

Other Engineering Organisations
PRICE

5	od213483/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
	Net Total Quantity	0.500 metre
	Say 0.500 metre @ Rs 12078.90 / metre	**Rs 6039.45**
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	118.764 sqm
	Say 118.764 sqm @ Rs 249.69 / sqm	**Rs 29654.18**
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	37.792 cum
	Say 37.792 cum @ Rs 9413.54 / cum	**Rs 355756.50**
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	4.875 cum
	Say 4.875 cum @ Rs 11065.64 / cum	**Rs 53944.99**
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	42.667 cum
	Say 42.667 cum @ Rs 82.10 / cum	**Rs 3502.96**
10	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Other Engineering Organisations PRICE

	Net Total Quantity	42.667 cum
	Say 42.667 cum @ Rs 1916.05 / cum	**Rs 81752.11**
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	1.767 cum
	Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	206.958 kilogram
	Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	2.120 cum
	Say 2.120 cum @ Rs 7211.15 / cum	**Rs 15287.64**
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
	Net Total Quantity	5247.706 kilogram
	Say 5247.706 kilogram @ Rs 108.47 / kilogram	**Rs 569218.67**
15	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	73.947 sqm
	Say 73.947 sqm @ Rs 542.29 / sqm	**Rs 40100.72**
16	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 401.21 / sqm	**Rs 6869.12**
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	

Other Engineering Organisations
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	Net Total Quantity	26.706 cum
	Say 26.706 cum @ Rs 258.57 / cum	**Rs 6905.37**
18	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	66.690 cum
	Say 66.690 cum @ Rs 606.82 / cum	**Rs 40468.83**
19	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	24.000 each
	Say 24.000 each @ Rs 545.00 / each	**Rs 13080.00**
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 45.29 / sqm	**Rs 775.41**
21	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	1635.379 kg
	Say 1635.379 kg @ Rs 119.79 / kg	**Rs 195902.05**
	3 Silt Pit 1.5mx1.5mx1.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	12.936 cum
	Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	

Other Engineering Organisations
PRICE

	Net Total Quantity	1.176 cum
	Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	0.485 cum
	Say 0.485 cum @ Rs 7211.15 / cum	**Rs 3497.41**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 1916.05 / cum	**Rs 5830.54**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	304.300 kilogram
	Say 304.300 kilogram @ Rs 98.30 / kilogram	**Rs 29912.69**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	15.459 sqm

Other Engineering Organisations PRICE

	Say 15.459 sqm @ Rs 223.32 / sqm	**Rs 3452.30**
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	21.250 sqm
	Say 21.250 sqm @ Rs 249.69 / sqm	**Rs 5305.91**
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	10.050 sqm
	Say 10.050 sqm @ Rs 542.29 / sqm	**Rs 5450.01**
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	9.600 sqm
	Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	5.533 cum
	Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**
13	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	7.406 cum
	Say 7.406 cum @ Rs 606.82 / cum	**Rs 4494.11**
	4 Valve chamber 2.4mx3.9mx2.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	53.371 cum
	Say 53.371 cum @ Rs 214.03 / cum	**Rs 11423.00**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	3.021 cum

Other Engineering Organisations PRICE

	Say 3.021 cum @ Rs 2298.93 / cum	**Rs 6945.07**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	1.667 cum
	Say 1.667 cum @ Rs 7211.15 / cum	**Rs 12020.99**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	11.074 cum
	Say 11.074 cum @ Rs 9413.54 / cum	**Rs 104245.54**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	11.074 cum
	Say 11.074 cum @ Rs 82.10 / cum	**Rs 909.18**
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	11.074 cum
	Say 11.074 cum @ Rs 1916.05 / cum	**Rs 21218.34**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	1107.400 kilogram
	Say 1107.400 kilogram @ Rs 98.30 / kilogram	**Rs 108857.42**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	55.371 sqm
	Say 55.371 sqm @ Rs 223.32 / sqm	**Rs 12365.45**

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9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	62.122 sqm
	Say 62.122 sqm @ Rs 249.69 / sqm	**Rs 15511.24**
10	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	
	Net Total Quantity	2.556 sqm
	Say 2.556 sqm @ Rs 717.20 / sqm	**Rs 1833.16**
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
	Net Total Quantity	14.200 metre
	Say 14.200 metre @ Rs 203.93 / metre	**Rs 2895.81**
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	27.720 sqm
	Say 27.720 sqm @ Rs 542.29 / sqm	**Rs 15032.28**
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	33.796 sqm
	Say 33.796 sqm @ Rs 401.21 / sqm	**Rs 13559.29**
14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	19.186 cum
	Say 19.186 cum @ Rs 258.57 / cum	**Rs 4960.92**
15	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	34.185 cum
	Say 34.185 cum @ Rs 606.82 / cum	**Rs 20744.14**

Other Engineering Organisations
PRICE

16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	7.000 each
	Say 7.000 each @ Rs 545.00 / each	**Rs 3815.00**
	5 SILT RAISER ARRANGEMENTS	
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe	
	Net Total Quantity	7.000 metre
	Say 7.000 metre @ Rs 2150.66 / metre	**Rs 15054.62**
2	od215542/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend	
	Net Total Quantity	1.000 each
	Say 1.000 each @ Rs 3028.03 / each	**Rs 3028.03**
3	od215543/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 2118.58 / each	**Rs 4237.16**
4	od215565/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 4629.76 / each	**Rs 9259.52**
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe	
	Net Total Quantity	11.000 no
	Say 11.000 no @ Rs 311.92 / no	**Rs 3431.12**

Other Engineering Organisations
PRICE

6	od215585/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	
	Net Total Quantity	10.000 metre
	Say 10.000 metre @ Rs 512.22 / metre	**Rs 5122.20**
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**12937428.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 12937428.00
		Rounded Total Rs 1,29,37,428
	Rupees One Crore Twenty Nine Lakh Thirty Seven Thousand Four Hundred and Twenty Eight Only	

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 2 (Block 3A) , Grit /Screen Chamber and connected works at Muttar STP

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
	1 Colletion well 7m dia							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	3.14/4	10.000	10.000	1.500		117.750	
	Second depth 1.5m to 2m	3.14/4	10.000	10.000	0.500		39.250	
	Total Quantity						157.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						157.000 cum	
	Say 157.000 cum @ Rs 214.03 / cum						**Rs 33602.71**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	10.000	10.000	0.500		39.250	
	Total Quantity						39.250 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.250 cum	
	Say 39.250 cum @ Rs 106.37 / cum						**Rs 4175.02**	
3	od213480/2022_2023 Sinking wells above 6.0 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (for 7m diameter)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 47748.85 / metre						**Rs 47748.85**	

Other Engineering Organisations PRICE

4	od213481/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m(for 7m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 50521.07 / metre						**Rs 75781.61**	
5	od213484/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m(for 7m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 53289.85 / metre						**Rs 79934.78**	
6	od213485/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m(for 7m diameter)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 56057.29 / metre						**Rs 84085.94**	
7	od213625/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m(for 7m diameter)							
		1			0.290		0.290	
	Total Quantity						0.290 metre	

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PRICE

	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.290 metre	
	Say 0.290 metre @ Rs 58826.57 / metre						**Rs 17059.71**	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	7.000	1.000			21.980	
	well Kerb - outer	1*3.14	9.150	2.100			60.336	
	well Kerb - Slope	1	7+7.83		1.380		20.466	
	Side wall	1*3.14	8.000		8.790		220.805	
	Total Quantity						323.587 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						323.587 sqm	
	Say 323.587 sqm @ Rs 249.69 / sqm						**Rs 80796.44**	
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000		38.465	
	From 1.5m to 4.5m below ground level-kerb	12.93					12.930	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790		195.685	
	Total Quantity						247.080 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						247.080 cum	

Other Engineering Organizations PRICE

	Say 247.080 cum @ Rs 9413.54 / cum						**Rs 2325897.46**	
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	8.000	1.000	1.000		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 11065.64 / cum						**Rs 277968.88**	
11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000		38.465	
	From 1.5m to 4.5m below ground level-kerb	12.93					12.930	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790		195.685	
	Side wall	3.14	8.000	1.000	1.000		25.120	
	Total Quantity						272.200 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						272.200 cum	
	Say 272.200 cum @ Rs 82.10 / cum						**Rs 22347.62**	
12	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							

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	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000		38.465	
	From 1.5m to 4.5m below ground level-kerb	12.93					12.930	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790		195.685	
	Side wall	3.14	8.000	1.000	1.000		25.120	
						Total Quantity	272.200 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	272.200 cum	
						Say 272.200 cum @ Rs 1916.05 / cum	**Rs 521548.81**	
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	7.000	7.000	0.250		9.617	
						Total Quantity	9.617 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.617 cum	
						Say 9.617 cum @ Rs 7990.86 / cum	**Rs 76848.10**	
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	9.000	16.900			477.594	
						Total Quantity	477.594 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	477.594 kilogram	
						Say 477.594 kilogram @ Rs 101.29 / kilogram	**Rs 48375.50**	
15	4.1.6							

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	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	8.000	8.000	1.710		85.911	
	Total Quantity						85.911 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						85.911 cum	
	Say 85.911 cum @ Rs 7211.15 / cum						**Rs 619517.11**	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000	120.0	4615.800	120Kg/m3
	From 1.5m to 4.5m below ground level-kerb	12.93				120.0	1551.600	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790	120.0	23482.176	
	Side wall	3.14	8.000	1.000	1.000	120.0	3014.400	120Kg/m3
	Wastage @2.5%	32663.976			2.5/100		816.600	
	Total Quantity						33480.576 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						33480.576 kilogram	
	Say 33480.576 kilogram @ Rs 98.30 / kilogram						**Rs 3291140.62**	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		33480.576				0.05	1700.814	0.0508 m2/kg
	Total Quantity						1700.814 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1700.814 sqm	

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	Say 1700.814 sqm @ Rs 223.32 / sqm						**Rs 379825.78**	
18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1*3.14	7.000		8.790		193.205	
	Well floor	1*3.14/4	7.000	7.000			38.465	
	Total Quantity						231.670 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						231.670 sqm	
	Say 231.670 sqm @ Rs 542.29 / sqm						**Rs 125632.32**	
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer 1m above GL)	1*3.14	9.000	1.000			28.260	
	top of wall thickness	1*3.14	8.000	1.000			25.120	
	Total Quantity						53.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						53.380 sqm	
	Say 53.380 sqm @ Rs 401.21 / sqm						**Rs 21416.59**	
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	7.000	7.000	2.000		-76.930	
	First depth 0 to 1.5m	3.14/4	10.000	10.000	1.500		117.750	
	Second depth 1.5m to 2m	3.14/4	10.000	10.000	0.500		39.250	
	Total Quantity						157.000 cum	
	Total Deducted Quantity						-76.930 cum	
	Net Total Quantity						80.070 cum	
	Say 80.070 cum @ Rs 258.57 / cum						**Rs 20703.70**	
21	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	First depth 0 to 1.5m	3.14/4	10.000	10.000	1.500		117.750	

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	Second depth 1.5m to 2m	3.14/4	10.000	10.000	0.500		39.250	
	For sinking well	3.14/4	9.000	9.000	7.290		463.535	
	Deduct for Refilling quantity	80.070					-80.070	
						Total Quantity	620.535 cum	
						Total Deducted Quantity	-80.070 cum	
						Net Total Quantity	540.465 cum	
						Say 540.465 cum @ Rs 606.82 / cum	**Rs 327964.97**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		30					30.000	
						Total Quantity	30.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	30.000 each	
						Say 30.000 each @ Rs 545.00 / each	**Rs 16350.00**	
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL)	1*3.14	6.200	1.000			19.468	
	top of wall thickness	1*3.14	5.600	0.600			10.551	
	Well outer 1m above GL)	1*3.14	9.000	1.000			28.260	
	top of wall thickness	1*3.14	8.000	1.000			25.120	
						Total Quantity	83.399 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	83.399 sqm	
						Say 83.399 sqm @ Rs 45.29 / sqm	**Rs 3777.14**	
24	10.2							

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	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station(64sqm)							
	(33*0.58)+(17*0.28)=24.23 kg/m	1	64.000			24.23	1550.720	25 x 3 flats at 30 mm spacing=33nos@0.59,12 x 3 flats at 60 mm spacing=17@.28
	25 x6 SS for outer frame@1.18kg/m	1*3.14	9.000			1.18	33.347	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	9.000			3.92	70.560	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	7.600			4.47	33.972	
	Misc. items for opening frame	1	10.000				10.000	
						Total Quantity	1698.599 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	1698.599 kg	
						Say 1698.599 kg @ Rs 119.79 / kg	**Rs 203475.17**	
25	od215736/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
		3.14/4	9.000	9.000			63.585	
						Total Quantity	63.585 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	63.585 sqm	

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	Say 63.585 sqm @ Rs 35309.60 / sqm						**Rs 2245160.92**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627	
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						**Rs 8740.13**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						**Rs 1085.93**	
3	od213479/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						**Rs 10859.75**	
4	od213482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							

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		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						**Rs 17204.09**	
5	od213483/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1	0.500				0.500	
	Total Quantity						0.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.500 metre	
	Say 0.500 metre @ Rs 12078.90 / metre						**Rs 6039.45**	
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.38		0.710		14.224	
	Side wall	1*3.14	3.900	7.100			86.947	
	Total Quantity						118.764 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						118.764 sqm	
	Say 118.764 sqm @ Rs 249.69 / sqm						**Rs 29654.18**	
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	

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	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Total Quantity						37.792 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						37.792 cum	
	Say 37.792 cum @ Rs 9413.54 / cum						**Rs 355756.50**	
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						4.875 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.875 cum	
	Say 4.875 cum @ Rs 11065.64 / cum						**Rs 53944.99**	
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07

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		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
						Total Quantity	42.667 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	42.667 cum	
						Say 42.667 cum @ Rs 82.10 / cum	**Rs 3502.96**	
10	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
						Total Quantity	42.667 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	42.667 cum	
						Say 42.667 cum @ Rs 1916.05 / cum	**Rs 81752.11**	
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							

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	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
						Total Quantity	1.767 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.767 cum	
						Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**	
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
						Total Quantity	206.958 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	206.958 kilogram	
						Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**	
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
						Total Quantity	2.120 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2.120 cum	
						Say 2.120 cum @ Rs 7211.15 / cum	**Rs 15287.64**	
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	Bottom slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510	
	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07
	@120kg/m3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07

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	@120kg/m3 of concrete	1*.5	11.070	0.380	0.600	120.0	151.438	Circum=3.14*3.53=11.07
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	6.100	120.0	3568.391	Circum=3.14*3.53=11.07
	Side wall@120kg/m3 of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	5119.713			2.5/100		127.993	
	Total Quantity						5247.706 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						5247.706 kilogram	
	Say 5247.706 kilogram @ Rs 108.47 / kilogram						**Rs 569218.67**	
15	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1	3.140	3.000	7.100		66.882	
	Well floor	1*3.14/4	3.000	3.000			7.065	
	Total Quantity						73.947 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						73.947 sqm	
	Say 73.947 sqm @ Rs 542.29 / sqm						**Rs 40100.72**	
16	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 401.21 / sqm						**Rs 6869.12**	
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.836				40.836	

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	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
						Total Quantity	40.836 cum	
						Total Deducted Quantity	-14.130 cum	
						Net Total Quantity	26.706 cum	
						Say 26.706 cum @ Rs 258.57 / cum	**Rs 6905.37**	
18	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Earthwork quantity	40.86					40.860	
	For sinking well	3.14/4	3.900	3.900	4.400		52.536	
	Deduct for Refilling quantity	26.706					-26.706	
						Total Quantity	93.396 cum	
						Total Deducted Quantity	-26.706 cum	
						Net Total Quantity	66.690 cum	
						Say 66.690 cum @ Rs 606.82 / cum	**Rs 40468.83**	
19	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		24					24.000	
						Total Quantity	24.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	24.000 each	
						Say 24.000 each @ Rs 545.00 / each	**Rs 13080.00**	
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
						Total Quantity	17.121 sqm	
						Total Deducted Quantity	0.000 sqm	

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	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						**Rs 775.41**	
21	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of slant screen(3*1.8)=5.4sqm							
	weight of 29 nos 50mmx10mm flats at 35mm spacing@3.92k/m	29	5.400			3.92	613.873	
	50 x 10mm SS for outer frame@3.92Kg/m	1	(3+1.8)*2			3.92	37.632	
	Area of horizontal portion(3x1.5=4.5sqm)							
	(34nos)50mmx10mm flats at 30 mm spacing	34	4.500			3.92	599.760	@3.92kg/m
	50 x 10mm SS for outer frame	1	(3+1.5)*2			3.92	35.280	@3.92kg/m
	Area of pumping station 12sqm							
	25 x 3 flats at 30 mm spacing@.58kg/m	33	12.000			0.59	233.640	
	12 x 3 flats at 60 mm spacing	17	12.000			0.28	57.121	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.800			4.47	8.046	
	Misc. items for opening frame	1	5.000				5.000	
	25 x6 SS for outer frame	3.14	3.900			1.18	14.451	@1.18kg/m
	Total Quantity						1635.379 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1635.379 kg	
	Say 1635.379 kg @ Rs 119.79 / kg						**Rs 195902.05**	

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Sl No	Description	No	L	B	D	CF	Quantity	Remark
	3 Silt Pit 1.5mx1.5mx1.2m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.936 cum	
	Say 12.936 cum @ Rs 214.03 / cum						**Rs 2768.69**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 2298.93 / cum						**Rs 2703.54**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						**Rs 3497.41**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	

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		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						**Rs 28645.40**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						**Rs 249.83**	
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						**Rs 5830.54**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	

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	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						**Rs 29912.69**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						**Rs 3452.30**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	
	Say 21.250 sqm @ Rs 249.69 / sqm						**Rs 5305.91**	
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Inside	2	1.500		1.200		3.600	
		2	1.500		1.200		3.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						10.050 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.050 sqm	
	Say 10.050 sqm @ Rs 542.29 / sqm						**Rs 5450.01**	
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.000			1.2	4.800	
		2	2.000			1.2	4.800	

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						Total Quantity	9.600 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	9.600 sqm	
						Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**	
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	-7.403 cum	
						Net Total Quantity	5.533 cum	
						Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**	
13	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	12.936					12.936	
	deduction for Refilling	5.53					-5.530	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	-5.530 cum	
						Net Total Quantity	7.406 cum	
						Say 7.406 cum @ Rs 606.82 / cum	**Rs 4494.11**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 2.4mx3.9mx2.2m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.800	5.300	2.650		53.371	
						Total Quantity	53.371 cum	

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	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						53.371 cum	
	Say 53.371 cum @ Rs 214.03 / cum						**Rs 11423.00**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.800	5.300	0.150		3.021	
	Total Quantity						3.021 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.021 cum	
	Say 3.021 cum @ Rs 2298.93 / cum						**Rs 6945.07**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.400	4.900	0.100		1.667	
	Total Quantity						1.667 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.667 cum	
	Say 1.667 cum @ Rs 7211.15 / cum						**Rs 12020.99**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.200	4.700	0.200		3.009	
	Walls	2	2.800	0.200	2.200		2.464	
		2	3.900	0.200	2.200		3.433	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						11.074 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.074 cum	
	Say 11.074 cum @ Rs 9413.54 / cum						**Rs 104245.54**	

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5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.200	4.700	0.200		3.009	
	Walls	2	2.800	0.200	2.200		2.464	
		2	3.900	0.200	2.200		3.433	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						11.074 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.074 cum	
	Say 11.074 cum @ Rs 82.10 / cum						**Rs 909.18**	
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Raft	1	3.200	4.700	0.200		3.009	
	Walls	2	2.800	0.200	2.200		2.464	
		2	3.900	0.200	2.200		3.433	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						11.074 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.074 cum	
	Say 11.074 cum @ Rs 1916.05 / cum						**Rs 21218.34**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@100kg per m3 concrete	1	11.074	100.000			1107.400	
	Total Quantity						1107.400 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						1107.400 kilogram	
	Say 1107.400 kilogram @ Rs 98.30 / kilogram						**Rs 108857.42**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	0.0508 Sqm/kg	1107.400				0.05	55.371	

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						Total Quantity	55.371 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	55.371 sqm	
						Say 55.371 sqm @ Rs 223.32 / sqm	**Rs 12365.45**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.200		0.200		1.281	
		2		4.700	0.200		1.881	
	Walls outer	2	2.800		2.200		12.320	
		2		4.300	2.200		18.920	
	Walls inner	2	2.400		2.200		10.560	
		2		3.900	2.200		17.160	
						Total Quantity	62.122 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	62.122 sqm	
						Say 62.122 sqm @ Rs 249.69 / sqm	**Rs 15511.24**	
10	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.							
	Cover slab	2	2.800		0.180		1.008	
		2	4.300		0.180		1.548	
						Total Quantity	2.556 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	2.556 sqm	
						Say 2.556 sqm @ Rs 717.20 / sqm	**Rs 1833.16**	
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.800+4.3				14.200	
						Total Quantity	14.200 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	14.200 metre	
						Say 14.200 metre @ Rs 203.93 / metre	**Rs 2895.81**	
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm							

Other Engineering Organisations
PRICE

	cement plaster							
	inside	2	2.400		2.200		10.560	
		2		3.900	2.200		17.160	
	Total Quantity						27.720 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						27.720 sqm	
	Say 27.720 sqm @ Rs 542.29 / sqm						**Rs 15032.28**	
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.800		2.380		13.328	
		2		4.300	2.380		20.468	
	Total Quantity						33.796 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						33.796 sqm	
	Say 33.796 sqm @ Rs 401.21 / sqm						**Rs 13559.29**	
14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	53.371				53.371	
	Sand filling Item 2	1	3.020				-3.020	
	PCC item 3	1	1.667				-1.667	
	RCC item 4	1	8.906				-8.906	
	Chamber size	1	2.400	3.900	2.200		-20.592	
	Total Quantity						53.371 cum	
	Total Deducted Quantity						-34.185 cum	
	Net Total Quantity						19.186 cum	
	Say 19.186 cum @ Rs 258.57 / cum						**Rs 4960.92**	
15	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	1	53.371				53.371	
	deduction for Refilling quantity	19.186					-19.186	

Other Engineering Organisations PRICE

	Total Quantity						53.371 cum	
	Total Deducted Quantity						-19.186 cum	
	Net Total Quantity						34.185 cum	
	Say 34.185 cum @ Rs 606.82 / cum						**Rs 20744.14**	
16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		7					7.000	
	Total Quantity						7.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						7.000 each	
	Say 7.000 each @ Rs 545.00 / each						**Rs 3815.00**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	5 SILT RAISER ARRANGEMENTS							
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe							
	From Desilting pump to silt pit							
	100mm dia D/F CI Pipe -0.5m length	2	0.500				1.000	
	100mm dia D/F CI Pipe -1.0m length	2	1.000				2.000	
	100mm dia D/F CI Pipe -2.0m length	2	2.000				4.000	
	Total Quantity						7.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						7.000 metre	
	Say 7.000 metre @ Rs 2150.66 / metre						**Rs 15054.62**	
2	od215542/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend							

Other Engineering Organisations
PRICE

		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 3028.03 / each						**Rs 3028.03**	
3	od215543/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend							
		2					2.000	
	Total Quantity						2.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 2118.58 / each						**Rs 4237.16**	
4	od215565/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete							
		2					2.000	
	Total Quantity						2.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 4629.76 / each						**Rs 9259.52**	
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe							
		11					11.000	
	Total Quantity						11.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						11.000 no	
	Say 11.000 no @ Rs 311.92 / no						**Rs 3431.12**	
6	od215585/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.							

Other Engineering Organisations
PRICE

		1	10.000				10.000	
	Total Quantity						10.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						10.000 metre	
	Say 10.000 metre @ Rs 512.22 / metre						**Rs 5122.20**	
Provision for GST payments (in %) @						**0.0%**		
Amount reserved for GST payments						**0.00**		
Total						**12937428.00**		
Lumpsum for round off						**0.00**		
TOTAL Rs 12937428.00								
Rounded Total Rs 1,29,37,428								
Rupees One Crore Twenty Nine Lakh Thirty Seven Thousand Four Hundred and Twenty Eight Only								

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Data Analysis

Colletion well 7m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

	Cost index **35.59 %**				56.18

Other Engineering Organisations
PRICE

	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59
				Cost per cum	78.46
				Say	78.45

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od213480/2022_2023

od213480/2022_2023 :Sinking wells above 6.0 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (for 7m diameter)
Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.7.2 366.45*1.3559	cum	158.35000	496.87	78679.36
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	123115.39
	cost for 3.0 metre				123115.39
	cost for one metre				41038.46
	say				41038.46

	Add Water Charges @ 1.0%				**410.38**
	Add CPOH @ 15.0%				**6217.32**
	Cost index **35.59 %**				82.67
	Total with Cost index				47748.85
	Say				47748.85

4 Specification Code: od213481/2022_2023

od213481/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of

Other Engineering Organisations
PRICE

soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m(for 7m diameter)
Quantity for 3.0m depth=3.14*3.6*3.6*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.3 399.80*1.3559 =542.088	cum	158.35000	542.09	85839.63
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	130275.66
	cost for 3.0 metre				130275.66
	cost for one metre				43425.22
	say				43425.22

	Add Water Charges @ 1.0%				**434.25**
	Add CPOH @ 15.0%				**6578.92**
	Cost index **35.59 %**				82.67
	Total with Cost index				50521.07
	Say				50521.07

5 Specification Code: od213484/2022_2023

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PRICE

od213484/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m(for 7m diameter)

Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.4 433.11*1.3559 =587.25	cum	158.35000	587.25	92991.04
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	137427.07
	cost for 3.0 metre				137427.07
	cost for one metre				45809.02
	say				45809.02

	Add Water Charges @ 1.0%				**458.09**
	Add CPOH @ 15.0%				**6940.06**
	Cost index **35.59 %**				82.67
	Total with Cost index				53289.85
	Say				53289.85

6 Specification Code: od213485/2022_2023

Other Engineering Organisations PRICE

od213485/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m(for 7m diameter)

Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.5 466.40*1.3559 =632.39	cum	158.35000	632.39	100138.96
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	144574.99
	cost for 3.0 metre				144574.99
	cost for one metre				48191.66
	say				48191.66

	Add Water Charges @ 1.0%				**481.91**
	Add CPOH @ 15.0%				**7301.03**
	Cost index **35.59 %**				82.67
	Total with Cost index				56057.29
	Say				56057.29

7 Specification Code: od213625/2022_2023

Other Engineering Organisations PRICE

od213625/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m(for 7m diameter)

Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.6 499.71*1.3559 =677.56	cum	158.35000	677.56	107291.63
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	151727.66
	cost for 3.0 metre				151727.66
	cost for one metre				50575.89
	say				50575.89

	Add Water Charges @ 1.0%				**505.75**
	Add CPOH @ 15.0%				**7662.24**
	Cost index **35.59 %**				82.67
	Total with Cost index				58826.57
	Say				58826.57

8 Specification Code: 5.9.12

SUBHEAD : **5.0**

Other Engineering Organisations PRICE

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

9 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
				TOTAL	5977.32

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

10 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

11 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

Other Engineering Organisation
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

12 Specification Code: od213486/2022_2023

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

13 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

14 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
	AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)				63.17

Other Engineering Organisations
PRICE

TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

15 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

16 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86
				TOTAL	1647.25
				Cost of 10.0 sqm	1647.25

Other Engineering Organisations
PRICE

Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

18 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

19 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84

0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

20 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42

TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

21 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82

	Say				606.82

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

24 Specification Code: 10.2

SUBHEAD : **10.0**

Other Engineering Organisations
PRICE

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00
1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00

Other Engineering Organisations PRICE

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25

Other Engineering Organisations
PRICE

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

25 Specification Code: od215736/2022_2023

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od215736/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
				TOTAL	30400.00

				cost for one sqm	30400.00
	say				30400.00

	Add Water Charges @ 1.0%				**304.00**
	Add CPOH @ 15.0%				**4605.60**
	Cost index **35.59 %**				0.00
	Total with Cost index				35309.60
	Say				35309.60

Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59

Cost per cum	78.46
Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od213479/2022_2023

od213479/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	27835.74
	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				**92.78**

	Add CPOH @ 15.0%				**1405.70**
	Cost index **35.59 %**				82.67
	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od213482/2022_2023

od213482/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				**98.03**

	Add CPOH @ 15.0%				**1485.22**
	Cost index **35.59 %**				82.67
	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od213483/2022_2023

od213483/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 421.44*1.3559 =	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	30984.67

	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				**103.28**

	Add CPOH @ 15.0%				**1564.72**
	Cost index **35.59 %**				82.67
	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

7 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

8 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

Other Engineering Organisations
PRICE

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

Other Engineering Organisations
PRICE

9 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

Other Engineering Organisations
PRICE

10 Specification Code: od213486/2022_2023

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

11 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

Other Engineering Organisations
PRICE

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

Other Engineering Organisations
PRICE

12 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)	63.17
TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

13 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

14 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

Other Engineering Organisations PRICE

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

	Cost index **35.59 %**				28.47
	Total with Cost index				108.47

15 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22

0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

16 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36

0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

17 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL	1641.80
Add Water Charges @ 1%	16.42
TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

Other Engineering Organisations
PRICE

18 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52

				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

19 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00

9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

20 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				

0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff	L.S	0.91	2.00	1.82
	LABOUR:				
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

21 Specification Code: 10.2

SUBHEAD : **10.0**

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

Other Engineering Organisations
PRICE

1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00
1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

Other Engineering Organisations
PRICE

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25
Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

Silt Pit 1.5mx1.5mx1.2m

1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm

on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10

Other Engineering Organisations PRICE

0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od213486/2022_2023

Other Engineering Organisations
PRICE

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

Other Engineering Organisations
PRICE

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				

3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

11 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

12 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

13 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer

First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Valve chamber 2.4mx3.9mx2.2m

1 Specification Code: 2.6.1

Other Engineering Organisations
PRICE

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00

0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

Other Engineering Organisations
PRICE

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33

Add Water Charges @ 1%	145.97
TOTAL	14743.30
Add CPOH @ 15%	2211.49
TOTAL	16954.79
Cost of 10.0 cum	16954.79
Cost per cum	1695.48
Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00

2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

Other Engineering Organisations
PRICE

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix

M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations
PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od213486/2022_2023

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10	Specification Code: 5.9.2

SUBHEAD 5.0

Other Engineering Organisations

REINFORCED CEMENT CONCRETE

PRICE

5.9

Centering and shuttering including strutting, etc. and removal of form for:

5.9.2

Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 7.9m long and 1.00m high wall Area of contact 2x7.9x1.0 = 15.8 sqm MATERIAL: Assuming shuttering material will become unserviceable after us of 40 times Adding for maintenance @ 10% of cost Taking salvage value after full use of material @ 25% of cost				

7319	wall form panel 1250x500 mm 2x3x2x2 = 24 Nos. Qty taken for cost of using once = 24x0.85/40 = 0.51	each	0.51	860.00	438.60
7327	100 mm channel shoulder 2.5 m long 4x2 = 8 Qty taken for cost of using once = 8x0.85/40 = 0.17	each	0.17	910.00	154.70
7328	Double clip (bridge clip) 2x6x2 = 24 Qty taken for cost of using once = 24x0.85/40 = 0.51	each	0.51	76.00	38.76
7329	Single clip 2x3x2 = 12 Qty taken for cost of using once = 12x0.85/40 = 0.255	each	0.255	59.00	15.05
7330	M.S. Tube 40 mm dia 2x2x8m = 32m Qty taken for cost of using once = 32x0.85/40 = 0.68	metre	0.68	215.00	146.20
9999	Sundries-Qty taken for cost of using once = 1300x0.85/40 = 27.62	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	78.0	2.00	156.00
0116	Fitter(grade1)	Day	3.5	738.00	2583.00
0114	Beldar	Day	6.0	558.00	3348.00
9999	Sundries- shuttering oil	L.S	78.0	2.00	156.00
9999	Sundries-	L.S	52.0	2.00	104.00
				TOTAL	7195.55
				Add Water Charges @ 1%	71.96
				TOTAL	7267.51
				Add CPOH @ 15%	1090.13

Other Engineering Organisations
PRICE

Costof 15.8 Sq. m.	8357.64
Cost per 1 Sq. m.	528.96
Say	528.95

	Cost index **35.59 %**				188.25
	Total with Cost index				717.20

11 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) 4x3x0.15x0.030 = 0.54 cum Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = 57/8 = 7.125 cudm	10 cud m	7.125	260.00	185.25

Other Engineering Organisations
PRICE

1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal 2x4x0.075x0.1x0.5 = 0.030 Horizontal 2x4x0.075x0.1 x 1.5 = 0.090 (iii) Vertical battens 16x0.15x0.075x0.030m = 0.0054 (iv) Struts 16x0.25x0.07x0.075 = 0.0225 Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = 155/8 = 19.375 cudm	10 cud m	19.375	260.00	503.75
2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = 0.212/8 =0.0265 cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL	1553.85
Add Water Charges @ 1%	15.54
TOTAL	1569.39
Add CPOH @ 15%	235.41
TOTAL	1804.80
Cost of 12.0 metre	1804.80
Cost per metre	150.40
Say	150.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				53.53
	Total with Cost index				203.93

12 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25
				Add Water Charges @ 1%	34.43
				TOTAL	3477.68
				Add CPOH @ 15%	521.65

Other Engineering Organisations PRICE

TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

13 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60

Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

14 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95

Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

15 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

16 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
	AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)				2.92
	TOTAL				357.72
	AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)				44.25

Other Engineering Organisations PRICE

TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

SILT RAISER ARRANGEMENTS
1 Specification Code: 18.71.1

SUBHEAD : **18.0**

WATER SUPPLY

18.71 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):

18.71.1 100 mm dia C.I Double Flanged Pipe

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 5 metre MATERIAL: 100 mm dia. cast iron pipes double flanged weight of 1m pipe = 27.00 kg Weight of 5 m pipes 27.00 x 5 = 135.00 kg				
7712	Screwed double flanged centrifugally cast (spun) C.I Pipe pf Class B confroming to I.S. 1536.- 100 mm dia	metre	5.0	1310.00	6550.00
2319	Carriage of Spun iron S & S pipes 100 mm dia Labour for laying	100 meter	5.0	226.82	11.34

18.23	Rate as per item Number18.23 of SH: Water Supply	quintal	1.35	229.40	309.69(A)

AddWater Charges @ 1% except on A ie on (6871.03-309.69=6561.34)	65.61
TOTAL	6936.64
AddCPOH @ 15% except on A ie on (6936.64-309.69=6626.95)	994.04
TOTAL	7930.75
Cost of 5.0 metre	7930.75
Cost of 1 metre	1586.15
Say	1586.15

	Cost index **35.59 %**				564.51
	Total with Cost index				2150.66

Other Engineering Organisations
PRICE

2 Specification Code: od215542/2022_2023

od215542/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllying and laying of 100 mm D/F 90oDuck Foot Bend TWAD rate	no	1.00000	2607.00	2607.00
				TOTAL	2607.00
				cost for one each	2607.00
	say				2607.00

	Add Water Charges @ 1.0%				**26.07**
	Add CPOH @ 15.0%				**394.96**

	Cost index **35.59 %**				0.00
	Total with Cost index				3028.03
	Say				3028.03

3 Specification Code: od215543/2022_2023

od215543/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllying and laying of 100 mm dia D/F CI bend 90o bend TWAD rate	no	1.00000	1824.00	1824.00
				TOTAL	1824.00
				cost for one each	1824.00
	say				1824.00

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**18.23**
	Add CPOH @ 15.0%				**276.33**
	Cost index **35.59 %**				0.00
	Total with Cost index				2118.58
	Say				2118.58

4 Specification Code: od215565/2022_2023

od215565/2022_2023 :Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete

Code	Description	Unit	Quantity	Rate	Amount
18.71.1	Rate as per item number 18.71.1 of SH: Water Supply	metre	2.00000	1365.60	2731.21

2.8.1	Rate as per item number 2.8.1 of SH: Earth Work	cum	1.00000	188.55	188.55
9999	Sundries	L.S	10.00000	2.00	20.00

				TOTAL	2939.76
				cost for one each	2939.76
	say				2939.76

	Add Water Charges @ 1.0%				**29.39**
	Add CPOH @ 15.0%				**445.37**
	Cost index **35.59 %**				1215.23
	Total with Cost index				4629.76
	Say				4629.76

5 Specification Code: 18.30.2

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.2 100 mm diameter pipe

Other Engineering Organisations
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Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1374	Rubber insertions for 100 mm dia pipe joints	each	10.0	18.00	180.00
1956	Bolts and nuts 16 mm dia 60 mm long	each	80.0	11.00	880.00
9977	Carriage of materialsLABOUR:	L.S	4.16	2.00	8.32
0116	Fitter(grade1)	Day	0.25	738.00	184.50
0117	Assistant Fitter or 2nd class fitter	Day	0.25	679.00	169.75
0114	Beldar	Day	1.0	558.00	558.00
				TOTAL	1980.57
				Add Water Charges @ 1%	19.81

TOTAL	2000.38
Add CPOH @ 15%	300.06
TOTAL	2300.44
Cost of 10.0 no	2300.44
Cost of each	230.04
Say	230.05

	Cost index **35.59 %**				81.87
	Total with Cost index				311.92

6 Specification Code: od215585/2022_2023

od215585/2022_2023 :Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m. TWAD	metre	1.00000	441.00	441.00
				TOTAL	441.00
				cost for one metre	441.00

	say				441.00

	Add Water Charges @ 1.0%				**4.41**
	Add CPOH @ 15.0%				**66.81**
	Cost index **35.59 %**				0.00
	Total with Cost index				512.22
	Say				512.22

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 1 (Block 3B+2) , Grit /Screen Chamber and connected works at Muttar STP

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Colletion well 5.5m dia**	5005053.47
2	**Grit/Screen Chamber 3m dia**	1585530.61
3	**Silt Pit 1.5mx1.5mx1.2m**	97595.15
4	**Valve chamber 2.1mx3.8mx1.9m**	313663.08
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**7001842.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 7001842.00
		Rounded Total Rs 70,01,842
		Rupees Seventy Lakh One Thousand Eight Hundred and Forty Two Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 1 (Block 3B+2) , Grit /Screen Chamber and connected works at Muttar STP

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

	1 Colletion well 5.5m dia	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	100.480 cum
	Say 100.480 cum @ Rs 214.03 / cum	**Rs 21505.73**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	25.120 cum
	Say 25.120 cum @ Rs 106.37 / cum	**Rs 2672.01**
3	od212791/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5.5m diameter R1)	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 29872.26 / metre	**Rs 29872.26**
4	od212837/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5.5m diameter R1)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 31527.93 / metre	**Rs 47291.90**
5	od212867/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5.5m diameter R1)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 33186.05 / metre	**Rs 49779.08**

Other Engineering Organisations PRICE

6	od212902/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5.5m diameter R1)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 34841.72 / metre	**Rs 52262.58**
7	od213138/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter R1)	
	Net Total Quantity	1.090 metre
	Say 1.090 metre @ Rs 36499.85 / metre	**Rs 39784.84**
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	236.086 sqm
	Say 236.086 sqm @ Rs 249.69 / sqm	**Rs 58948.31**
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	18.458 cum
	Say 18.458 cum @ Rs 9413.54 / cum	**Rs 173755.12**
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	98.720 cum
	Say 98.720 cum @ Rs 11065.64 / cum	**Rs 1092399.98**

Other Engineering Organisations PRICE

11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	117.178 cum
	Say 117.178 cum @ Rs 82.10 / cum	**Rs 9620.31**
12	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	117.178 cum
	Say 117.178 cum @ Rs 1916.05 / cum	**Rs 224518.91**
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	5.937 cum
	Say 5.937 cum @ Rs 7990.86 / cum	**Rs 47441.74**
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	355.543 kilogram
	Say 355.543 kilogram @ Rs 101.29 / kilogram	**Rs 36012.95**
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	11.684 cum
	Say 11.684 cum @ Rs 7211.15 / cum	**Rs 84255.08**
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	14415.600 kilogram
	Say 14415.600 kilogram @ Rs 98.30 / kilogram	**Rs 1417053.48**
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	732.313 sqm
	Say 732.313 sqm @ Rs 223.32 / sqm	**Rs 163540.14**

Other Engineering Organisations
PRICE

18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	172.097 sqm
	Say 172.097 sqm @ Rs 542.29 / sqm	**Rs 93326.48**
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	32.531 sqm
	Say 32.531 sqm @ Rs 401.21 / sqm	**Rs 13051.76**
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	52.988 cum
	Say 52.988 cum @ Rs 258.57 / cum	**Rs 13701.11**
21	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	279.715 cum
	Say 279.715 cum @ Rs 606.82 / cum	**Rs 169736.66**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	29.000 each
	Say 29.000 each @ Rs 545.00 / each	**Rs 15805.00**
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	32.531 sqm
	Say 32.531 sqm @ Rs 45.29 / sqm	**Rs 1473.33**
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	

Other Engineering Organisations PRICE

	Net Total Quantity	967.120 kg
	Say 967.120 kg @ Rs 119.79 / kg	**Rs 115851.30**
25	od215737/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
	Net Total Quantity	29.210 sqm
	Say 29.210 sqm @ Rs 35309.60 / sqm	**Rs 1031393.42**
	2 Grit/Screen Chamber 3m dia	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	40.836 cum
	Say 40.836 cum @ Rs 214.03 / cum	**Rs 8740.13**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	10.209 cum
	Say 10.209 cum @ Rs 106.37 / cum	**Rs 1085.93**
3	od211167/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 10859.75 / metre	**Rs 10859.75**
4	od211170/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 11469.39 / metre	**Rs 17204.09**

Other Engineering Organisations
PRICE

5	od211171/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 12078.90 / metre	**Rs 18118.35**
6	od213517/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)	
	Net Total Quantity	0.800 metre
	Say 0.800 metre @ Rs 16674.35 / metre	**Rs 13339.48**
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	114.890 sqm
	Say 114.890 sqm @ Rs 249.69 / sqm	**Rs 28686.88**
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	8.068 cum
	Say 8.068 cum @ Rs 9413.54 / cum	**Rs 75948.44**
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	33.149 cum
	Say 33.149 cum @ Rs 11065.64 / cum	**Rs 366814.90**

Other Engineering Organisations PRICE

10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	41.229 cum
	Say 41.229 cum @ Rs 82.10 / cum	**Rs 3384.90**
11	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	41.229 cum
	Say 41.229 cum @ Rs 1916.05 / cum	**Rs 78996.83**
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	1.767 cum
	Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	206.958 kilogram
	Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	2.804 cum
	Say 2.804 cum @ Rs 7211.15 / cum	**Rs 20220.06**
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
	Net Total Quantity	5068.830 kilogram
	Say 5068.830 kilogram @ Rs 108.47 / kilogram	**Rs 549815.99**
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	257.497 sqm
	Say 257.497 sqm @ Rs 223.32 / sqm	**Rs 57504.23**

Other Engineering Organisations
PRICE

17	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	71.121 sqm
	Say 71.121 sqm @ Rs 542.29 / sqm	**Rs 38568.21**
18	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 401.21 / sqm	**Rs 6869.12**
19	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	26.704 cum
	Say 26.704 cum @ Rs 258.57 / cum	**Rs 6904.85**
20	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	63.110 cum
	Say 63.110 cum @ Rs 606.82 / cum	**Rs 38296.41**
21	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 45.29 / sqm	**Rs 775.41**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	23.000 each
	Say 23.000 each @ Rs 545.00 / each	**Rs 12535.00**
23	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	

Other Engineering Organisations PRICE

	Net Total Quantity	1634.352 kg
	Say 1634.352 kg @ Rs 119.79 / kg	**Rs 195779.03**
	3 Silt Pit 1.5mx1.5mx1.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	12.936 cum
	Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	1.176 cum
	Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	0.485 cum
	Say 0.485 cum @ Rs 7211.15 / cum	**Rs 3497.41**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**
6	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Other Engineering Organisations
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	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 1916.05 / cum	**Rs 5830.54**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	304.300 kilogram
	Say 304.300 kilogram @ Rs 98.30 / kilogram	**Rs 29912.69**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	15.459 sqm
	Say 15.459 sqm @ Rs 223.32 / sqm	**Rs 3452.30**
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	21.250 sqm
	Say 21.250 sqm @ Rs 249.69 / sqm	**Rs 5305.91**
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	10.050 sqm
	Say 10.050 sqm @ Rs 542.29 / sqm	**Rs 5450.01**
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	9.600 sqm
	Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	5.533 cum
	Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**
13	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	7.410 cum
	Say 7.410 cum @ Rs 606.82 / cum	**Rs 4496.54**

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	4 Valve chamber 2.1mx3.8mx1.9m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	45.216 cum
	Say 45.216 cum @ Rs 214.03 / cum	**Rs 9677.58**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	16.355 cum
	Say 16.355 cum @ Rs 106.37 / cum	**Rs 1739.68**
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	2.886 cum
	Say 2.886 cum @ Rs 2298.93 / cum	**Rs 6634.71**
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	1.457 cum
	Say 1.457 cum @ Rs 7211.15 / cum	**Rs 10506.65**
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 9413.54 / cum	**Rs 92582.17**
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	9.835 cum

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	Say 9.835 cum @ Rs 82.10 / cum	**Rs 807.45**
7	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 1916.05 / cum	**Rs 18844.35**
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	983.501 kilogram
	Say 983.501 kilogram @ Rs 98.30 / kilogram	**Rs 96678.15**
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	49.962 sqm
	Say 49.962 sqm @ Rs 223.32 / sqm	**Rs 11157.51**
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	52.481 sqm
	Say 52.481 sqm @ Rs 249.69 / sqm	**Rs 13103.98**
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
	Net Total Quantity	13.800 metre
	Say 13.800 metre @ Rs 203.93 / metre	**Rs 2814.23**
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	23.180 sqm
	Say 23.180 sqm @ Rs 542.29 / sqm	**Rs 12570.28**
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	28.705 sqm
	Say 28.705 sqm @ Rs 401.21 / sqm	**Rs 11516.73**

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14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	16.295 cum
	Say 16.295 cum @ Rs 258.57 / cum	**Rs 4213.40**
15	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	28.915 cum
	Say 28.915 cum @ Rs 606.82 / cum	**Rs 17546.20**
16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	6.000 each
	Say 6.000 each @ Rs 545.00 / each	**Rs 3270.00**
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**7001842.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 7001842.00
		Rounded Total Rs 70,01,842
		Rupees Seventy Lakh One Thousand Eight Hundred and Forty Two Only

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(Cost Index Applied for this estimate is 35.59%)

Sewerage Scheme- Construction of wet well 1 (Block 3B+2) , Grit /Screen Chamber and connected works at Muttar STP

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
	1 Colletion well 5.5m dia							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	1*3.14	4.000	4.000	1.500		75.360	
	For Earth work 1.5m to 3m	1*3.14	4.000	4.000	0.500		25.120	
	Total Quantity						100.480 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.480 cum	
	Say 100.480 cum @ Rs 214.03 / cum						**Rs 21505.73**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 3m	1*3.14	4.000	4.000	0.500		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 106.37 / cum						**Rs 2672.01**	
3	od212791/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5.5m diameter R1)							
		1			1.000		1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 29872.26 / metre						**Rs 29872.26**	

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4	od212837/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5.5m diameter R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 31527.93 / metre						**Rs 47291.90**	
5	od212867/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5.5m diameter R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 33186.05 / metre						**Rs 49779.08**	
6	od212902/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5.5m diameter R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 34841.72 / metre						**Rs 52262.58**	
7	od213138/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter R1)							
		1			1.090		1.090	
	Total Quantity						1.090 metre	

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	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.090 metre	
	Say 1.090 metre @ Rs 36499.85 / metre						**Rs 39784.84**	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	5.500	0.600			10.362	
	well Kerb - outer	1*3.14	6.850	1.330			28.607	
	well Kerb - Slope	1*3.14	5.5+6.03		0.900		32.584	
	Side wall	1*3.14	6.100		8.590		164.533	
	Total Quantity						236.086 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						236.086 sqm	
	Say 236.086 sqm @ Rs 249.69 / sqm						**Rs 58948.31**	
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	kerb -((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1			4.210		4.210	
	From 4.5m to 9.0m below ground level ,Bottom Slab	3.14/4	5.500	5.500	0.600		14.248	
	Total Quantity						18.458 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.458 cum	
	Say 18.458 cum @ Rs 9413.54 / cum						**Rs 173755.12**	
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing							

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	and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	6.100	0.600	8.590		98.720	
						Total Quantity	98.720 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	98.720 cum	
						Say 98.720 cum @ Rs 11065.64 / cum	**Rs 1092399.98**	
11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	k e r b - ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1			4.210		4.210	
	From 4.5m to 9.0m below ground level ,Bottom Slab	3.14/4	5.500	5.500	0.600		14.248	
	Side wall	1*3.14	6.100	0.600	8.590		98.720	
						Total Quantity	117.178 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	117.178 cum	
						Say 117.178 cum @ Rs 82.10 / cum	**Rs 9620.31**	
12	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	k e r b - ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1			4.210		4.210	
	From 4.5m to 9.0m below ground level ,Bottom Slab	3.14/4	5.500	5.500	0.600		14.248	
	Side wall	1*3.14	6.100	0.600	8.590		98.720	
						Total Quantity	117.178 cum	
						Total Deducted Quantity	0.000 cum	

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	Net Total Quantity						117.178 cum	
	Say 117.178 cum @ Rs 1916.05 / cum						**Rs 224518.91**	
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
		1*3.14/4	5.500	5.500	0.250		5.937	
	Total Quantity						5.937 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5.937 cum	
	Say 5.937 cum @ Rs 7990.86 / cum						**Rs 47441.74**	
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	6.700	16.900			355.543	
	Total Quantity						355.543 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						355.543 kilogram	
	Say 355.543 kilogram @ Rs 101.29 / kilogram						**Rs 36012.95**	
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	6.100	6.100	0.400		11.684	
	Total Quantity						11.684 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.684 cum	
	Say 11.684 cum @ Rs 7211.15 / cum						**Rs 84255.08**	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	120Kg/m3 Concrete Qty Item 5 & 6	1	117.200	120.000			14064.000	

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	2.5 % wastage	1	117.2*0.025	120.000			351.600	
						Total Quantity	14415.600 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	14415.600 kilogram	
						Say 14415.600 kilogram @ Rs 98.30 / kilogram	**Rs 1417053.48**	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	14415.600	0.0508			732.313	
						Total Quantity	732.313 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	732.313 sqm	
						Say 732.313 sqm @ Rs 223.32 / sqm	**Rs 163540.14**	
18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1*3.14	5.500		8.590		148.350	
	Well floor	3.14/4	5.500	5.500			23.747	
						Total Quantity	172.097 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	172.097 sqm	
						Say 172.097 sqm @ Rs 542.29 / sqm	**Rs 93326.48**	
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer 1m above GL)	1*3.14	6.700	1.000			21.038	
	top of wall thickness	1*3.14	6.100	0.600			11.493	
						Total Quantity	32.531 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	32.531 sqm	
						Say 32.531 sqm @ Rs 401.21 / sqm	**Rs 13051.76**	
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m							

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	and lift up to 1.5 m.							
	Earthwork Qty item 1	1	100.480				100.480	
	Volume of well	3.14/4	5.500	5.500	2.000		-47.492	
						Total Quantity	100.480 cum	
						Total Deducted Quantity	-47.492 cum	
						Net Total Quantity	52.988 cum	
						Say 52.988 cum @ Rs 258.57 / cum	**Rs 13701.11**	
21	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Total earth work quantity Item 1	1	100.480				100.480	
	Well sinking	3.14/4	6.700	6.700	6.590		232.223	
	refilling qty	1			52.988		-52.988	
						Total Quantity	332.703 cum	
						Total Deducted Quantity	-52.988 cum	
						Net Total Quantity	279.715 cum	
						Say 279.715 cum @ Rs 606.82 / cum	**Rs 169736.66**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		29					29.000	
						Total Quantity	29.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	29.000 each	
						Say 29.000 each @ Rs 545.00 / each	**Rs 15805.00**	
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL	1*3.14	6.700	1.000			21.038	

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	top of wall thickness	1*3.14	6.100	0.600			11.493	
						Total Quantity	32.531 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	32.531 sqm	
						Say 32.531 sqm @ Rs 45.29 / sqm	**Rs 1473.33**	
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station kg of steel per sqm for-35.239,25 x 3 flats at 30 mm spacing * 12 x 3 flats at 60 mm spacing	1	(33*0.59)+ (17*0.28)	35.239			853.841	
	25 x6 SS for outer frame	1	3.140	1.180	6.700		24.825	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.700	3.920			52.528	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.800	4.470			25.926	
	Misc. items for opening frame	1	10.000				10.000	
						Total Quantity	967.120 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	967.120 kg	
						Say 967.120 kg @ Rs 119.79 / kg	**Rs 115851.30**	
25	od215737/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
		1	3.14/4	6.100	6.100		29.210	
						Total Quantity	29.210 sqm	

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	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						29.210 sqm	
	Say 29.210 sqm @ Rs 35309.60 / sqm						**Rs 1031393.42**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14	2.550	2.550	1.500		30.627	
	For 1.5m to 3m	1*3.14	2.550	2.550	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						**Rs 8740.13**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 3m	1*3.14	2.550	2.550	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						**Rs 1085.93**	
3	od211167/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						**Rs 10859.75**	
4	od211170/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances							

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	including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						**Rs 17204.09**	
5	od211171/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 12078.90 / metre						**Rs 18118.35**	
6	od213517/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)							
		1			0.800		0.800	
	Total Quantity						0.800 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.800 metre	
	Say 0.800 metre @ Rs 16674.35 / metre						**Rs 13339.48**	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.38		0.700		14.024	
	Side wall	1*3.14	3.900	6.800			83.273	
	Total Quantity						114.890 sqm	
	Total Deducted Quantity						0.000 sqm	

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	Net Total Quantity						114.890 sqm	
	Say 114.890 sqm @ Rs 249.69 / sqm						**Rs 28686.88**	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.100	0.525	0.450		2.623	Circum=3.14*3.53=11.07
		1	11.100	0.150	0.600		0.999	Circum=3.14*3.53=11.07
		1*.5	11.100	0.380	0.600		1.266	Circum=3.14*3.53=11.07
	Total Quantity						8.068 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						8.068 cum	
	Say 8.068 cum @ Rs 9413.54 / cum						**Rs 75948.44**	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	3.450	0.450	6.800		33.149	
	Total Quantity						33.149 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						33.149 cum	
	Say 33.149 cum @ Rs 11065.64 / cum						**Rs 366814.90**	
10	5.34.1							

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	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Item 4 and 5	1	8.080				8.080	
		1	33.149				33.149	
	Total Quantity						41.229 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						41.229 cum	
	Say 41.229 cum @ Rs 82.10 / cum						**Rs 3384.90**	
11	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Item 4 and 5	1	8.080				8.080	
		1	33.149				33.149	
	Total Quantity						41.229 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						41.229 cum	
	Say 41.229 cum @ Rs 1916.05 / cum						**Rs 78996.83**	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14	1.500	1.500	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						**Rs 14119.85**	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	

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	Say 206.958 kilogram @ Rs 101.29 / kilogram						**Rs 20962.78**	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	3.14/4	3.450	3.450	0.300		2.804	
	Total Quantity						2.804 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.804 cum	
	Say 2.804 cum @ Rs 7211.15 / cum						**Rs 20220.06**	
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	@ 1 2 0 k g / m 3 of c o n c r e t e	1	41.210	120.000			4945.200	
	wastage 2.5%	1	41.210	120.000		0.03	123.630	
	Total Quantity						5068.830 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						5068.830 kilogram	
	Say 5068.830 kilogram @ Rs 108.47 / kilogram						**Rs 549815.99**	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	5068.830	0.0508			257.497	
	Total Quantity						257.497 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						257.497 sqm	
	Say 257.497 sqm @ Rs 223.32 / sqm						**Rs 57504.23**	
17	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1	3.140	3.000	6.800		64.056	
	Well floor	1*3.14	1.500	1.500			7.065	
	Total Quantity						71.121 sqm	

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	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						71.121 sqm	
	Say 71.121 sqm @ Rs 542.29 / sqm						**Rs 38568.21**	
18	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 401.21 / sqm						**Rs 6869.12**	
19	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.834				40.834	
	Volume of well	3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.834 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.704 cum	
	Say 26.704 cum @ Rs 258.57 / cum						**Rs 6904.85**	
20	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Earthwork qty	1			40.860		40.860	
		3.14/4	3.900	3.900	4.100		48.954	
	Refilling quantity	1			26.704		-26.704	
	Total Quantity						89.814 cum	
	Total Deducted Quantity						-26.704 cum	
	Net Total Quantity						63.110 cum	
	Say 63.110 cum @ Rs 606.82 / cum						**Rs 38296.41**	
21	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							

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	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						**Rs 775.41**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		23					23.000	
	Total Quantity						23.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						23.000 each	
	Say 23.000 each @ Rs 545.00 / each						**Rs 12535.00**	
23	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	50mmx10mm flats at 35 mm spacing*Area of slant screen	29	3.920	3.000	1.800		613.872	0.59Kg/m
	50 x 10mm SS for outer frame	1	9.600	3.920			37.632	0.59Kg/m
	50mmx10mm flats at 30 mm spacing*Area of horizontal portion	34	3.920	3.000	1.500		599.760	0.59Kg/m
	50 x 10mm SS for outer frame	1	9.000	3.920			35.280	0.59Kg/m
	Area of pumping station * kg of steel per sqm for 25X3 flats at 30mm spacing *12X3 flats at 60mm spacing	0.785*3.9*3.9	(33*.59)+(17*.28)				289.303	0.59Kg/m

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	25 x6 SS for outer frame	1.18	3.140	3.920			14.525	0.59Kg/m
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900	3.920			30.576	0.59Kg/m
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.880	4.470			8.404	0.59Kg/m
	Misc. items for opening frame	1		5.000			5.000	0.59Kg/m
						Total Quantity	1634.352 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	1634.352 kg	
						Say 1634.352 kg @ Rs 119.79 / kg	**Rs 195779.03**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	3 Silt Pit 1.5mx1.5mx1.2m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	12.936 cum	
						Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
						Total Quantity	1.176 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.176 cum	
						Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and							

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	shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						**Rs 3497.41**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						**Rs 28645.40**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						**Rs 249.83**	
6	od211174/2022_2023							

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	Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						**Rs 5830.54**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						**Rs 29912.69**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	304.300	0.0508			15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						**Rs 3452.30**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	

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	Say 21.250 sqm @ Rs 249.69 / sqm						**Rs 5305.91**	
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Inside	2	1.500		1.200		3.600	
		2	1.500		1.200		3.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						10.050 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.050 sqm	
	Say 10.050 sqm @ Rs 542.29 / sqm						**Rs 5450.01**	
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
		2	2.000		1.200		4.800	
		2	2.000		1.200		4.800	
	Total Quantity						9.600 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.600 sqm	
	Say 9.600 sqm @ Rs 401.21 / sqm						**Rs 3851.62**	
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						**Rs 1430.67**	
13	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							

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	Excavation	1			12.940		12.940	
	Refilling	1			5.530		-5.530	
						Total Quantity	12.940 cum	
						Total Deducted Quantity	-5.530 cum	
						Net Total Quantity	7.410 cum	
						Say 7.410 cum @ Rs 606.82 / cum	**Rs 4496.54**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	4 Valve chamber 2.1mx3.8mx1.9m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.700	5.200	1.500		28.861	
		1	3.700	5.200	0.850		16.355	
						Total Quantity	45.216 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	45.216 cum	
						Say 45.216 cum @ Rs 214.03 / cum	**Rs 9677.58**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	3.700	5.200	0.850		16.355	
						Total Quantity	16.355 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	16.355 cum	
						Say 16.355 cum @ Rs 106.37 / cum	**Rs 1739.68**	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.700	5.200	0.150		2.886	
						Total Quantity	2.886 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2.886 cum	
						Say 2.886 cum @ Rs 2298.93 / cum	**Rs 6634.71**	

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4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.100	4.700	0.100		1.457	
						Total Quantity	1.457 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.457 cum	
						Say 1.457 cum @ Rs 7211.15 / cum	**Rs 10506.65**	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Cover slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 9413.54 / cum	**Rs 92582.17**	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Cover slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 82.10 / cum	**Rs 807.45**	

Other Engineering Organisations
PRICE

7	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Cover slab	1	2.700	4.200	0.180		2.042	
	Total Quantity						9.835 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.835 cum	
	Say 9.835 cum @ Rs 1916.05 / cum						**Rs 18844.35**	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@100kg per m3 concrete	1	9.835	100.000			983.501	
	Total Quantity						983.501 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						983.501 kilogram	
	Say 983.501 kilogram @ Rs 98.30 / kilogram						**Rs 96678.15**	
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	983.501	0.0508			49.962	
	Total Quantity						49.962 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						49.962 sqm	
	Say 49.962 sqm @ Rs 223.32 / sqm						**Rs 11157.51**	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.100		0.200		1.241	
		2		4.600	0.200		1.840	
	Walls outer	2	2.700		1.900		10.260	
		2		4.200	1.900		15.960	
	Walls inner	2	2.300		1.900		8.740	

Other Engineering Organisations
PRICE

		2		3.800	1.900		14.440	
	Total Quantity						52.481 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						52.481 sqm	
	Say 52.481 sqm @ Rs 249.69 / sqm						**Rs 13103.98**	
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.700				5.400	
		2	4.200				8.400	
	Total Quantity						13.800 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						13.800 metre	
	Say 13.800 metre @ Rs 203.93 / metre						**Rs 2814.23**	
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	inside	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
	Total Quantity						23.180 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						23.180 sqm	
	Say 23.180 sqm @ Rs 542.29 / sqm						**Rs 12570.28**	
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.700		2.080		11.233	
		2		4.200	2.080		17.472	
	Total Quantity						28.705 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28.705 sqm	
	Say 28.705 sqm @ Rs 401.21 / sqm						**Rs 11516.73**	
14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							

Other Engineering Organisations
PRICE

	Total excavated earth Item 1	1	45.160				45.160	
	PCC	1	1.580				-1.580	
	Sand filling	1	2.890				-2.890	
	RCC	1	7.790				-7.790	
	Chamber size	1	2.300	3.800	1.900		-16.605	
	Total Quantity						45.160 cum	
	Total Deducted Quantity						-28.865 cum	
	Net Total Quantity						16.295 cum	
	Say 16.295 cum @ Rs 258.57 / cum						**Rs 4213.40**	
15	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Refilling	1			16.295		-16.295	
	Excavation earth	1			45.210		45.210	
	Total Quantity						45.210 cum	
	Total Deducted Quantity						-16.295 cum	
	Net Total Quantity						28.915 cum	
	Say 28.915 cum @ Rs 606.82 / cum						**Rs 17546.20**	
16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		6					6.000	
	Total Quantity						6.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						6.000 each	
	Say 6.000 each @ Rs 545.00 / each						**Rs 3270.00**	
	Provision for GST payments (in %) @						**0.0%**	
	Amount reserved for GST payments						**0.00**	
	Total						**7001842.00**	

Other Engineering Organisations
PRICE

Lumpsum for round off	**0.00**
	TOTAL Rs 7001842.00
	Rounded Total Rs 70,01,842
Rupees Seventy Lakh One Thousand Eight Hundred and Forty Two Only	

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Data Analysis

Colletion well 5.5m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

	Cost index **35.59 %**				56.18

Other Engineering Organisations
PRICE

	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59
				Cost per cum	78.46
				Say	78.45

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od212791/2022_2023

od212791/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	105.72000	445.29	47076.06
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	76942.53
	cost for 3.0 metre				76942.53
	cost for one metre				25647.51
	say				25647.51

	Add Water Charges @ 1.0%				**256.47**
	Add CPOH @ 15.0%				**3885.59**
	Cost index **35.59 %**				82.67
	Total with Cost index				29872.26
	Say				29872.26

4 Specification Code: od212837/2022_2023

od212837/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all

Other Engineering Organisations
PRICE

classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 358.24*1.3559 =485.74	cum	105.72000	485.74	51352.43
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	81218.90
	cost for 3.0 metre				81218.90
	cost for one metre				27072.97
	say				27072.97

	Add Water Charges @ 1.0%				**270.72**
	Add CPOH @ 15.0%				**4101.55**
	Cost index **35.59 %**				82.67
	Total with Cost index				31527.93
	Say				31527.93

5 Specification Code: od212867/2022_2023

Other Engineering Organisations
PRICE

od212867/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 388.12*1.3559 =485.74	cum	105.72000	526.25	55635.15
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	85501.62
	cost for 3.0 metre				85501.62
	cost for one metre				28500.54
	say				28500.54

	Add Water Charges @ 1.0%				**285.00**
	Add CPOH @ 15.0%				**4317.83**
	Cost index **35.59 %**				82.67
	Total with Cost index				33186.05
	Say				33186.05

6 Specification Code: od212902/2022_2023

Other Engineering Organisations
PRICE

od212902/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5.5m diameter R1)

Quantity for 3.0m depth=3.14*3.35*3.5*3=105.72m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	105.72000	566.70	59911.52
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	89777.99
	cost for 3.0 metre				89777.99
	cost for one metre				29926.00
	say				29926.00

	Add Water Charges @ 1.0%				**299.26**
	Add CPOH @ 15.0%				**4533.78**
	Cost index **35.59 %**				82.67
	Total with Cost index				34841.72
	Say				34841.72

7 Specification Code: od213138/2022_2023

Other Engineering Organisations PRICE

od213138/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter R1)

Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.6 447.82*1.3559 =607.21	cum	105.72000	607.21	64194.24
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	94060.71
	cost for 3.0 metre				94060.71
	cost for one metre				31353.57
	say				31353.57

	Add Water Charges @ 1.0%				**313.53**
	Add CPOH @ 15.0%				**4750.06**
	Cost index **35.59 %**				82.67
	Total with Cost index				36499.85
	Say				36499.85

8 Specification Code: 5.9.12

SUBHEAD : **5.0**

Other Engineering Organisations PRICE

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

9 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
				TOTAL	5977.32

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

10 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

11 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

Other Engineering Organisation
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

12 Specification Code: od211174/2022_2023

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

13 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

14 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
	AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)				63.17

Other Engineering Organisations
PRICE

TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

15 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

16 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86
				TOTAL	1647.25
				Cost of 10.0 sqm	1647.25

Other Engineering Organisations
PRICE

Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

18 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

19 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84

0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

20 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42

TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

21 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82

	Say				606.82

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

24 Specification Code: 10.2

SUBHEAD : **10.0**

Other Engineering Organisations
PRICE

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00
1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00

Other Engineering Organisations PRICE

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25

Other Engineering Organisations
PRICE

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

25 Specification Code: od215737/2022_2023

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od215737/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
				TOTAL	30400.00

				cost for one sqm	30400.00
	say				30400.00

	Add Water Charges @ 1.0%				**304.00**
	Add CPOH @ 15.0%				**4605.60**
	Cost index **35.59 %**				0.00
	Total with Cost index				35309.60
	Say				35309.60

Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59

Cost per cum	78.46
Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od211167/2022_2023

od211167/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	27835.74

	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				**92.78**

	Add CPOH @ 15.0%				**1405.70**
	Cost index **35.59 %**				82.67
	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od211170/2022_2023

od211170/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				**98.03**

	Add CPOH @ 15.0%				**1485.22**
	Cost index **35.59 %**				82.67
	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od211171/2022_2023

od211171/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 421.44*1.3559 =	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	30984.67

	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				**103.28**

	Add CPOH @ 15.0%				**1564.72**
	Cost index **35.59 %**				82.67
	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: od213517/2022_2023

od213517/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)
Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 545.99 *1.3559 =740.307	cum	41.54220	740.31	30753.98
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	42854.11

	cost for 3.0 metre				42854.11
	cost for one metre				14284.70
	say				14284.70

	Add Water Charges @ 1.0%				**142.84**

	Add CPOH @ 15.0%				**2164.13**
	Cost index **35.59 %**				82.67
	Total with Cost index				16674.35
	Say				16674.35

7 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

8 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations
PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

9 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

Other Engineering Organisations
PRICE

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

Other Engineering Organisations
PRICE

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

Other Engineering Organisations
PRICE

11 Specification Code: od211174/2022_2023

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

Other Engineering Organisations
PRICE

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

Other Engineering Organisations
PRICE

13 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)	63.17
TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

14 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

15 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

Other Engineering Organisations PRICE

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

	Cost index **35.59 %**				28.47
	Total with Cost index				108.47

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

17 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

18 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

19 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

20 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Other Engineering Organisations
PRICE

21 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82

0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

Other Engineering Organisations
PRICE

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
	AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)				2.92
	TOTAL				357.72
	AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)				44.25
	TOTAL				401.95
	Cost of 1.0 each				401.95
	Cost of 1 each				401.95
	Say				401.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

Other Engineering Organisations
PRICE

1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00
1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

Other Engineering Organisations
PRICE

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25
Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

Silt Pit 1.5mx1.5mx1.2m
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm

on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

Other Engineering Organisations PRICE

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10

0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od211174/2022_2023

Other Engineering Organisations
PRICE

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

Other Engineering Organisations
PRICE

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				

3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

11 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

12 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

13 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer

First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Valve chamber 2.1mx3.8mx1.9m

1 Specification Code: 2.6.1

Other Engineering Organisations
PRICE

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00

0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

Other Engineering Organisations
PRICE

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25

Add CPOH @ 15%	102.34
TOTAL	784.59
Cost of 10.0 cum	784.59
Cost per cum	78.46
Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
	TOTAL				14597.33
	Add Water Charges @ 1%				145.97
	TOTAL				14743.30
	Add CPOH @ 15%				2211.49
	TOTAL				16954.79
	Cost of 10.0 cum				16954.79

Other Engineering Organisations PRICE

Cost per cum	1695.48
Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80

Other Engineering Organisations
PRICE

2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

5 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organization
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

6 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52

TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

7	Specification Code: od211174/2022_2023

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

	Cost index **35.59 %**				25.80

Other Engineering Organisations PRICE

	Total with Cost index				98.30

9 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18

Other Engineering Organisations PRICE

TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

10 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

11 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) 4x3x0.15x0.030 = 0.54 cum Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = 57/8 = 7.125 cudm	10 cudm	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal 2x4x0.075x0.1x0.5 = 0.030 Horizontal 2x4x0.075x0.1 x 1.5 = 0.090 (iii) Vertical battens 16x0.15x0.075x0.030m = 0.0054 (iv) Struts 16x0.25x0.07x0.075 = 0.0225 Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = 155/8 = 19.375 cudm	10 cudm	19.375	260.00	503.75

Other Engineering Organisations PRICE

2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = 0.212/8 =0.0265 cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL	1553.85
Add Water Charges @ 1%	15.54
TOTAL	1569.39
Add CPOH @ 15%	235.41
TOTAL	1804.80
Cost of 12.0 metre	1804.80
Cost per metre	150.40
Say	150.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				53.53
	Total with Cost index				203.93

12 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

13 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

14 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

15 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer

First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Other Engineering Organisations
PRICE

16 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded

stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
	AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)				2.92
	TOTAL				357.72
	AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)				44.25
	TOTAL				401.95
	Cost of 1.0 each				401.95
	Cost of 1 each				401.95
	Say				401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

Other Engineering Organisations
PRICE

Other Engineering Organisations
P R I C E

	Details of Cost for 10m Pole required for vertical Post = 6x1.65=9.90m				
KW14	Casuarina Pole girth 15cm to 24cm. Hire Charges of Casurania pole (25% of cost as hire) Quantity is taken as 1/4 of 9.9	metre	2.475	22.13	54.77
9999	Sundries-Carriage of Casurania pole	L.S	3.0	2.00	6.00
KW15	Red Coloured Flourescent caution tape	metre	21.2	1.28	27.14
0114	Beldar Labour	Day	0.2	558.00	111.60

TOTAL	199.51
Add Water Charges @ 1%	2.00
TOTAL	201.51
Add CPOH @ 15%	30.23
TOTAL	231.74
Cost of 10.0 metre	231.74
Cost per metre	23.17
Say	23.15

Kerala Water Authority
PRICE

	Cost index **35.59%**				4.86
	Total with Cost index				28.01

9 Specification Code: od132445/2022_2023

od132445/2022_2023 :Providing New Sewer Connection

Code	Description	Unit	Quantity	Rate	Amount	Remarks

15.2.2	Rate as per item number 15.2.2 of SH: Dismantling and Demolishing	cum	0.15000	931.35	139.70	2*0.5*0.15

100.1.1	Rate as per item number 100.1.1 of SH: KWA Approved Data	cum	2.50000	409.70	1024.25	5*0.5*1.00
50.18.9.9.2	Rate as per item number 50.18.9.9.2 of SH: Approved Observed data	metre	5.00000	405.60	2028.00	
19.30.1.1	Rate as per item number 19.30.1.1 of SH: Drainage	No	1.00000	5147.05	5147.05	
4.1.3	Rate as per item number 4.1.3 of SH: Concrete work	cum	0.15000	5893.40	884.01	5*0.5*0.15
MR	KWA sewer connection fee & Documentaion charge	No	1.00000	3000.00	3000.00	
				TOTAL	12223.01	
				cost for one No	12223.01	
				say	12223.01	

Cost index **35.59 %**	2913.58
Total with Cost index	15136.59

Kerala Water Authority
PRICE

10 Specification Code: 100.8.2

100.8.2 Fencing 1.50m high with two rows of casuarina poles (girth 15cm to 24cm) tied with coir yarn on vertical casuarina pole (girth 15cm to 24cm) fixed at 1.5m intervals.
NEW DATA (Prepared based on PWD SDB - Item No.1009

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 10 m Materials Poles required for vertical Post = 8x1.65=13.20 m; Poles required for Horizontal = 2x10=20.00 m; Total Length required = 20.00+13.20= 33.20m;				

GOVERNMENT OF KERALA

Abstract

Public Works Department - Online System for according Road Cutting Permission/Right of Way Permission - Sanction Accorded - Orders issued.

PUBLIC WORKS (H) DEPARTMENT

G.O.(Ms)No.59/2020/PWD Dated,Thiruvananthapuram, 30/07/2020

Read: 1. G.O.(P)No.13/2012/PWD dated 01.02.2012.

2. Circular No. CE/R& B I GL-RC/2/2019 dated 30.03.2019 of the Chief Engineer,Public Works Department (Roads).

3. Letter.No-CE/Admin/IT/General/2020-21dated 24/07/2020 from the Chief Engineer, Public Works Department (Administration).

ORDER

As per Section 2607 of the revised Kerala PWD Manual read as 1st first paper above, any person or authority or agency intending to construct, place, maintain or carry any cable, wire, pipe, drain, sewer, channel of any kind through, across, along, under, in or over any PWD road shall get permit for the same from the concerned road or highway authority. In PWD, the application for road cutting permission is being received from the agencies like Kerala Water Authority, Kerala State Electricity Board and from the Telecom Operators. Thereafter, the concerned Assistant Engineer in charge of the road to be cut, prepares the estimate for restoration work and after approval of the estimate the concerned AEE or EE informs the applicant to deposit the restoration amount in PWD's deposit head of account. After getting confirmation from the applicant that the required amount for restoration is got deposited in PWD's account, cutting permission is issued by the Assistant Executive Engineer or the Executive Engineer concerned. All these activities are being carried out through manual processing in concerned offices which attracts a lot of complaints regarding delay in getting permissions and thereby ultimately delays the completion of many projects.

2. Now, the Kerala State IT Mission has developed an online portal for the management of road cutting permissions. The objectives of the application are as follows:

a)Online submission of application for Road Cutting Permission/ Right of Way Permission without the need of approaching any office

b)Online submission of relevant documents such as road sketch, GIS Map of cutting etc.

c)To provide permission within a time limit.

d)To facilitate the users to download the final signed approval certificate online.

This portal is now available in the web address http://rowservices.kerala.gov.in/. The users of this online system would be PWD, KWA, KSEB and Telecom Operators.

3. In view of the above, the Chief Engineer (Administration) as per the letter read as 3rd paper above, has requested to issue necessary Govt. Orders for implementation of the Online Road Cutting permission/ Right of Way Permission Portal developed by Kerala State IT Mission in managing the road cutting permission issuance of PWD.

4. Government have examined the matter in detail and sanction is accorded hereby to use the online Road Cutting Permission/ Right of Way Permission Portal in PWD with the following guidelines:

A. Procedure for Road Cutting / Right of Way Permission:

(i) The online system will be operational for Telecom Service Provider / Internet Service Provider / Infrastructure Provider for use from 01.08.2020 and shall not accept any application and documents related to Road Cutting Permission / Right of Way in physical form after 1st August, 2020. Applications and documents submitted online shall be accepted.

(ii) Any Telecom Service Provider / Internet Service Provider / Infrastructure Provider, whoever requires permission for Road cutting or for Right of Way shall invariably submit their applications online.

(iii) The Applicant (TSP/IP/ISP/KWA/KSEB) will submit applications for Rights of Way permissions along with necessary documents including the stretch details to the concerned road authority. The route map in GIS format can also be uploaded in the portal.

(iv) The Road Authority (EE/AEE) shall verify the application after receipt and assigns the application to the concerned AEE or AE for verification and processing, if the application is in order; otherwise the application will be returned to applicant.

(v) The concerned AE shall prepare the demand note as per the procedure

laid down in the PWD Manual and as per the prevailing rates for road cutting and restoration and submit the same for approval of the competent authority as per the delegation of powers based on the restoration amount required (manual process not through the system). After approval of the demand note, the same shall be uploaded in the online system from the approval office. Thereafter, once the applicant remits the demand note amount in the required head of account, the road cutting permission is to be issued by the competent authority through the system.

(vi) After the utility authority/applicant completes the road cutting and temporary restoration, the same shall be updated in the online system so that the Road Authority gets information about the completion of the work. Thereafter the Road Authority shall take action to restore the road surface as per the guidelines specified in the PWD Manual.

(vii) In cases, where the applicant is to restore the road surface as per the provisions laid down in the cutting permission, after the completion of such works, the applicant shall upload the details in the portal. After getting such information through the portal, the Road authority shall issue NOC through the system.

B. Road Cutting Fees:

The Chief Engineer (Roads) publishes the restoration charges for the road cutting of various types of PWD road surfaces. The prevailing rates as per the Circular read as 2nd paper above are given below.

Sl.No	Type of road or cutting surface	Restoration charges (Rs)/ sq.meter
1	Berm Cutting	359.85
2	Shoulder Cutting	1530.77
3	20mm open graded chipping carpet surface	3090.57
4	20mm close graded chipping carpet surface	3129.12
5	20mm open graded chipping carpet surface (Manual means)	3179.04
6	40mm pre mixed chipping carpet surface	3457.29
7	BM & BC road surface	4069.51
8	Concrete road surface	5473.44
9	100mm thick inter locking Tiled road surface	4196.75
10	80mm thick inter locking tiled road surface	3722.14
11	60mm thick inter locking tiled road surface	3665.91

The above charges are including cost index, centage charges and GST.

C. Timelines:

a) Road cutting permission

(i) Application Scrutiny – within 3 days after receiving the Application.
(ii) Physical Verification and Demand Note approval for Payment and intimation to applicant- Within 15 days after receiving the Application.
(iii) Payment of Fees by Applicant after issue of Demand Note – As specified in the demand note.
(iv) Road cutting Permission Letter Issued – Within 7 days after payment of Fees and uploading details by the applicant in the portal.
(v) Completion of road cutting work and temporary restoration - as specified in the permission letter/proceedings.

b) Right of Way permission

(i) Application Scrutiny – within 3 days after receiving the Application
(ii) Physical Verification and granting online permission by the concerned authority - Within 15 days after receiving the Application provided all application documents are in order
(iii) Issue of NOC after the applicant uploads the details of completion of road restoration works - Within 7 days after uploading details by the applicant in the portal.

5. The Chief Engineer (Roads), Chief Engineer (National Highway), CE(KSTP) and CE(Bridges) shall take necessary action in the matter accordingly.

(By order of the Governor)
ANAND SINGH
SECRETARY

All the Chief Engineers, PWD, Thiruvananthapuram.

The Managing Director, Kerala Water Authority, Thiruvananthapuram.

The Managing Director, KSEB Ltd, Thiruvananthapuram.

The Managing Director, BSNL, Thiruvananthapuram.

The Managing Director, RICK/RBDCK/KSCC/KSTP, Tvpm.

The Chief Executive officer, KRFB, Thiruvananthapuram.

All Telecom Service Providers.

Stock File/Office Copy/Website

Forwarded /By order

Section Officer

Copy to: PS to Minister (Works & Registration)

PA to Secretary, PWD
PA to Secretary-1,PWD

RAJAGIRI outREACH

Rajagiri Educational Alternatives and Community Health (outREACH) Service Society
Rajagiri College of Social Sciences (Autonomous)

Rajagiri P.O., Kalamassery - 683 104, Kerala, India, Ph: +91 484 2911330-332, 2550785
Telefax: +91 484 2532862, E-mail: rossrajagiri@gmail.com / outreach@rajagiri.edu website: www.rajagirioutreach.org

RCSS
RAJAGIRI COLLEGE OF SOCIAL SCIENCES

Ref: ROR/KMRL/075/20-21
Date: July 17, 2020

Er. Eldho Thomas
Manager (Civil) - WT
Kochi Metro Rail Limited
Ernakulam

Respected Sir,

Sub: Proposal for carrying out 65528 Households Survey for Sewerage System as part of IURWTS Project reg.

Ref: E-mail dated 13.07.2020 from Er. Eldho Thomas -Manager (Civil) – WT Kochi Metro Rail Limited, Ernakulam

"Greetings from Rajagiri outREACH"

We would like to draw your kind attention to the captioned subject and thank you for inviting us to submit our budgetary proposal.

We are pleased to hereby submit the Budgetary Proposal for "**Carrying out 65528 Households Survey for Sewerage System as part of Integrated Urban Regeneration and Water Transport System (IURWTS) Project at the 5 important canals namely Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavannoor Canal and Market Canal at Ernakulam District.**

We assure you that we will place our best efforts to carry out the Household Survey for Sewerage System as part of IUWRTS Project within the time frame.

We will be gratified if our proposal is considered positively.

Thanking You,
Yours faithfully,

RAJAGIRI EDUCATIONAL ALTERNATIVES AND COMMUNITY HEALTH (outREACH) SERVICE SOCIETY
Rajagiri outREACH
Rajagiri College
Rajagiri P.O.
Kalamassery, Kochi
Pin: 683 104
Reg No. ER-157/02

Dr. Binoy Joseph
Chief Executive Officer, Rajagiri outREACH &
Principal, Rajagiri College of Social Sciences

Encl: Budget Estimate Proposal for carrying out Household Survey Sewerage System at 5 canals in Ernakulam District

IURWTS
Integrated Urban Regeneration & Water Transport System

KOCHI METRO RAIL LIMITED

PROPOSAL FOR CARRYING OUT 65528 HOUSEHOLDS SURVEY FOR SEWERAGE SYSTEM AS PART OF IURWTS PROJECT

for

Kochi Metro Rail Limited (KMRL), Ernakulam

Submitted by

RAJAGIRI outREACH

RCSS
RAJAGIRI COLLEGE OF SOCIAL SCIENCES (AUTONOMOUS)

Rajagiri outREACH
Rajagiri College of Social Sciences (Autonomous)
Rajagiri P.O
Kalamassery
Kochi

July 17, 2020

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Reg No. ER-157/02

PROJECT PROPOSAL

1. INTRODUCTION

The Kochi Metro is a rapid transit system serving the city of Kochi in Kerala, India. It was opened to the public within four years of starting construction, making it one of the fastest completed metro project in India.

It is the world's first rapid transit system whose entire management operations are handled by women. The system is also involved in sustainable initiatives with the introduction of non-motorized transport corridors in the city, installation of solar panels for power and vertical garden on every sixth metro pillar. Apart from the regular tickets, it has also adopted a single card, single timetable and a singular command and control. This debit card along with the Kochi One Mobile App will allow passengers to access all modes of public transportation as well as be utilized for mercantile and internet transactions and will introduce the 'click and collect' feature in the near future where goods ordered online can be collected in the metro stations. Every Kochi Metro station is designed on a specific theme around Kerala culture and geography.

KMRL (Kerala Metro Rail Limited) has initiated the task of developing a comprehensive master plan for regenerating the 5 important canals namely, Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal and bring back these canals to its erstwhile glory under the Integrated Urban Regeneration and Water Transport System (IURWTS) project entrusted to it by Govt. of Kerala. In pursuit of this goal, KMRL has started the concept designs and initiated the required surveys for the project.

To assess the existing sanitation facilities for the preparation of concept / detailed design of sewerage network and pumping system for the canals and sub – canals in the IURWTS catchment area, household surveys has to be carried out.

Rajagiri outREACH is the professional service wing of Rajagiri College of Social Sciences and the major live lab reaching out the communities and the society at large through various field offices established across the state of Kerala. RAJAGIRI outreach is accredited, supported by and associated with various Central/State/Local Self Government Departments, International Organizations, Corporates, Hospitals and Local Associations. Rajagiri outREACH has extensive spectrum of activities such as Social Impact Assessment Studies, Need Assessment Studies, Research Studies, Training and Consultancy, Corporate Social Responsibilities (CSR) Projects, Child Centered Programmes, Women Entrepreneurship Programmes / Empowerment, Day Care Centre for the Elderly - Geriatric Services / Programmes, Programmes for Community Health / Community Health Insurance Scheme / Community Development - HIV/AIDS Project / Suraksha Migrant Projects, Jalanidhi Projects, Community Outreach Events, Natural Resource Management and Environmental Protection, Disaster Management, Post Flood Relief Activities, Student Internship Programmes, COVID-19 Relief Activities. Rajagiri outREACH had undertaken many Need Assessment & Social Impact Studies funded through Public sector and Private Sector Corporates.

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Reg No. ER-157/02

2. Backdrop of the Project

The proposed project envisages the development of the 5 canals and activities such as cleaning of canals, dredging and cutting, bank protection, reconstruction of cross structures and foot over bridges, sanitary sewer line and STPs, sanitation facilities, jetties, infrastructure development, beautification of canals thus leading to a cleaner and greener environment, better drainage, sewage and rain water harvesting systems, effective and enhanced connectivity from various locations, improved landscape around the facility, reduced risk of potential flooding near the canals, properly treated and reused sewage water from the facilities and circulation of the treated water, etc.

It is understood that Kochi Metro Rail Limited (KMRL) has KMRL has initiated the task of developing a comprehensive master plan for regenerating the 5 important canals namely, Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal, and bring back these canals to its erstwhile glory under the Integrated Urban Regeneration and Water Transport System (IURWTS) project entrusted to it by Govt. of Kerala. In pursuit of this goal, KMRL has started the concept designs and initiated the required surveys for the project.

The study will help to assess the existing sanitation facilities for the preparation of concept / detailed design of sewerage network and pumping system for the canals and sub – canals in the IURWTS catchment area, household surveys has to be carried out.

The main aim of the project is to conduct surveys and study the existing sewerage system and develop comprehensive plans for regenerating the 5 important canals namely Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal.

3. General Objective of the Project

To assess the existing sanitation facilities for the preparation of concept / detailed design of sewerage network and pumping system for the canals and sub – canals in the IURWTS catchment area for the five canals namely Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal in Ernakulam District.

4. Specific Objectives

1. To describe present Sanitation conditions of the people of different socio-economic groups.
2. To identify Income levels or other indications of socio-economic studies in the canal catchment.
3. To assess housing facilities and affordability for improved sanitation.
4. To show on the project area map, location-wise density of population and the present and future land uses (as per development plan provided).
5. To gather information on drinking water facilities from government and private source.
6. To provide data and make projection on housing standards and average household occupancy in various parts of the project area.
7. To assess household expenses on water tariff and awareness on water savings.

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8. To describe public health status within the project area with particular attention to diseases related to water and sanitary conditions.
9. To discuss the status of health care programmes in the area, as well as other projects, which have bearing on improvements in environmental sanitation.
10. To assess rainwater harvesting facilities in the catchments.

5. Methodology

5.1 **Project Title:** Proposal for "**Carrying out Household Survey for Sewerage System as part of IURWTS (Integrated Urban Regeneration and Water Transport System) Project" in Ernakulam District**

5.2 **Project Area:** **65528 households** at 5 important canals in Ernakulam District namely, Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal.

Canal-wise Details of Household survey for Sewerage connection:

Sl. No.	Canal Catchment	Approx. No. of Households
1	Edapally Canal	20821
2	Thevara-Perandoor Canal	18832
3	Thevara Canal	2000
4	Chilavanoor Canal	23375
5	Market Canal	500
	Total	**65528**

5.3 **Target Group:** **65528** Households at 5 important canals namely, Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal in Ernakulam District

6. Data collection

a) Quantitative Data

The Survey requires the data of 65528 households residing in 5 canals namely, Edapally Canal, Thevara-Perandoor Canal, Thevara Canal, Chilavanoor Canal and Market Canal in Ernakulam District. Therefore Census method would be used to collect the data from all the households. Data from Respondents of each household to be collected door to door with the help of a structured questionnaire by experienced data collectors.

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b) **Qualitative Data**

Key Informant Interviews would be held with Local Self Government leaders, Key Persons from the area and the heads of Institutions/ Department relevant to the area. Focus Group Discussion would be conducted with the household community members. Observation visits, will also be included to collect the data that would be detrimental to the study. Key Informant Interview Guidelines and FGD Guidelines would be used for data collection.

7. Data Processing and Analysis

The collected data would be tabulated / analyzed using Qualitative and Quantitative data analysis techniques. The data thus collected would be tabulated using Statistical Package for Social Scientists (SPSS). Qualitative data to be analyzed separately

8. Report Submission

The quantitative and qualitative data would be analyzed, tabulated and processed into a report detailing all the findings and suggestions.

9. Time Schedule for the Project

Sl. No.	Activity	Tentative Time Period
1	Pilot Study and Interaction with the Households	2 weeks
2	Data Collection Tool Preparation and Printing	
3	Selection of Investigators and orientation	
4	Data Collection (Survey, Key Informant Interview, FGD and Observation visits, etc	3 months
5	Data Entry	1 month
6	Tabulation, Data Analysis & Draft Report Preparation	1 month
7	Final Report Preparation	2 weeks

Note: Some of the activities will be conducted simultaneously. Total of 6 months would be required.

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10. <u>Estimated Budget for the Project</u> **"Carrying out Household Survey for Sewerage System as part of IURWTS (Integrated Urban Regeneration and Water Transport System) Project" in Ernakulam District**

Sl. No.	Particulars	Amount in Rs.
1	Preparatory Works and Pilot Study	30,000
2	Tool Preparation - Survey forms, FGD Guidelines, Key Informant Interview Guidelines, Observation Checklists etc	150,000
3	Focus Group Discussions and Key Informant Interviews with stakeholders	70,000
4	Data Collection Charges- Survey 65528 households	1,310,560
5	Data Entry Charges	982,920
6	Stakeholder Consultation	60,000
7	Documentation Charges	27,000
8	Field level monitoring and Data Verification	240,000
9	Professional Charges- Data Analysis and Report Preparation	450,000
10	Printing, Stationary & DTP Charges - Survey Forms, Guidelines, Observation Checklist, Draft & Final Report	400,000
11	Travel & Refreshment Charges	395,000
12	Overhead Expenses (2% of 1 - 11)	82,310
	Sub Total (Items 1-12)	4,197,790
13	GST Charges (18% of Item 12)	755,604
14	Flood Cess (1% of Item 12)	41,978
	Grand Total	**4,995,372**

Total Estimated Budget **- (Rupees Forty Nine Lakhs Ninety Five Thousand Three Hundred Seventy Two Only)**

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Dr. Binoy Joseph
Chief Executive Officer, Rajagiri outREACH &
Principal, Rajagiri College of Social Sciences

Place: Kalamassery
Date: July 17, 2020

	Details of Cost for 10m Pole required for vertical Post = 6x1.65=9.90m				
KW14	Casuarina Pole girth 15cm to 24cm. Hire Charges of Casurania pole (25% of cost as hire) Quantity is taken as 1/4 of 9.9	metre	2.475	22.13	54.77
9999	Sundries-Carriage of Casurania pole	L.S	3.0	2.00	6.00
KW15	Red Coloured Flourescent caution tape	metre	21.2	1.28	27.14
0114	Beldar Labour	Day	0.2	558.00	111.60

TOTAL	199.51
Add Water Charges @ 1%	2.00
TOTAL	201.51
Add CPOH @ 15%	30.23
TOTAL	231.74
Cost of 10.0 metre	231.74
Cost per metre	23.17
Say	23.15

Kerala Water Authority
PRICE

	Cost index **35.59%**				4.86
	Total with Cost index				28.01

9 Specification Code: od132445/2022_2023

od132445/2022_2023 :Providing New Sewer Connection

Code	Description	Unit	Quantity	Rate	Amount	Remarks

15.2.2	Rate as per item number 15.2.2 of SH: Dismantling and Demolishing	cum	0.15000	931.35	139.70	2*0.5*0.15

100.1.1	Rate as per item number 100.1.1 of SH: KWA Approved Data	cum	2.50000	409.70	1024.25	5*0.5*1.00
50.18.9.9.2	Rate as per item number 50.18.9.9.2 of SH: Approved Observed data	metre	5.00000	405.60	2028.00	
19.30.1.1	Rate as per item number 19.30.1.1 of SH: Drainage	No	1.00000	5147.05	5147.05	
4.1.3	Rate as per item number 4.1.3 of SH: Concrete work	cum	0.15000	5893.40	884.01	5*0.5*0.15
MR	KWA sewer connection fee & Documentaion charge	No	1.00000	3000.00	3000.00	
				TOTAL	12223.01	
				cost for one No	12223.01	
				say	12223.01	

Cost index **35.59 %**	2913.58
Total with Cost index	15136.59

Kerala Water Authority
PRICE

10 Specification Code: 100.8.2

100.8.2 Fencing 1.50m high with two rows of casuarina poles (girth 15cm to 24cm) tied with coir yarn on vertical casuarina pole (girth 15cm to 24cm) fixed at 1.5m intervals.
NEW DATA (Prepared based on PWD SDB - Item No.1009

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 10 m Materials Poles required for vertical Post = 8x1.65=13.20 m; Poles required for Horizontal = 2x10=20.00 m; Total Length required = 20.00+13.20= 33.20m;				

Appendix A - PROCURING SEWAGE SUCTION CUM JETTING TANKER

1 Specification Code: od30614/2022_2023

od30614/2022_2023 :Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete

Code	Description	Unit	Quantity	Rate	Amount	Remarks
MR	Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity,Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm, pressure 150 Bar and Vacuum Pump Capacity of 5300 lpm and all other technical specification as specified in the NIT.	No	1.00000	4198970.00	4198970.00	
MR	Road Tax 6%	No	1.00000	297288.00	297288.00	
MR	RTO Registration & entry tax(if any)	No	1.00000	50000.00	50000.00	
MR	other unforeseen items	No	1.00000	10000.00	10000.00	
				TOTAL	4556258.00	
				Add Water Charges @ 1%	45562.58	
				Add CPOH @ 15%	690273.09	
				cost for one No	5292093.67	
				say	5292093.67	

Cost index **35.59 %**	.00
Total with Cost index	5292093.67

Appendix B- Construction of new Vechicle porch for Suction cum Jetting machine lorry

Kerala Water Authority
PRICE

Construction of Valave chamber for Collection System in Sewerage Systems - Pumping mains- MUttar Sewer

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Valve chamber for air valves , Scour valves**	952314.07
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**952314.00**
	Lumpsum for round off	**7686.00**
		TOTAL Rs 960000.00
		Rounded Total Rs 9,60,000
		Rupees Nine Lakh Sixty Thousand Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Construction of Valave chamber for Collection System in Sewerage Systems - Pumping mains- MUttar Sewer

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

1 Valve chamber for air valves , Scour valves		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	156.281 cum
	Say 156.281 cum @ Rs 214.03 / cum	**Rs 33448.82**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	8.775 cum
	Say 8.775 cum @ Rs 2298.93 / cum	**Rs 20173.11**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	4.159 cum
	Say 4.159 cum @ Rs 7211.15 / cum	**Rs 29991.17**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	34.367 cum
	Say 34.367 cum @ Rs 9413.54 / cum	**Rs 323515.13**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	34.367 cum
	Say 34.367 cum @ Rs 82.10 / cum	**Rs 2821.53**

Other Engineering Organisations PRICE

6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	3436.206 kilogram
	Say 3436.206 kilogram @ Rs 98.30 / kilogram	**Rs 337779.05**
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	227.888 sqm
	Say 227.888 sqm @ Rs 249.69 / sqm	**Rs 56901.35**
8	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	83.162 sqm
	Say 83.162 sqm @ Rs 542.29 / sqm	**Rs 45097.92**
9	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	132.804 sqm
	Say 132.804 sqm @ Rs 401.21 / sqm	**Rs 53282.29**
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	76.860 cum
	Say 76.860 cum @ Rs 258.57 / cum	**Rs 19873.69**
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	54.000 each
	Say 54.000 each @ Rs 545.00 / each	**Rs 29430.00**
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**952314.00**

Other Engineering Organisations PRICE

Lumpsum for round off	**7686.00**
	TOTAL Rs 960000.00
	Rounded Total Rs 9,60,000
	Rupees Nine Lakh Sixty Thousand Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Construction of Valave chamber for Collection System in Sewerage Systems - Pumping mains- MUttar Sewer

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
	1 Valve chamber for air valves , Scour valves							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For air valves 7 nos							
	Air valve -Valve Chamber Size 1.2mx0.9mx2.2m	1*7	2.600	2.300	2.680		112.185	
	For scour valves 2 nos							
	Scour valve -Valve Chamber Size 1.8x1.2m	1*2	3.200	2.600	2.650		44.096	
	Total Quantity						156.281 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						156.281 cum	
	Say 156.281 cum @ Rs 214.03 / cum						**Rs 33448.82**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
	For air valves 7 nos							
	Air valve -Valve Chamber Size 1.2mx0.9mx2.2m	1*7	2.600	2.300	0.150		6.279	
	For scour valves 2 nos							
	Scour valve -Valve Chamber Size 1.8mx1.2mx2.2m	1*2	3.200	2.600	0.150		2.496	
	Total Quantity						8.775 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						8.775 cum	
	Say 8.775 cum @ Rs 2298.93 / cum						**Rs 20173.11**	

Other Engineering Organisations
PRICE

3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	For air valves 7 nos							
	Air valve -Valave Chamber Size 1.2mx0.9mx2.2m	1*7	2.200	1.900	0.100		2.926	
	For scour valves 2 nos							
	Scourvalve -Valave Chamber Size 1.8mx1.2mx2.2m	1*2	2.800	2.200	0.100		1.233	
	Total Quantity						4.159 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.159 cum	
	Say 4.159 cum @ Rs 7211.15 / cum						**Rs 29991.17**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	For air valve 7 Nos							
	Valve Chambers for Air valve Raft	1*7	2.000	1.700	0.200		4.761	
	Walls	2*7	1.600	0.200	2.200		9.857	
		2*7	0.900	0.200	2.200		5.545	
		1*7	2.200	1.300	0.180		3.604	
	For scour valve 2 Nos							
	Valve Chambers for scour valve Raft	1*2	2.600	2.000	0.200		2.080	
	Walls	2*2	2.200	0.200	2.200		3.873	
		2*2	1.200	0.200	2.200		2.112	
		2*2	2.200	1.600	0.180		2.535	
	Total Quantity						34.367 cum	

Other Engineering Organisations PRICE

	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						34.367 cum	
	Say 34.367 cum @ Rs 9413.54 / cum						**Rs 323515.13**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	For air valve 7 Nos							
	Valve Chambers for Air valve Raft	1*7	2.000	1.700	0.200		4.761	
	Walls	2*7	1.600	0.200	2.200		9.857	
		2*7	0.900	0.200	2.200		5.545	
		1*7	2.200	1.300	0.180		3.604	
	For scour valve 2 Nos							
	Valve Chambers for scour valve Raft	1*2	2.600	2.000	0.200		2.080	
	Walls	2*2	2.200	0.200	2.200		3.873	
		2*2	1.200	0.200	2.200		2.112	
		2*2	2.200	1.600	0.180		2.535	
	Total Quantity						34.367 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						34.367 cum	
	Say 34.367 cum @ Rs 82.10 / cum						**Rs 2821.53**	
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	For air valve 7 Nos							
	@100Kg/m3Valve Chambers for Air valve Raft	1*7	2.000	1.700	0.200	100.0	476.001	
	Walls	2*7	1.600	0.200	2.200	100.0	985.601	
		2*7	0.900	0.200	2.200	100.0	554.401	
		1*7	2.200	1.300	0.180	100.0	360.360	
	For scour valve 2 Nos							
	Valve Chambers for scour valve Raft	1*2	2.600	2.000	0.200	100.0	208.000	

Other Engineering Organisations PRICE

	Walls	2*2	2.200	0.200	2.200	100.0	387.201	
		2*2	1.200	0.200	2.200	100.0	211.201	
		2*2	2.200	1.600	0.180	100.0	253.441	
	Total Quantity						3436.206 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						3436.206 kilogram	
	Say 3436.206 kilogram @ Rs 98.30 / kilogram						**Rs 337779.05**	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	For air valve 7 Nos							
	Raft	2*7	2.000		0.200		5.601	
		2*7		1.700	0.200		4.761	
	Walls outer	2*7	1.600		2.200		49.281	
		2*7		1.300	2.200		40.041	
	Walls inner	2*7	1.200		2.200		36.960	
		2*7		0.900	2.200		27.721	
	For scouir valve 2 Nos							
	Raft	2*2	2.600		0.200		2.080	
		2*2		2.000	0.200		1.600	
	Walls outer	2*2	2.200		2.200		19.361	
		2*2		1.600	2.200		14.081	
	Walls inner	2*2	1.800		2.200		15.841	
		2*2		1.200	2.200		10.560	
	Total Quantity						227.888 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						227.888 sqm	
	Say 227.888 sqm @ Rs 249.69 / sqm						**Rs 56901.35**	
8	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	For air valve 7 Nos							
	inside	2*7	1.200		2.200		36.960	
		2*7		0.900	2.200		27.721	
	For scour valve 2 Nos							

Other Engineering Organisations
PRICE

	inside	2*2	1.200		2.200		10.560	
		2*2		0.900	2.200		7.921	
	Total Quantity						83.162 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						83.162 sqm	
	Say 83.162 sqm @ Rs 542.29 / sqm						**Rs 45097.92**	
9	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	For air valve 7 Nos							
	Outside	2*7	1.600		2.380		53.312	
		2*7		1.300	2.380		43.316	
	For scour valve 2 Nos							
	Outside	2*2	2.200		2.380		20.944	
		2*2		1.600	2.380		15.232	
	Total Quantity						132.804 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						132.804 sqm	
	Say 132.804 sqm @ Rs 401.21 / sqm						**Rs 53282.29**	
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	For Air valve 7 Nos							
	Total excavated earth Item 1	1	112.185				112.185	
	For air valve 7 Nos							
	Sand filling Item 2	1	6.279				-6.279	
	PCC item 3	1	2.926				-2.926	
	RCC item 4	1	23.767				-23.767	
	Chamber size	1*7	1.200	0.900	2.200		-16.632	
	For Souir valve 2 Nos							
	Total excavated earth Item 1	1	44.096				44.096	
	For air valve 2 Nos							
	Sand filling Item 2	1	2.496				-2.496	

Other Engineering Organisations PRICE

	PCC item 3	1	1.233				-1.233	
	RCC item 4	1	10.600				-10.600	
	Chamber size	1*2	2.200	1.600	2.200		-15.488	
						Total Quantity	156.281 cum	
						Total Deducted Quantity	-79.421 cum	
						Net Total Quantity	76.860 cum	
						Say 76.860 cum @ Rs 258.57 / cum	**Rs 19873.69**	
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
	For air valve 7 Nos							
		6*7					42.000	
	For scour valve 2 Nos							
		6*2					12.000	
						Total Quantity	54.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	54.000 each	
						Say 54.000 each @ Rs 545.00 / each	**Rs 29430.00**	
						Provision for GST payments (in %) @	**0.0%**	
						Amount reserved for GST payments	**0.00**	
						Total	**952314.00**	
						Lumpsum for round off	**7686.00**	
							TOTAL Rs 960000.00	
							Rounded Total Rs 9,60,000	
							Rupees Nine Lakh Sixty Thousand Only	

Other Engineering Organisations
PRICE

(Cost Index Applied for this estimate is 35.59%)

Data Analysis

Valve chamber for air valves , Scour valves
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

	Cost index **35.59 %**				56.18

Other Engineering Organisations PRICE

	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90

Other Engineering Organisations
PRICE

9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

Other Engineering Organisations
PRICE

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc.	cum	1.0	210.00	210.00
	LABOUR:				
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65

Other Engineering Organisations
PRICE

Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

Other Engineering Organisations PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52

Other Engineering Organisations
PRICE

Cost per kilogram	72.50
Say	72.5

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

7 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

8 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25
				Add Water Charges @ 1%	34.43
				TOTAL	3477.68
				Add CPOH @ 15%	521.65
				TOTAL	3999.33
				Cost of 10.0 sqm	3999.33
				Cost per sqm	399.93

Other Engineering Organisations
PRICE

Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

9 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08

Other Engineering Organisations
PRICE

Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

10 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

11 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76

0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 1 (Block 3B+2) , Grit /Screen Chamber and connected works at Muttar STP

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Colletion well 5.5m dia**	5005053.47
2	**Grit/Screen Chamber 3m dia**	1585530.61
3	**Silt Pit 1.5mx1.5mx1.2m**	97595.15
4	**Valve chamber 2.1mx3.8mx1.9m**	313663.08
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**7001842.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 7001842.00
		Rounded Total Rs 70,01,842
		Rupees Seventy Lakh One Thousand Eight Hundred and Forty Two Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 1 (Block 3B+2) , Grit /Screen Chamber and connected works at Muttar STP

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

1 Colletion well 5.5m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	100.480 cum
	Say 100.480 cum @ Rs 214.03 / cum	**Rs 21505.73**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	25.120 cum
	Say 25.120 cum @ Rs 106.37 / cum	**Rs 2672.01**
3	od212791/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5.5m diameter R1)	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 29872.26 / metre	**Rs 29872.26**
4	od212837/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5.5m diameter R1)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 31527.93 / metre	**Rs 47291.90**
5	od212867/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5.5m diameter R1)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 33186.05 / metre	**Rs 49779.08**

Other Engineering Organisations PRICE

6	od212902/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5.5m diameter R1)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 34841.72 / metre	**Rs 52262.58**
7	od213138/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter R1)	
	Net Total Quantity	1.090 metre
	Say 1.090 metre @ Rs 36499.85 / metre	**Rs 39784.84**
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	236.086 sqm
	Say 236.086 sqm @ Rs 249.69 / sqm	**Rs 58948.31**
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	18.458 cum
	Say 18.458 cum @ Rs 9413.54 / cum	**Rs 173755.12**
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	98.720 cum
	Say 98.720 cum @ Rs 11065.64 / cum	**Rs 1092399.98**

Other Engineering Organisations PRICE

11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	117.178 cum
	Say 117.178 cum @ Rs 82.10 / cum	**Rs 9620.31**
12	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	117.178 cum
	Say 117.178 cum @ Rs 1916.05 / cum	**Rs 224518.91**
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	5.937 cum
	Say 5.937 cum @ Rs 7990.86 / cum	**Rs 47441.74**
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	355.543 kilogram
	Say 355.543 kilogram @ Rs 101.29 / kilogram	**Rs 36012.95**
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	11.684 cum
	Say 11.684 cum @ Rs 7211.15 / cum	**Rs 84255.08**
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	14415.600 kilogram
	Say 14415.600 kilogram @ Rs 98.30 / kilogram	**Rs 1417053.48**
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	732.313 sqm
	Say 732.313 sqm @ Rs 223.32 / sqm	**Rs 163540.14**

Other Engineering Organisations
PRICE

18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	172.097 sqm
	Say 172.097 sqm @ Rs 542.29 / sqm	**Rs 93326.48**
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	32.531 sqm
	Say 32.531 sqm @ Rs 401.21 / sqm	**Rs 13051.76**
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	52.988 cum
	Say 52.988 cum @ Rs 258.57 / cum	**Rs 13701.11**
21	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	279.715 cum
	Say 279.715 cum @ Rs 606.82 / cum	**Rs 169736.66**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	29.000 each
	Say 29.000 each @ Rs 545.00 / each	**Rs 15805.00**
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	32.531 sqm
	Say 32.531 sqm @ Rs 45.29 / sqm	**Rs 1473.33**
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	

Other Engineering Organisations
PRICE

	Net Total Quantity	967.120 kg
	Say 967.120 kg @ Rs 119.79 / kg	**Rs 115851.30**
25	od215737/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
	Net Total Quantity	29.210 sqm
	Say 29.210 sqm @ Rs 35309.60 / sqm	**Rs 1031393.42**
	2 Grit/Screen Chamber 3m dia	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	40.836 cum
	Say 40.836 cum @ Rs 214.03 / cum	**Rs 8740.13**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	10.209 cum
	Say 10.209 cum @ Rs 106.37 / cum	**Rs 1085.93**
3	od211167/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 10859.75 / metre	**Rs 10859.75**
4	od211170/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 11469.39 / metre	**Rs 17204.09**

Other Engineering Organisations
PRICE

5	od211171/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 12078.90 / metre	**Rs 18118.35**
6	od213517/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)	
	Net Total Quantity	0.800 metre
	Say 0.800 metre @ Rs 16674.35 / metre	**Rs 13339.48**
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	114.890 sqm
	Say 114.890 sqm @ Rs 249.69 / sqm	**Rs 28686.88**
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	8.068 cum
	Say 8.068 cum @ Rs 9413.54 / cum	**Rs 75948.44**
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	33.149 cum
	Say 33.149 cum @ Rs 11065.64 / cum	**Rs 366814.90**

Other Engineering Organisations PRICE

10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	41.229 cum
	Say 41.229 cum @ Rs 82.10 / cum	**Rs 3384.90**
11	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	41.229 cum
	Say 41.229 cum @ Rs 1916.05 / cum	**Rs 78996.83**
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	1.767 cum
	Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	206.958 kilogram
	Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	2.804 cum
	Say 2.804 cum @ Rs 7211.15 / cum	**Rs 20220.06**
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
	Net Total Quantity	5068.830 kilogram
	Say 5068.830 kilogram @ Rs 108.47 / kilogram	**Rs 549815.99**
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	257.497 sqm
	Say 257.497 sqm @ Rs 223.32 / sqm	**Rs 57504.23**

Other Engineering Organisations
PRICE

17	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	71.121 sqm
	Say 71.121 sqm @ Rs 542.29 / sqm	**Rs 38568.21**
18	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 401.21 / sqm	**Rs 6869.12**
19	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	26.704 cum
	Say 26.704 cum @ Rs 258.57 / cum	**Rs 6904.85**
20	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	63.110 cum
	Say 63.110 cum @ Rs 606.82 / cum	**Rs 38296.41**
21	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 45.29 / sqm	**Rs 775.41**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	23.000 each
	Say 23.000 each @ Rs 545.00 / each	**Rs 12535.00**
23	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	

Other Engineering Organisations PRICE

	Net Total Quantity	1634.352 kg
	Say 1634.352 kg @ Rs 119.79 / kg	**Rs 195779.03**
	3 Silt Pit 1.5mx1.5mx1.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	12.936 cum
	Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	1.176 cum
	Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	0.485 cum
	Say 0.485 cum @ Rs 7211.15 / cum	**Rs 3497.41**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**
6	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

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	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 1916.05 / cum	**Rs 5830.54**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	304.300 kilogram
	Say 304.300 kilogram @ Rs 98.30 / kilogram	**Rs 29912.69**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	15.459 sqm
	Say 15.459 sqm @ Rs 223.32 / sqm	**Rs 3452.30**
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	21.250 sqm
	Say 21.250 sqm @ Rs 249.69 / sqm	**Rs 5305.91**
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	10.050 sqm
	Say 10.050 sqm @ Rs 542.29 / sqm	**Rs 5450.01**
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	9.600 sqm
	Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	5.533 cum
	Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**
13	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	7.410 cum
	Say 7.410 cum @ Rs 606.82 / cum	**Rs 4496.54**

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	4 Valve chamber 2.1mx3.8mx1.9m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	45.216 cum
	Say 45.216 cum @ Rs 214.03 / cum	**Rs 9677.58**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	16.355 cum
	Say 16.355 cum @ Rs 106.37 / cum	**Rs 1739.68**
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	2.886 cum
	Say 2.886 cum @ Rs 2298.93 / cum	**Rs 6634.71**
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	1.457 cum
	Say 1.457 cum @ Rs 7211.15 / cum	**Rs 10506.65**
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 9413.54 / cum	**Rs 92582.17**
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	9.835 cum

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	Say 9.835 cum @ Rs 82.10 / cum	**Rs 807.45**
7	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 1916.05 / cum	**Rs 18844.35**
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	983.501 kilogram
	Say 983.501 kilogram @ Rs 98.30 / kilogram	**Rs 96678.15**
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	49.962 sqm
	Say 49.962 sqm @ Rs 223.32 / sqm	**Rs 11157.51**
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	52.481 sqm
	Say 52.481 sqm @ Rs 249.69 / sqm	**Rs 13103.98**
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
	Net Total Quantity	13.800 metre
	Say 13.800 metre @ Rs 203.93 / metre	**Rs 2814.23**
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	23.180 sqm
	Say 23.180 sqm @ Rs 542.29 / sqm	**Rs 12570.28**
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	28.705 sqm
	Say 28.705 sqm @ Rs 401.21 / sqm	**Rs 11516.73**

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14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	16.295 cum
	Say 16.295 cum @ Rs 258.57 / cum	**Rs 4213.40**
15	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	28.915 cum
	Say 28.915 cum @ Rs 606.82 / cum	**Rs 17546.20**
16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	6.000 each
	Say 6.000 each @ Rs 545.00 / each	**Rs 3270.00**
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**7001842.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 7001842.00
		Rounded Total Rs 70,01,842
		Rupees Seventy Lakh One Thousand Eight Hundred and Forty Two Only

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(Cost Index Applied for this estimate is 35.59%)

Sewerage Scheme- Construction of wet well 1 (Block 3B+2) , Grit /Screen Chamber and connected works at Muttar STP

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
	1 Colletion well 5.5m dia							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	1*3.14	4.000	4.000	1.500		75.360	
	For Earth work 1.5m to 3m	1*3.14	4.000	4.000	0.500		25.120	
	Total Quantity						100.480 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.480 cum	
	Say 100.480 cum @ Rs 214.03 / cum						**Rs 21505.73**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 3m	1*3.14	4.000	4.000	0.500		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 106.37 / cum						**Rs 2672.01**	
3	od212791/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5.5m diameter R1)							
		1			1.000		1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 29872.26 / metre						**Rs 29872.26**	

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4	od212837/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5.5m diameter R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 31527.93 / metre						**Rs 47291.90**	
5	od212867/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5.5m diameter R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 33186.05 / metre						**Rs 49779.08**	
6	od212902/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5.5m diameter R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 34841.72 / metre						**Rs 52262.58**	
7	od213138/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter R1)							
		1			1.090		1.090	
	Total Quantity						1.090 metre	

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	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.090 metre	
	Say 1.090 metre @ Rs 36499.85 / metre						**Rs 39784.84**	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	5.500	0.600			10.362	
	well Kerb - outer	1*3.14	6.850	1.330			28.607	
	well Kerb - Slope	1*3.14	5.5+6.03		0.900		32.584	
	Side wall	1*3.14	6.100		8.590		164.533	
	Total Quantity						236.086 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						236.086 sqm	
	Say 236.086 sqm @ Rs 249.69 / sqm						**Rs 58948.31**	
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	kerb -((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1			4.210		4.210	
	From 4.5m to 9.0m below ground level ,Bottom Slab	3.14/4	5.500	5.500	0.600		14.248	
	Total Quantity						18.458 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.458 cum	
	Say 18.458 cum @ Rs 9413.54 / cum						**Rs 173755.12**	
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing							

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	and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	6.100	0.600	8.590		98.720	
						Total Quantity	98.720 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	98.720 cum	
						Say 98.720 cum @ Rs 11065.64 / cum	**Rs 1092399.98**	
11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	k e r b - ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1			4.210		4.210	
	From 4.5m to 9.0m below ground level ,Bottom Slab	3.14/4	5.500	5.500	0.600		14.248	
	Side wall	1*3.14	6.100	0.600	8.590		98.720	
						Total Quantity	117.178 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	117.178 cum	
						Say 117.178 cum @ Rs 82.10 / cum	**Rs 9620.31**	
12	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	k e r b - ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1			4.210		4.210	
	From 4.5m to 9.0m below ground level ,Bottom Slab	3.14/4	5.500	5.500	0.600		14.248	
	Side wall	1*3.14	6.100	0.600	8.590		98.720	
						Total Quantity	117.178 cum	
						Total Deducted Quantity	0.000 cum	

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	Net Total Quantity						117.178 cum	
	Say 117.178 cum @ Rs 1916.05 / cum						**Rs 224518.91**	
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
		1*3.14/4	5.500	5.500	0.250		5.937	
	Total Quantity						5.937 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5.937 cum	
	Say 5.937 cum @ Rs 7990.86 / cum						**Rs 47441.74**	
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	6.700	16.900			355.543	
	Total Quantity						355.543 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						355.543 kilogram	
	Say 355.543 kilogram @ Rs 101.29 / kilogram						**Rs 36012.95**	
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	6.100	6.100	0.400		11.684	
	Total Quantity						11.684 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.684 cum	
	Say 11.684 cum @ Rs 7211.15 / cum						**Rs 84255.08**	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	120Kg/m3 Concrete Qty Item 5 & 6	1	117.200	120.000			14064.000	

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	2.5 % wastage	1	117.2*0.025	120.000			351.600	
						Total Quantity	14415.600 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	14415.600 kilogram	
						Say 14415.600 kilogram @ Rs 98.30 / kilogram	**Rs 1417053.48**	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	14415.600	0.0508			732.313	
						Total Quantity	732.313 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	732.313 sqm	
						Say 732.313 sqm @ Rs 223.32 / sqm	**Rs 163540.14**	
18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1*3.14	5.500		8.590		148.350	
	Well floor	3.14/4	5.500	5.500			23.747	
						Total Quantity	172.097 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	172.097 sqm	
						Say 172.097 sqm @ Rs 542.29 / sqm	**Rs 93326.48**	
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer 1m above GL)	1*3.14	6.700	1.000			21.038	
	top of wall thickness	1*3.14	6.100	0.600			11.493	
						Total Quantity	32.531 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	32.531 sqm	
						Say 32.531 sqm @ Rs 401.21 / sqm	**Rs 13051.76**	
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m							

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	and lift up to 1.5 m.							
	Earthwork Qty item 1	1	100.480				100.480	
	Volume of well	3.14/4	5.500	5.500	2.000		-47.492	
						Total Quantity	100.480 cum	
						Total Deducted Quantity	-47.492 cum	
						Net Total Quantity	52.988 cum	
						Say 52.988 cum @ Rs 258.57 / cum	**Rs 13701.11**	
21	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Total earth work quantity Item 1	1	100.480				100.480	
	Well sinking	3.14/4	6.700	6.700	6.590		232.223	
	refilling qty	1			52.988		-52.988	
						Total Quantity	332.703 cum	
						Total Deducted Quantity	-52.988 cum	
						Net Total Quantity	279.715 cum	
						Say 279.715 cum @ Rs 606.82 / cum	**Rs 169736.66**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		29					29.000	
						Total Quantity	29.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	29.000 each	
						Say 29.000 each @ Rs 545.00 / each	**Rs 15805.00**	
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL	1*3.14	6.700	1.000			21.038	

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	top of wall thickness	1*3.14	6.100	0.600			11.493	
						Total Quantity	32.531 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	32.531 sqm	
						Say 32.531 sqm @ Rs 45.29 / sqm	**Rs 1473.33**	
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station kg of steel per sqm for-35.239,25 x 3 flats at 30 mm spacing * 12 x 3 flats at 60 mm spacing	1	(33*0.59)+ (17*0.28)	35.239			853.841	
	25 x6 SS for outer frame	1	3.140	1.180	6.700		24.825	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.700	3.920			52.528	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.800	4.470			25.926	
	Misc. items for opening frame	1	10.000				10.000	
						Total Quantity	967.120 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	967.120 kg	
						Say 967.120 kg @ Rs 119.79 / kg	**Rs 115851.30**	
25	od215737/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
		1	3.14/4	6.100	6.100		29.210	
						Total Quantity	29.210 sqm	

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	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						29.210 sqm	
	Say 29.210 sqm @ Rs 35309.60 / sqm						**Rs 1031393.42**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14	2.550	2.550	1.500		30.627	
	For 1.5m to 3m	1*3.14	2.550	2.550	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						**Rs 8740.13**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 3m	1*3.14	2.550	2.550	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						**Rs 1085.93**	
3	od211167/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						**Rs 10859.75**	
4	od211170/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances							

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	including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						**Rs 17204.09**	
5	od211171/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 12078.90 / metre						**Rs 18118.35**	
6	od213517/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)							
		1			0.800		0.800	
	Total Quantity						0.800 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.800 metre	
	Say 0.800 metre @ Rs 16674.35 / metre						**Rs 13339.48**	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.38		0.700		14.024	
	Side wall	1*3.14	3.900	6.800			83.273	
	Total Quantity						114.890 sqm	
	Total Deducted Quantity						0.000 sqm	

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	Net Total Quantity						114.890 sqm	
	Say 114.890 sqm @ Rs 249.69 / sqm						**Rs 28686.88**	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.100	0.525	0.450		2.623	Circum=3.14*3.53=11.07
		1	11.100	0.150	0.600		0.999	Circum=3.14*3.53=11.07
		1*.5	11.100	0.380	0.600		1.266	Circum=3.14*3.53=11.07
	Total Quantity						8.068 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						8.068 cum	
	Say 8.068 cum @ Rs 9413.54 / cum						**Rs 75948.44**	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	3.450	0.450	6.800		33.149	
	Total Quantity						33.149 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						33.149 cum	
	Say 33.149 cum @ Rs 11065.64 / cum						**Rs 366814.90**	
10	5.34.1							

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	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Item 4 and 5	1	8.080				8.080	
		1	33.149				33.149	
	Total Quantity						41.229 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						41.229 cum	
	Say 41.229 cum @ Rs 82.10 / cum						**Rs 3384.90**	
11	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Item 4 and 5	1	8.080				8.080	
		1	33.149				33.149	
	Total Quantity						41.229 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						41.229 cum	
	Say 41.229 cum @ Rs 1916.05 / cum						**Rs 78996.83**	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14	1.500	1.500	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						**Rs 14119.85**	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	

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	Say 206.958 kilogram @ Rs 101.29 / kilogram						**Rs 20962.78**	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	3.14/4	3.450	3.450	0.300		2.804	
	Total Quantity						2.804 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.804 cum	
	Say 2.804 cum @ Rs 7211.15 / cum						**Rs 20220.06**	
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	@ 1 2 0 k g / m 3 of c o n c r e t e	1	41.210	120.000			4945.200	
	wastage 2.5%	1	41.210	120.000		0.03	123.630	
	Total Quantity						5068.830 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						5068.830 kilogram	
	Say 5068.830 kilogram @ Rs 108.47 / kilogram						**Rs 549815.99**	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	5068.830	0.0508			257.497	
	Total Quantity						257.497 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						257.497 sqm	
	Say 257.497 sqm @ Rs 223.32 / sqm						**Rs 57504.23**	
17	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1	3.140	3.000	6.800		64.056	
	Well floor	1*3.14	1.500	1.500			7.065	
	Total Quantity						71.121 sqm	

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	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						71.121 sqm	
	Say 71.121 sqm @ Rs 542.29 / sqm						**Rs 38568.21**	
18	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 401.21 / sqm						**Rs 6869.12**	
19	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.834				40.834	
	Volume of well	3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.834 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.704 cum	
	Say 26.704 cum @ Rs 258.57 / cum						**Rs 6904.85**	
20	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Earthwork qty	1			40.860		40.860	
		3.14/4	3.900	3.900	4.100		48.954	
	Refilling quantity	1			26.704		-26.704	
	Total Quantity						89.814 cum	
	Total Deducted Quantity						-26.704 cum	
	Net Total Quantity						63.110 cum	
	Say 63.110 cum @ Rs 606.82 / cum						**Rs 38296.41**	
21	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							

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	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
						Total Quantity	17.121 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	17.121 sqm	
						Say 17.121 sqm @ Rs 45.29 / sqm	**Rs 775.41**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		23					23.000	
						Total Quantity	23.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	23.000 each	
						Say 23.000 each @ Rs 545.00 / each	**Rs 12535.00**	
23	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	50mmx10mm flats at 35 mm spacing*Area of slant screen	29	3.920	3.000	1.800		613.872	0.59Kg/m
	50 x 10mm SS for outer frame	1	9.600	3.920			37.632	0.59Kg/m
	50mmx10mm flats at 30 mm spacing*Area of horizontal portion	34	3.920	3.000	1.500		599.760	0.59Kg/m
	50 x 10mm SS for outer frame	1	9.000	3.920			35.280	0.59Kg/m
	Area of pumping station * kg of steel per sqm for 25X3 flats at 30mm spacing *12X3 flats at 60mm spacing	0.785*3.9*3.9	(33*.59)+(17*.28)				289.303	0.59Kg/m

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	25 x6 SS for outer frame	1.18	3.140	3.920			14.525	0.59Kg/m
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900	3.920			30.576	0.59Kg/m
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.880	4.470			8.404	0.59Kg/m
	Misc. items for opening frame	1		5.000			5.000	0.59Kg/m
						Total Quantity	1634.352 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	1634.352 kg	
						Say 1634.352 kg @ Rs 119.79 / kg	**Rs 195779.03**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	3 Silt Pit 1.5mx1.5mx1.2m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	12.936 cum	
						Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
						Total Quantity	1.176 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.176 cum	
						Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and							

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	shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						**Rs 3497.41**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						**Rs 28645.40**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						**Rs 249.83**	
6	od211174/2022_2023							

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	Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						**Rs 5830.54**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						**Rs 29912.69**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	304.300	0.0508			15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						**Rs 3452.30**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	

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	Say 21.250 sqm @ Rs 249.69 / sqm						**Rs 5305.91**	
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Inside	2	1.500		1.200		3.600	
		2	1.500		1.200		3.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						10.050 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.050 sqm	
	Say 10.050 sqm @ Rs 542.29 / sqm						**Rs 5450.01**	
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
		2	2.000		1.200		4.800	
		2	2.000		1.200		4.800	
	Total Quantity						9.600 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.600 sqm	
	Say 9.600 sqm @ Rs 401.21 / sqm						**Rs 3851.62**	
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						**Rs 1430.67**	
13	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							

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	Excavation	1			12.940		12.940	
	Refilling	1			5.530		-5.530	
						Total Quantity	12.940 cum	
						Total Deducted Quantity	-5.530 cum	
						Net Total Quantity	7.410 cum	
						Say 7.410 cum @ Rs 606.82 / cum	**Rs 4496.54**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	4 Valve chamber 2.1mx3.8mx1.9m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.700	5.200	1.500		28.861	
		1	3.700	5.200	0.850		16.355	
						Total Quantity	45.216 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	45.216 cum	
						Say 45.216 cum @ Rs 214.03 / cum	**Rs 9677.58**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	3.700	5.200	0.850		16.355	
						Total Quantity	16.355 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	16.355 cum	
						Say 16.355 cum @ Rs 106.37 / cum	**Rs 1739.68**	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.700	5.200	0.150		2.886	
						Total Quantity	2.886 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2.886 cum	
						Say 2.886 cum @ Rs 2298.93 / cum	**Rs 6634.71**	

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4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.100	4.700	0.100		1.457	
						Total Quantity	1.457 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.457 cum	
						Say 1.457 cum @ Rs 7211.15 / cum	**Rs 10506.65**	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Cover slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 9413.54 / cum	**Rs 92582.17**	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Cover slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 82.10 / cum	**Rs 807.45**	

Other Engineering Organisations
PRICE

7	od211174/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Cover slab	1	2.700	4.200	0.180		2.042	
	Total Quantity						9.835 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.835 cum	
	Say 9.835 cum @ Rs 1916.05 / cum						**Rs 18844.35**	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@100kg per m3 concrete	1	9.835	100.000			983.501	
	Total Quantity						983.501 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						983.501 kilogram	
	Say 983.501 kilogram @ Rs 98.30 / kilogram						**Rs 96678.15**	
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	983.501	0.0508			49.962	
	Total Quantity						49.962 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						49.962 sqm	
	Say 49.962 sqm @ Rs 223.32 / sqm						**Rs 11157.51**	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.100		0.200		1.241	
		2		4.600	0.200		1.840	
	Walls outer	2	2.700		1.900		10.260	
		2		4.200	1.900		15.960	
	Walls inner	2	2.300		1.900		8.740	

Other Engineering Organisations
PRICE

		2		3.800	1.900		14.440	
						Total Quantity	52.481 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	52.481 sqm	
						Say 52.481 sqm @ Rs 249.69 / sqm	**Rs 13103.98**	
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.700				5.400	
		2	4.200				8.400	
						Total Quantity	13.800 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	13.800 metre	
						Say 13.800 metre @ Rs 203.93 / metre	**Rs 2814.23**	
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	inside	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
						Total Quantity	23.180 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	23.180 sqm	
						Say 23.180 sqm @ Rs 542.29 / sqm	**Rs 12570.28**	
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.700		2.080		11.233	
		2		4.200	2.080		17.472	
						Total Quantity	28.705 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	28.705 sqm	
						Say 28.705 sqm @ Rs 401.21 / sqm	**Rs 11516.73**	
14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							

Other Engineering Organisations
PRICE

	Total excavated earth Item 1	1	45.160				45.160	
	PCC	1	1.580				-1.580	
	Sand filling	1	2.890				-2.890	
	RCC	1	7.790				-7.790	
	Chamber size	1	2.300	3.800	1.900		-16.605	
						Total Quantity	45.160 cum	
						Total Deducted Quantity	-28.865 cum	
						Net Total Quantity	16.295 cum	
						Say 16.295 cum @ Rs 258.57 / cum	**Rs 4213.40**	
15	od211175/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Refilling	1			16.295		-16.295	
	Excavation earth	1			45.210		45.210	
						Total Quantity	45.210 cum	
						Total Deducted Quantity	-16.295 cum	
						Net Total Quantity	28.915 cum	
						Say 28.915 cum @ Rs 606.82 / cum	**Rs 17546.20**	
16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		6					6.000	
						Total Quantity	6.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	6.000 each	
						Say 6.000 each @ Rs 545.00 / each	**Rs 3270.00**	
						Provision for GST payments (in %) @	**0.0%**	
						Amount reserved for GST payments	**0.00**	
						Total	**7001842.00**	

Other Engineering Organisations
PRICE

Lumpsum for round off	**0.00**
	TOTAL Rs 7001842.00
	Rounded Total Rs 70,01,842
Rupees Seventy Lakh One Thousand Eight Hundred and Forty Two Only	

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Data Analysis

Colletion well 5.5m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

	Cost index **35.59 %**				56.18

Other Engineering Organisations
PRICE

	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59
				Cost per cum	78.46
				Say	78.45

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od212791/2022_2023

od212791/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	105.72000	445.29	47076.06
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	76942.53
	cost for 3.0 metre				76942.53
	cost for one metre				25647.51
	say				25647.51

	Add Water Charges @ 1.0%				**256.47**
	Add CPOH @ 15.0%				**3885.59**
	Cost index **35.59 %**				82.67
	Total with Cost index				29872.26
	Say				29872.26

4 Specification Code: od212837/2022_2023

od212837/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

Other Engineering Organisations
PRICE

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 358.24*1.3559 =485.74	cum	105.72000	485.74	51352.43
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	81218.90
	cost for 3.0 metre				81218.90
	cost for one metre				27072.97
	say				27072.97

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**270.72**
	Add CPOH @ 15.0%				**4101.55**
	Cost index **35.59 %**				82.67
	Total with Cost index				31527.93
	Say				31527.93

5 Specification Code: od212867/2022_2023

od212867/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 388.12*1.3559 =485.74	cum	105.72000	526.25	55635.15
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	85501.62
	cost for 3.0 metre				85501.62
	cost for one metre				28500.54
	say				28500.54

	Add Water Charges @ 1.0%				**285.00**
	Add CPOH @ 15.0%				**4317.83**
	Cost index **35.59 %**				82.67
	Total with Cost index				33186.05
	Say				33186.05

6 Specification Code: od212902/2022_2023

od212902/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

Other Engineering Organisations
PRICE

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.5*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	105.72000	566.70	59911.52
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	89777.99
	cost for 3.0 metre				89777.99
	cost for one metre				29926.00
	say				29926.00

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**299.26**
	Add CPOH @ 15.0%				**4533.78**
	Cost index **35.59 %**				82.67
	Total with Cost index				34841.72
	Say				34841.72

7 Specification Code: od213138/2022_2023

od213138/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter R1)
Quantity for 3.0m depth=3.14*3.35*3.35*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.6 447.82*1.3559 =607.21	cum	105.72000	607.21	64194.24
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	94060.71
	cost for 3.0 metre				94060.71
	cost for one metre				31353.57
	say				31353.57

	Add Water Charges @ 1.0%				**313.53**
	Add CPOH @ 15.0%				**4750.06**
	Cost index **35.59 %**				82.67
	Total with Cost index				36499.85
	Say				36499.85

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

Other Engineering Organisations
PRICE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

9 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
				TOTAL	5977.32

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

10 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

11 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

Other Engineering Organisation
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

12 Specification Code: od211174/2022_2023

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

13 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

© Other Engineering Organisations PRICE

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46

	Total with Cost index				7990.86

14 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
	AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)				63.17
	TOTAL				6512.45

Other Engineering Organisations
PRICE

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

15 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

16 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86
				TOTAL	1647.25
				Cost of 10.0 sqm	1647.25

Other Engineering Organisations
PRICE

Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

18 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25

Other Engineering Organisations PRICE

Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

19 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84

0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

20 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42

TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

21 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82

	Say				606.82

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 13.39.2

Other Engineering Organisations PRICE

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

24 Specification Code: 10.2

SUBHEAD : **10.0**

Other Engineering Organisations
PRICE

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00
1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00

Other Engineering Organisations
PRICE

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25

Other Engineering Organisations
PRICE

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

25 Specification Code: od215737/2022_2023

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od215737/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
				TOTAL	30400.00

				cost for one sqm	30400.00
	say				30400.00

	Add Water Charges @ 1.0%				**304.00**
	Add CPOH @ 15.0%				**4605.60**
	Cost index **35.59 %**				0.00
	Total with Cost index				35309.60
	Say				35309.60

Grit/Screen Chamber 3m dia

1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59

Cost per cum	78.46
Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od211167/2022_2023

od211167/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	27835.74

	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				**92.78**

Other Engineering Organisations PRICE

	Add CPOH @ 15.0%				**1405.70**
	Cost index **35.59 %**				82.67
	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od211170/2022_2023

od211170/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	29410.38

	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				**98.03**

Other Engineering Organisations PRICE

	Add CPOH @ 15.0%				**1485.22**
	Cost index **35.59 %**				82.67
	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od211171/2022_2023

od211171/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 421.44*1.3559 =	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	30984.67
	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				**103.28**

Other Engineering Organisations PRICE

	Add CPOH @ 15.0%				**1564.72**
	Cost index **35.59 %**				82.67
	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: od213517/2022_2023

od213517/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)
Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 545.99 *1.3559 =740.307	cum	41.54220	740.31	30753.98
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	42854.11

	cost for 3.0 metre				42854.11
	cost for one metre				14284.70
	say				14284.70

	Add Water Charges @ 1.0%				**142.84**

	Add CPOH @ 15.0%				**2164.13**
	Cost index **35.59 %**				82.67
	Total with Cost index				16674.35
	Say				16674.35

7 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

8 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

9 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

Other Engineering Organisations
PRICE

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

Other Engineering Organisations
PRICE

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

Other Engineering Organisations
PRICE

11 Specification Code: od211174/2022_2023

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

Other Engineering Organisations PRICE

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

Other Engineering Organisations
PRICE

13 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)	63.17
TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

14 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

15 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

Other Engineering Organisations PRICE

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

	Cost index **35.59 %**				28.47
	Total with Cost index				108.47

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

17 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

18 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

19 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

20 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Other Engineering Organisations
PRICE

21 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82

0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

Other Engineering Organisations
PRICE

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
				AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
				TOTAL	357.72
				AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
				TOTAL	401.95
				Cost of 1.0 each	401.95
				Cost of 1 each	401.95
				Say	401.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

Other Engineering Organisations PRICE

1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00
1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

Other Engineering Organisations
PRICE

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25
Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

Silt Pit 1.5mx1.5mx1.2m
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm

on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10

Other Engineering Organisations PRICE

0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od211174/2022_2023

Other Engineering Organisations
PRICE

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

Other Engineering Organisations
PRICE

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				

3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

11 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

12 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

13 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Valve chamber 2.1mx3.8mx1.9m

1 Specification Code: 2.6.1

Other Engineering Organisations
PRICE

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00

0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

Other Engineering Organisations
PRICE

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25

Add CPOH @ 15%	102.34
TOTAL	784.59
Cost of 10.0 cum	784.59
Cost per cum	78.46
Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
	TOTAL				14597.33
	Add Water Charges @ 1%				145.97
	TOTAL				14743.30
	Add CPOH @ 15%				2211.49
	TOTAL				16954.79
	Cost of 10.0 cum				16954.79

Other Engineering Organisations PRICE

Cost per cum	1695.48
Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80

Other Engineering Organisations PRICE

2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

5 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisation
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

6 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52

TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

7 Specification Code: od211174/2022_2023

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od211174/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

	Cost index **35.59 %**				25.80

Other Engineering Organisations PRICE

	Total with Cost index				98.30

9 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18

Other Engineering Organisations PRICE

TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

10 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

11 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) 4x3x0.15x0.030 = 0.54 cum Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = 57/8 = 7.125 cudm	10 cudm	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal 2x4x0.075x0.1x0.5 = 0.030 Horizontal 2x4x0.075x0.1 x 1.5 = 0.090 (iii) Vertical battens 16x0.15x0.075x0.030m = 0.0054 (iv) Struts 16x0.25x0.07x0.075 = 0.0225 Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = 155/8 = 19.375 cudm	10 cudm	19.375	260.00	503.75

Other Engineering Organisations PRICE

2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = 0.212/8 =0.0265 cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL	1553.85
Add Water Charges @ 1%	15.54
TOTAL	1569.39
Add CPOH @ 15%	235.41
TOTAL	1804.80
Cost of 12.0 metre	1804.80
Cost per metre	150.40
Say	150.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				53.53
	Total with Cost index				203.93

12 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

13 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

Other Engineering Organisations PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

14 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

15 Specification Code: od211175/2022_2023

od211175/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Other Engineering Organisations
PRICE

16 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
	AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)				2.92
	TOTAL				357.72
	AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)				44.25
	TOTAL				401.95
	Cost of 1.0 each				401.95
	Cost of 1 each				401.95
	Say				401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 2 (Block 3A) , Grit /Screen Chamber and connected works at Muttar STP

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Colletion well 7m dia**	10951135.73
2	**Grit/Screen Chamber 3m dia**	1492230.51
3	**Silt Pit 1.5mx1.5mx1.2m**	97592.72
4	**Valve chamber 2.4mx3.9mx2.2m**	356336.82
5	**SILT RAISER ARRANGEMENTS**	40132.64
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**12937428.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 12937428.00
		Rounded Total Rs 1,29,37,428
	Rupees One Crore Twenty Nine Lakh Thirty Seven Thousand Four Hundred and Twenty Eight Only	

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 2 (Block 3A) , Grit /Screen Chamber and connected works at Muttar STP

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

1 Colletion well 7m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	157.000 cum
	Say 157.000 cum @ Rs 214.03 / cum	**Rs 33602.71**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	39.250 cum
	Say 39.250 cum @ Rs 106.37 / cum	**Rs 4175.02**
3	od213480/2022_2023 Sinking wells above 6.0 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (for 7m diameter)	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 47748.85 / metre	**Rs 47748.85**
4	od213481/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m(for 7m diameter)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 50521.07 / metre	**Rs 75781.61**
5	od213484/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m(for 7m diameter)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 53289.85 / metre	**Rs 79934.78**

Other Engineering Organisations PRICE

6	od213485/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m(for 7m diameter)	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 56057.29 / metre	**Rs 84085.94**
7	od213625/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m(for 7m diameter)	
	Net Total Quantity	0.290 metre
	Say 0.290 metre @ Rs 58826.57 / metre	**Rs 17059.71**
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	323.587 sqm
	Say 323.587 sqm @ Rs 249.69 / sqm	**Rs 80796.44**
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	247.080 cum
	Say 247.080 cum @ Rs 9413.54 / cum	**Rs 2325897.46**
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	25.120 cum
	Say 25.120 cum @ Rs 11065.64 / cum	**Rs 277968.88**

Other Engineering Organisations PRICE

11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	272.200 cum
	Say 272.200 cum @ Rs 82.10 / cum	**Rs 22347.62**
12	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	272.200 cum
	Say 272.200 cum @ Rs 1916.05 / cum	**Rs 521548.81**
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	9.617 cum
	Say 9.617 cum @ Rs 7990.86 / cum	**Rs 76848.10**
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	477.594 kilogram
	Say 477.594 kilogram @ Rs 101.29 / kilogram	**Rs 48375.50**
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	85.911 cum
	Say 85.911 cum @ Rs 7211.15 / cum	**Rs 619517.11**
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	33480.576 kilogram
	Say 33480.576 kilogram @ Rs 98.30 / kilogram	**Rs 3291140.62**
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	1700.814 sqm
	Say 1700.814 sqm @ Rs 223.32 / sqm	**Rs 379825.78**

Other Engineering Organisations
PRICE

18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	231.670 sqm
	Say 231.670 sqm @ Rs 542.29 / sqm	**Rs 125632.32**
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	53.380 sqm
	Say 53.380 sqm @ Rs 401.21 / sqm	**Rs 21416.59**
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	80.070 cum
	Say 80.070 cum @ Rs 258.57 / cum	**Rs 20703.70**
21	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	540.465 cum
	Say 540.465 cum @ Rs 606.82 / cum	**Rs 327964.97**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	30.000 each
	Say 30.000 each @ Rs 545.00 / each	**Rs 16350.00**
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	83.399 sqm
	Say 83.399 sqm @ Rs 45.29 / sqm	**Rs 3777.14**
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	

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	Net Total Quantity	1698.599 kg
	Say 1698.599 kg @ Rs 119.79 / kg	**Rs 203475.17**
25	od215736/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
	Net Total Quantity	63.585 sqm
	Say 63.585 sqm @ Rs 35309.60 / sqm	**Rs 2245160.92**
	2 Grit/Screen Chamber 3m dia	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	40.836 cum
	Say 40.836 cum @ Rs 214.03 / cum	**Rs 8740.13**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	10.209 cum
	Say 10.209 cum @ Rs 106.37 / cum	**Rs 1085.93**
3	od213479/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 10859.75 / metre	**Rs 10859.75**
4	od213482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 11469.39 / metre	**Rs 17204.09**

Other Engineering Organisations
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5	od213483/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
	Net Total Quantity	0.500 metre
	Say 0.500 metre @ Rs 12078.90 / metre	**Rs 6039.45**
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	118.764 sqm
	Say 118.764 sqm @ Rs 249.69 / sqm	**Rs 29654.18**
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	37.792 cum
	Say 37.792 cum @ Rs 9413.54 / cum	**Rs 355756.50**
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	4.875 cum
	Say 4.875 cum @ Rs 11065.64 / cum	**Rs 53944.99**
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	42.667 cum
	Say 42.667 cum @ Rs 82.10 / cum	**Rs 3502.96**
10	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Other Engineering Organisations PRICE

	Net Total Quantity	42.667 cum
	Say 42.667 cum @ Rs 1916.05 / cum	**Rs 81752.11**
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	1.767 cum
	Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	206.958 kilogram
	Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	2.120 cum
	Say 2.120 cum @ Rs 7211.15 / cum	**Rs 15287.64**
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
	Net Total Quantity	5247.706 kilogram
	Say 5247.706 kilogram @ Rs 108.47 / kilogram	**Rs 569218.67**
15	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	73.947 sqm
	Say 73.947 sqm @ Rs 542.29 / sqm	**Rs 40100.72**
16	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 401.21 / sqm	**Rs 6869.12**
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	

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	Net Total Quantity	26.706 cum
	Say 26.706 cum @ Rs 258.57 / cum	**Rs 6905.37**
18	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	66.690 cum
	Say 66.690 cum @ Rs 606.82 / cum	**Rs 40468.83**
19	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	24.000 each
	Say 24.000 each @ Rs 545.00 / each	**Rs 13080.00**
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 45.29 / sqm	**Rs 775.41**
21	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	1635.379 kg
	Say 1635.379 kg @ Rs 119.79 / kg	**Rs 195902.05**
	3 Silt Pit 1.5mx1.5mx1.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	12.936 cum
	Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	

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	Net Total Quantity	1.176 cum
	Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	0.485 cum
	Say 0.485 cum @ Rs 7211.15 / cum	**Rs 3497.41**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 1916.05 / cum	**Rs 5830.54**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	304.300 kilogram
	Say 304.300 kilogram @ Rs 98.30 / kilogram	**Rs 29912.69**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	15.459 sqm

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	Say 15.459 sqm @ Rs 223.32 / sqm	**Rs 3452.30**
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	21.250 sqm
	Say 21.250 sqm @ Rs 249.69 / sqm	**Rs 5305.91**
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	10.050 sqm
	Say 10.050 sqm @ Rs 542.29 / sqm	**Rs 5450.01**
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	9.600 sqm
	Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	5.533 cum
	Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**
13	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	7.406 cum
	Say 7.406 cum @ Rs 606.82 / cum	**Rs 4494.11**
	4 Valve chamber 2.4mx3.9mx2.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	53.371 cum
	Say 53.371 cum @ Rs 214.03 / cum	**Rs 11423.00**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	3.021 cum

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	Say 3.021 cum @ Rs 2298.93 / cum	**Rs 6945.07**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	1.667 cum
	Say 1.667 cum @ Rs 7211.15 / cum	**Rs 12020.99**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	11.074 cum
	Say 11.074 cum @ Rs 9413.54 / cum	**Rs 104245.54**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	11.074 cum
	Say 11.074 cum @ Rs 82.10 / cum	**Rs 909.18**
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	11.074 cum
	Say 11.074 cum @ Rs 1916.05 / cum	**Rs 21218.34**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	1107.400 kilogram
	Say 1107.400 kilogram @ Rs 98.30 / kilogram	**Rs 108857.42**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	55.371 sqm
	Say 55.371 sqm @ Rs 223.32 / sqm	**Rs 12365.45**

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9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	62.122 sqm
	Say 62.122 sqm @ Rs 249.69 / sqm	**Rs 15511.24**
10	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	
	Net Total Quantity	2.556 sqm
	Say 2.556 sqm @ Rs 717.20 / sqm	**Rs 1833.16**
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
	Net Total Quantity	14.200 metre
	Say 14.200 metre @ Rs 203.93 / metre	**Rs 2895.81**
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	27.720 sqm
	Say 27.720 sqm @ Rs 542.29 / sqm	**Rs 15032.28**
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	33.796 sqm
	Say 33.796 sqm @ Rs 401.21 / sqm	**Rs 13559.29**
14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	19.186 cum
	Say 19.186 cum @ Rs 258.57 / cum	**Rs 4960.92**
15	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	34.185 cum
	Say 34.185 cum @ Rs 606.82 / cum	**Rs 20744.14**

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16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	7.000 each
	Say 7.000 each @ Rs 545.00 / each	**Rs 3815.00**
	5 SILT RAISER ARRANGEMENTS	
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe	
	Net Total Quantity	7.000 metre
	Say 7.000 metre @ Rs 2150.66 / metre	**Rs 15054.62**
2	od215542/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend	
	Net Total Quantity	1.000 each
	Say 1.000 each @ Rs 3028.03 / each	**Rs 3028.03**
3	od215543/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 2118.58 / each	**Rs 4237.16**
4	od215565/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 4629.76 / each	**Rs 9259.52**
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe	
	Net Total Quantity	11.000 no
	Say 11.000 no @ Rs 311.92 / no	**Rs 3431.12**

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6	od215585/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	
	Net Total Quantity	10.000 metre
	Say 10.000 metre @ Rs 512.22 / metre	**Rs 5122.20**
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**12937428.00**
	Lumpsum for round off	**0.00**
		TOTAL Rs 12937428.00
		Rounded Total Rs 1,29,37,428
	Rupees One Crore Twenty Nine Lakh Thirty Seven Thousand Four Hundred and Twenty Eight Only	

(Cost Index Applied for this estimate is 35.59%)

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Sewerage Scheme- Construction of wet well 2 (Block 3A) , Grit /Screen Chamber and connected works at Muttar STP

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
	1 Colletion well 7m dia							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	3.14/4	10.000	10.000	1.500		117.750	
	Second depth 1.5m to 2m	3.14/4	10.000	10.000	0.500		39.250	
	Total Quantity						157.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						157.000 cum	
	Say 157.000 cum @ Rs 214.03 / cum						**Rs 33602.71**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	10.000	10.000	0.500		39.250	
	Total Quantity						39.250 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.250 cum	
	Say 39.250 cum @ Rs 106.37 / cum						**Rs 4175.02**	
3	od213480/2022_2023 Sinking wells above 6.0 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (for 7m diameter)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 47748.85 / metre						**Rs 47748.85**	

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4	od213481/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m(for 7m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 50521.07 / metre						**Rs 75781.61**	
5	od213484/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m(for 7m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 53289.85 / metre						**Rs 79934.78**	
6	od213485/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m(for 7m diameter)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 56057.29 / metre						**Rs 84085.94**	
7	od213625/2022_2023 Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m(for 7m diameter)							
		1			0.290		0.290	
	Total Quantity						0.290 metre	

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	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.290 metre	
	Say 0.290 metre @ Rs 58826.57 / metre						**Rs 17059.71**	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	7.000	1.000			21.980	
	well Kerb - outer	1*3.14	9.150	2.100			60.336	
	well Kerb - Slope	1	7+7.83		1.380		20.466	
	Side wall	1*3.14	8.000		8.790		220.805	
	Total Quantity						323.587 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						323.587 sqm	
	Say 323.587 sqm @ Rs 249.69 / sqm						**Rs 80796.44**	
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000		38.465	
	From 1.5m to 4.5m below ground level-kerb	12.93					12.930	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790		195.685	
	Total Quantity						247.080 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						247.080 cum	

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	Say 247.080 cum @ Rs 9413.54 / cum						**Rs 2325897.46**	
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	8.000	1.000	1.000		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 11065.64 / cum						**Rs 277968.88**	
11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000		38.465	
	From 1.5m to 4.5m below ground level-kerb	12.93					12.930	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790		195.685	
	Side wall	3.14	8.000	1.000	1.000		25.120	
	Total Quantity						272.200 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						272.200 cum	
	Say 272.200 cum @ Rs 82.10 / cum						**Rs 22347.62**	
12	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							

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	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000		38.465	
	From 1.5m to 4.5m below ground level-kerb	12.93					12.930	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790		195.685	
	Side wall	3.14	8.000	1.000	1.000		25.120	
						Total Quantity	272.200 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	272.200 cum	
						Say 272.200 cum @ Rs 1916.05 / cum	**Rs 521548.81**	
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	7.000	7.000	0.250		9.617	
						Total Quantity	9.617 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.617 cum	
						Say 9.617 cum @ Rs 7990.86 / cum	**Rs 76848.10**	
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	9.000	16.900			477.594	
						Total Quantity	477.594 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	477.594 kilogram	
						Say 477.594 kilogram @ Rs 101.29 / kilogram	**Rs 48375.50**	
15	4.1.6							

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	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	8.000	8.000	1.710		85.911	
	Total Quantity						85.911 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						85.911 cum	
	Say 85.911 cum @ Rs 7211.15 / cum						**Rs 619517.11**	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	7.000	7.000	1.000	120.0	4615.800	120Kg/m3
	From 1.5m to 4.5m below ground level-kerb	12.93				120.0	1551.600	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	8.000	1.000	7.790	120.0	23482.176	
	Side wall	3.14	8.000	1.000	1.000	120.0	3014.400	120Kg/m3
	Wastage @2.5%	32663.976			2.5/100		816.600	
	Total Quantity						33480.576 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						33480.576 kilogram	
	Say 33480.576 kilogram @ Rs 98.30 / kilogram						**Rs 3291140.62**	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		33480.576				0.05	1700.814	0.0508 m2/kg
	Total Quantity						1700.814 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1700.814 sqm	

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	Say 1700.814 sqm @ Rs 223.32 / sqm						**Rs 379825.78**	
18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1*3.14	7.000		8.790		193.205	
	Well floor	1*3.14/4	7.000	7.000			38.465	
	Total Quantity						231.670 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						231.670 sqm	
	Say 231.670 sqm @ Rs 542.29 / sqm						**Rs 125632.32**	
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer 1m above GL)	1*3.14	9.000	1.000			28.260	
	top of wall thickness	1*3.14	8.000	1.000			25.120	
	Total Quantity						53.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						53.380 sqm	
	Say 53.380 sqm @ Rs 401.21 / sqm						**Rs 21416.59**	
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	7.000	7.000	2.000		-76.930	
	First depth 0 to 1.5m	3.14/4	10.000	10.000	1.500		117.750	
	Second depth 1.5m to 2m	3.14/4	10.000	10.000	0.500		39.250	
	Total Quantity						157.000 cum	
	Total Deducted Quantity						-76.930 cum	
	Net Total Quantity						80.070 cum	
	Say 80.070 cum @ Rs 258.57 / cum						**Rs 20703.70**	
21	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	First depth 0 to 1.5m	3.14/4	10.000	10.000	1.500		117.750	

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	Second depth 1.5m to 2m	3.14/4	10.000	10.000	0.500		39.250	
	For sinking well	3.14/4	9.000	9.000	7.290		463.535	
	Deduct for Refilling quantity	80.070					-80.070	
						Total Quantity	620.535 cum	
						Total Deducted Quantity	-80.070 cum	
						Net Total Quantity	540.465 cum	
						Say 540.465 cum @ Rs 606.82 / cum	**Rs 327964.97**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		30					30.000	
						Total Quantity	30.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	30.000 each	
						Say 30.000 each @ Rs 545.00 / each	**Rs 16350.00**	
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL)	1*3.14	6.200	1.000			19.468	
	top of wall thickness	1*3.14	5.600	0.600			10.551	
	Well outer 1m above GL)	1*3.14	9.000	1.000			28.260	
	top of wall thickness	1*3.14	8.000	1.000			25.120	
						Total Quantity	83.399 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	83.399 sqm	
						Say 83.399 sqm @ Rs 45.29 / sqm	**Rs 3777.14**	
24	10.2							

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	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station(64sqm)							
	(33*0.58)+(17*0.28)=24.23 kg/m	1	64.000			24.23	1550.720	25 x 3 flats at 30 mm spacing=33nos@0.59,12 x 3 flats at 60 mm spacing=17@.28
	25 x6 SS for outer frame@1.18kg/m	1*3.14	9.000			1.18	33.347	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	9.000			3.92	70.560	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	7.600			4.47	33.972	
	Misc. items for opening frame	1	10.000				10.000	
						Total Quantity	1698.599 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	1698.599 kg	
						Say 1698.599 kg @ Rs 119.79 / kg	**Rs 203475.17**	
25	od215736/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
		3.14/4	9.000	9.000			63.585	
						Total Quantity	63.585 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	63.585 sqm	

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	Say 63.585 sqm @ Rs 35309.60 / sqm						**Rs 2245160.92**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627	
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						**Rs 8740.13**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						**Rs 1085.93**	
3	od213479/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						**Rs 10859.75**	
4	od213482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							

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		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						**Rs 17204.09**	
5	od213483/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1	0.500				0.500	
	Total Quantity						0.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.500 metre	
	Say 0.500 metre @ Rs 12078.90 / metre						**Rs 6039.45**	
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.38		0.710		14.224	
	Side wall	1*3.14	3.900	7.100			86.947	
	Total Quantity						118.764 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						118.764 sqm	
	Say 118.764 sqm @ Rs 249.69 / sqm						**Rs 29654.18**	
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	

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	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Total Quantity						37.792 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						37.792 cum	
	Say 37.792 cum @ Rs 9413.54 / cum						**Rs 355756.50**	
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						4.875 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.875 cum	
	Say 4.875 cum @ Rs 11065.64 / cum						**Rs 53944.99**	
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07

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		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
						Total Quantity	42.667 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	42.667 cum	
						Say 42.667 cum @ Rs 82.10 / cum	**Rs 3502.96**	
10	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
						Total Quantity	42.667 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	42.667 cum	
						Say 42.667 cum @ Rs 1916.05 / cum	**Rs 81752.11**	
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							

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	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
						Total Quantity	1.767 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.767 cum	
						Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**	
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
						Total Quantity	206.958 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	206.958 kilogram	
						Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**	
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
						Total Quantity	2.120 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2.120 cum	
						Say 2.120 cum @ Rs 7211.15 / cum	**Rs 15287.64**	
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	Bottom slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510	
	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07
	@120kg/m3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07

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	@120kg/m3 of concrete	1*.5	11.070	0.380	0.600	120.0	151.438	Circum=3.14*3.53=11.07
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	6.100	120.0	3568.391	Circum=3.14*3.53=11.07
	Side wall@120kg/m3 of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	5119.713			2.5/100		127.993	
	Total Quantity						5247.706 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						5247.706 kilogram	
	Say 5247.706 kilogram @ Rs 108.47 / kilogram						**Rs 569218.67**	
15	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1	3.140	3.000	7.100		66.882	
	Well floor	1*3.14/4	3.000	3.000			7.065	
	Total Quantity						73.947 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						73.947 sqm	
	Say 73.947 sqm @ Rs 542.29 / sqm						**Rs 40100.72**	
16	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 401.21 / sqm						**Rs 6869.12**	
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.836				40.836	

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	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
						Total Quantity	40.836 cum	
						Total Deducted Quantity	-14.130 cum	
						Net Total Quantity	26.706 cum	
						Say 26.706 cum @ Rs 258.57 / cum	**Rs 6905.37**	
18	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Earthwork quantity	40.86					40.860	
	For sinking well	3.14/4	3.900	3.900	4.400		52.536	
	Deduct for Refilling quantity	26.706					-26.706	
						Total Quantity	93.396 cum	
						Total Deducted Quantity	-26.706 cum	
						Net Total Quantity	66.690 cum	
						Say 66.690 cum @ Rs 606.82 / cum	**Rs 40468.83**	
19	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		24					24.000	
						Total Quantity	24.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	24.000 each	
						Say 24.000 each @ Rs 545.00 / each	**Rs 13080.00**	
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
						Total Quantity	17.121 sqm	
						Total Deducted Quantity	0.000 sqm	

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	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						**Rs 775.41**	
21	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of slant screen(3*1.8)=5.4sqm							
	weight of 29 nos 50mmx10mm flats at 35mm spacing@3.92k/m	29	5.400			3.92	613.873	
	50 x 10mm SS for outer frame@3.92Kg/m	1	(3+1.8)*2			3.92	37.632	
	Area of horizontal portion(3x1.5=4.5sqm)							
	(34nos)50mmx10mm flats at 30 mm spacing	34	4.500			3.92	599.760	@3.92kg/m
	50 x 10mm SS for outer frame	1	(3+1.5)*2			3.92	35.280	@3.92kg/m
	Area of pumping station 12sqm							
	25 x 3 flats at 30 mm spacing@.58kg/m	33	12.000			0.59	233.640	
	12 x 3 flats at 60 mm spacing	17	12.000			0.28	57.121	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.800			4.47	8.046	
	Misc. items for opening frame	1	5.000				5.000	
	25 x6 SS for outer frame	3.14	3.900			1.18	14.451	@1.18kg/m
	Total Quantity						1635.379 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1635.379 kg	
	Say 1635.379 kg @ Rs 119.79 / kg						**Rs 195902.05**	

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Sl No	Description	No	L	B	D	CF	Quantity	Remark
	3 Silt Pit 1.5mx1.5mx1.2m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.936 cum	
	Say 12.936 cum @ Rs 214.03 / cum						**Rs 2768.69**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 2298.93 / cum						**Rs 2703.54**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						**Rs 3497.41**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	

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		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
						Total Quantity	3.043 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	3.043 cum	
						Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
						Total Quantity	3.043 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	3.043 cum	
						Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**	
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
						Total Quantity	3.043 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	3.043 cum	
						Say 3.043 cum @ Rs 1916.05 / cum	**Rs 5830.54**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
						Total Quantity	304.300 kilogram	
						Total Deducted Quantity	0.000 kilogram	

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	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						**Rs 29912.69**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						**Rs 3452.30**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	
	Say 21.250 sqm @ Rs 249.69 / sqm						**Rs 5305.91**	
10	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Inside	2	1.500		1.200		3.600	
		2	1.500		1.200		3.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						10.050 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.050 sqm	
	Say 10.050 sqm @ Rs 542.29 / sqm						**Rs 5450.01**	
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.000			1.2	4.800	
		2	2.000			1.2	4.800	

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						Total Quantity	9.600 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	9.600 sqm	
						Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**	
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	-7.403 cum	
						Net Total Quantity	5.533 cum	
						Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**	
13	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	12.936					12.936	
	deduction for Refilling	5.53					-5.530	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	-5.530 cum	
						Net Total Quantity	7.406 cum	
						Say 7.406 cum @ Rs 606.82 / cum	**Rs 4494.11**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 2.4mx3.9mx2.2m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.800	5.300	2.650		53.371	
						Total Quantity	53.371 cum	

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	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						53.371 cum	
	Say 53.371 cum @ Rs 214.03 / cum						**Rs 11423.00**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.800	5.300	0.150		3.021	
	Total Quantity						3.021 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.021 cum	
	Say 3.021 cum @ Rs 2298.93 / cum						**Rs 6945.07**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.400	4.900	0.100		1.667	
	Total Quantity						1.667 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.667 cum	
	Say 1.667 cum @ Rs 7211.15 / cum						**Rs 12020.99**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.200	4.700	0.200		3.009	
	Walls	2	2.800	0.200	2.200		2.464	
		2	3.900	0.200	2.200		3.433	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						11.074 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.074 cum	
	Say 11.074 cum @ Rs 9413.54 / cum						**Rs 104245.54**	

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5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.200	4.700	0.200		3.009	
	Walls	2	2.800	0.200	2.200		2.464	
		2	3.900	0.200	2.200		3.433	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						11.074 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.074 cum	
	Say 11.074 cum @ Rs 82.10 / cum						**Rs 909.18**	
6	od213486/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Raft	1	3.200	4.700	0.200		3.009	
	Walls	2	2.800	0.200	2.200		2.464	
		2	3.900	0.200	2.200		3.433	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						11.074 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.074 cum	
	Say 11.074 cum @ Rs 1916.05 / cum						**Rs 21218.34**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@100kg per m3 concrete	1	11.074	100.000			1107.400	
	Total Quantity						1107.400 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						1107.400 kilogram	
	Say 1107.400 kilogram @ Rs 98.30 / kilogram						**Rs 108857.42**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	0.0508 Sqm/kg	1107.400				0.05	55.371	

Other Engineering Organisations
PRICE

						Total Quantity	55.371 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	55.371 sqm	
						Say 55.371 sqm @ Rs 223.32 / sqm	**Rs 12365.45**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.200		0.200		1.281	
		2		4.700	0.200		1.881	
	Walls outer	2	2.800		2.200		12.320	
		2		4.300	2.200		18.920	
	Walls inner	2	2.400		2.200		10.560	
		2		3.900	2.200		17.160	
						Total Quantity	62.122 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	62.122 sqm	
						Say 62.122 sqm @ Rs 249.69 / sqm	**Rs 15511.24**	
10	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.							
	Cover slab	2	2.800		0.180		1.008	
		2	4.300		0.180		1.548	
						Total Quantity	2.556 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	2.556 sqm	
						Say 2.556 sqm @ Rs 717.20 / sqm	**Rs 1833.16**	
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.800+4.3				14.200	
						Total Quantity	14.200 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	14.200 metre	
						Say 14.200 metre @ Rs 203.93 / metre	**Rs 2895.81**	
12	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm							

Other Engineering Organisations
PRICE

	cement plaster							
	inside	2	2.400		2.200		10.560	
		2		3.900	2.200		17.160	
						Total Quantity	27.720 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	27.720 sqm	
						Say 27.720 sqm @ Rs 542.29 / sqm	**Rs 15032.28**	
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.800		2.380		13.328	
		2		4.300	2.380		20.468	
						Total Quantity	33.796 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	33.796 sqm	
						Say 33.796 sqm @ Rs 401.21 / sqm	**Rs 13559.29**	
14	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	53.371				53.371	
	Sand filling Item 2	1	3.020				-3.020	
	PCC item 3	1	1.667				-1.667	
	RCC item 4	1	8.906				-8.906	
	Chamber size	1	2.400	3.900	2.200		-20.592	
						Total Quantity	53.371 cum	
						Total Deducted Quantity	-34.185 cum	
						Net Total Quantity	19.186 cum	
						Say 19.186 cum @ Rs 258.57 / cum	**Rs 4960.92**	
15	od213487/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	1	53.371				53.371	
	deduction for Refilling quantity	19.186					-19.186	

Other Engineering Organisations PRICE

	Total Quantity						53.371 cum	
	Total Deducted Quantity						-19.186 cum	
	Net Total Quantity						34.185 cum	
	Say 34.185 cum @ Rs 606.82 / cum						**Rs 20744.14**	
16	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		7					7.000	
	Total Quantity						7.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						7.000 each	
	Say 7.000 each @ Rs 545.00 / each						**Rs 3815.00**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	5 SILT RAISER ARRANGEMENTS							
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe							
	From Desilting pump to silt pit							
	100mm dia D/F CI Pipe -0.5m length	2	0.500				1.000	
	100mm dia D/F CI Pipe -1.0m length	2	1.000				2.000	
	100mm dia D/F CI Pipe -2.0m length	2	2.000				4.000	
	Total Quantity						7.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						7.000 metre	
	Say 7.000 metre @ Rs 2150.66 / metre						**Rs 15054.62**	
2	od215542/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend							

Other Engineering Organisations
PRICE

		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 3028.03 / each						**Rs 3028.03**	
3	od215543/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend							
		2					2.000	
	Total Quantity						2.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 2118.58 / each						**Rs 4237.16**	
4	od215565/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete							
		2					2.000	
	Total Quantity						2.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 4629.76 / each						**Rs 9259.52**	
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe							
		11					11.000	
	Total Quantity						11.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						11.000 no	
	Say 11.000 no @ Rs 311.92 / no						**Rs 3431.12**	
6	od215585/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.							

Other Engineering Organisations
PRICE

		1	10.000				10.000	
	Total Quantity						10.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						10.000 metre	
	Say 10.000 metre @ Rs 512.22 / metre						**Rs 5122.20**	
Provision for GST payments (in %) @						**0.0%**		
Amount reserved for GST payments						**0.00**		
Total						**12937428.00**		
Lumpsum for round off						**0.00**		
TOTAL Rs 12937428.00								
Rounded Total Rs 1,29,37,428								
Rupees One Crore Twenty Nine Lakh Thirty Seven Thousand Four Hundred and Twenty Eight Only								

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Data Analysis

Colletion well 7m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

	Cost index **35.59 %**				56.18

Other Engineering Organisations PRICE

	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59
				Cost per cum	78.46
				Say	78.45

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od213480/2022_2023

od213480/2022_2023 :Sinking wells above 6.0 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (for 7m diameter)
Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.7.2 366.45*1.3559	cum	158.35000	496.87	78679.36
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	123115.39
	cost for 3.0 metre				123115.39
	cost for one metre				41038.46
	say				41038.46

	Add Water Charges @ 1.0%				**410.38**
	Add CPOH @ 15.0%				**6217.32**
	Cost index **35.59 %**				82.67
	Total with Cost index				47748.85
	Say				47748.85

4 Specification Code: od213481/2022_2023

od213481/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary

Other Engineering Organisations
PRICE

appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m(for 7m diameter)
Quantity for 3.0m depth=3.14*3.6*3.6*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.3 399.80*1.3559 =542.088	cum	158.35000	542.09	85839.63
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	130275.66
	cost for 3.0 metre				130275.66
	cost for one metre				43425.22
	say				43425.22

	Add Water Charges @ 1.0%				**434.25**
	Add CPOH @ 15.0%				**6578.92**
	Cost index **35.59 %**				82.67
	Total with Cost index				50521.07
	Say				50521.07

5 Specification Code: od213484/2022_2023

od213484/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary

Other Engineering Organisations
PRICE

appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m(for 7m diameter)
Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.4 433.11*1.3559 =587.25	cum	158.35000	587.25	92991.04
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	137427.07
	cost for 3.0 metre				137427.07
	cost for one metre				45809.02
	say				45809.02

	Add Water Charges @ 1.0%				**458.09**
	Add CPOH @ 15.0%				**6940.06**
	Cost index **35.59 %**				82.67
	Total with Cost index				53289.85
	Say				53289.85

6 Specification Code: od213485/2022_2023

od213485/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary

Other Engineering Organisations
PRICE

appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m(for 7m diameter)
Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.5 466.40*1.3559 =632.39	cum	158.35000	632.39	100138.96
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	144574.99
	cost for 3.0 metre				144574.99
	cost for one metre				48191.66
	say				48191.66

	Add Water Charges @ 1.0%				**481.91**
	Add CPOH @ 15.0%				**7301.03**
	Cost index **35.59 %**				82.67
	Total with Cost index				56057.29
	Say				56057.29

7 Specification Code: od213625/2022_2023

od213625/2022_2023 :Sinking wells above 6 m dia. and up to 9.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary

Other Engineering Organisations
PRICE

appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m(for 7m diameter)
Quantity for 3.0m depth=3.14/4*8.2*8.2*3=158.35m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.7.6 499.71*1.3559 =677.56	cum	158.35000	677.56	107291.63
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	158.35000	276.83	43836.03
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	151727.66
	cost for 3.0 metre				151727.66
	cost for one metre				50575.89
	say				50575.89

	Add Water Charges @ 1.0%				**505.75**
	Add CPOH @ 15.0%				**7662.24**
	Cost index **35.59 %**				82.67
	Total with Cost index				58826.57
	Say				58826.57

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

Other Engineering Organisations
PRICE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

9 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
				TOTAL	5977.32

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

10 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

11 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

Other Engineering Organisation
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

12 Specification Code: od213486/2022_2023

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

13 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

Other Engineering Organisations PRICE

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46

	Total with Cost index				7990.86

14 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
	AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)				63.17
	TOTAL				6512.45

Other Engineering Organisations
PRICE

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

15 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

16 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86
				TOTAL	1647.25
				Cost of 10.0 sqm	1647.25

Other Engineering Organisations
PRICE

Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

18 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25

Other Engineering Organisations PRICE

Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

19 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84

0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

20 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42

TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

21 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82

	Say				606.82

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 13.39.2

Other Engineering Organisations PRICE

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

24 Specification Code: 10.2

SUBHEAD : **10.0**

Other Engineering Organisations
PRICE

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00
1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00

Other Engineering Organisations
PRICE

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25

Other Engineering Organisations
PRICE

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

25 Specification Code: od215736/2022_2023

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od215736/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
				TOTAL	30400.00

				cost for one sqm	30400.00
	say				30400.00

	Add Water Charges @ 1.0%				**304.00**
	Add CPOH @ 15.0%				**4605.60**
	Cost index **35.59 %**				0.00
	Total with Cost index				35309.60
	Say				35309.60

Grit/Screen Chamber 3m dia

1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59

Cost per cum	78.46
Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od213479/2022_2023

od213479/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	27835.74

	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				**92.78**

	Add CPOH @ 15.0%				**1405.70**
	Cost index **35.59 %**				82.67
	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od213482/2022_2023

od213482/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	29410.38

	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				**98.03**

	Add CPOH @ 15.0%				**1485.22**
	Cost index **35.59 %**				82.67
	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od213483/2022_2023

od213483/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 421.44*1.3559 =	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	30984.67
	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				**103.28**

Other Engineering Organisations PRICE

	Add CPOH @ 15.0%				**1564.72**
	Cost index **35.59 %**				82.67
	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

7 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

8 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

Other Engineering Organisations
PRICE

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

Other Engineering Organisations
PRICE

9 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

Other Engineering Organisations
PRICE

10 Specification Code: od213486/2022_2023

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

11 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

Other Engineering Organisations PRICE

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

Other Engineering Organisations
PRICE

12 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)	63.17
TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

13 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

14 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

	Cost index **35.59 %**				28.47
	Total with Cost index				108.47

15 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22

0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

16 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36

0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

17 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL	1641.80
Add Water Charges @ 1%	16.42
TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

Other Engineering Organisations
PRICE

18 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52

				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

19 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00

9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

20 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				

0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff	L.S	0.91	2.00	1.82
	LABOUR:				
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

21 Specification Code: 10.2

SUBHEAD : **10.0**

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

Other Engineering Organisations
PRICE

1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00
1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

Other Engineering Organisations
PRICE

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25
Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

Silt Pit 1.5mx1.5mx1.2m
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm

on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

Other Engineering Organisations PRICE

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10

0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od213486/2022_2023

Other Engineering Organisations
PRICE

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

Other Engineering Organisations
PRICE

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				

3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

11 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

12 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

13 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer

First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Valve chamber 2.4mx3.9mx2.2m

1 Specification Code: 2.6.1

Other Engineering Organisations
PRICE

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00

0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL	1359.04
Add Water Charges @ 1%	13.59
TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

Other Engineering Organisations
PRICE

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33

Add Water Charges @ 1%	145.97
TOTAL	14743.30
Add CPOH @ 15%	2211.49
TOTAL	16954.79
Cost of 10.0 cum	16954.79
Cost per cum	1695.48
Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00

2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

Other Engineering Organisations
PRICE

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix

M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od213486/2022_2023

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od213486/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 5.9.2

SUBHEAD 5.0

Other Engineering Organisations

REINFORCED CEMENT CONCRETE

PRICE

5.9

Centering and shuttering including strutting, etc. and removal of form for:

5.9.2

Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 7.9m long and 1.00m high wall Area of contact 2x7.9x1.0 = 15.8 sqm MATERIAL: Assuming shuttering material will become unserviceable after us of 40 times Adding for maintenance @ 10% of cost Taking salvage value after full use of material @ 25% of cost				

7319	wall form panel 1250x500 mm 2x3x2x2 = 24 Nos. Qty taken for cost of using once = 24x0.85/40 = 0.51	each	0.51	860.00	438.60
7327	100 mm channel shoulder 2.5 m long 4x2 = 8 Qty taken for cost of using once = 8x0.85/40 = 0.17	each	0.17	910.00	154.70
7328	Double clip (bridge clip) 2x6x2 = 24 Qty taken for cost of using once = 24x0.85/40 = 0.51	each	0.51	76.00	38.76
7329	Single clip 2x3x2 = 12 Qty taken for cost of using once = 12x0.85/40 = 0.255	each	0.255	59.00	15.05
7330	M.S. Tube 40 mm dia 2x2x8m = 32m Qty taken for cost of using once = 32x0.85/40 = 0.68	metre	0.68	215.00	146.20
9999	Sundries-Qty taken for cost of using once = 1300x0.85/40 = 27.62	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	78.0	2.00	156.00
0116	Fitter(grade1)	Day	3.5	738.00	2583.00
0114	Beldar	Day	6.0	558.00	3348.00
9999	Sundries- shuttering oil	L.S	78.0	2.00	156.00
9999	Sundries-	L.S	52.0	2.00	104.00
				TOTAL	7195.55
				Add Water Charges @ 1%	71.96
				TOTAL	7267.51
				Add CPOH @ 15%	1090.13

Other Engineering Organisations
PRICE

Costof 15.8 Sq. m.	8357.64
Cost per 1 Sq. m.	528.96
Say	528.95

	Cost index **35.59 %**				188.25
	Total with Cost index				717.20

11 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) 4x3x0.15x0.030 = 0.54 cum Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = 57/8 = 7.125 cudm	10 cud m	7.125	260.00	185.25

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1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal 2x4x0.075x0.1x0.5 = 0.030 Horizontal 2x4x0.075x0.1 x 1.5 = 0.090 (iii) Vertical battens 16x0.15x0.075x0.030m = 0.0054 (iv) Struts 16x0.25x0.07x0.075 = 0.0225 Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = 155/8 = 19.375 cudm	10 cud m	19.375	260.00	503.75
2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = 0.212/8 =0.0265 cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL	1553.85
Add Water Charges @ 1%	15.54
TOTAL	1569.39
Add CPOH @ 15%	235.41
TOTAL	1804.80
Cost of 12.0 metre	1804.80
Cost per metre	150.40
Say	150.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				53.53
	Total with Cost index				203.93

12 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25
				Add Water Charges @ 1%	34.43
				TOTAL	3477.68
				Add CPOH @ 15%	521.65

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TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

13 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

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Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60

Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

14 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

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Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95

Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

15 Specification Code: od213487/2022_2023

od213487/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

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	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

16 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
	AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)				2.92
	TOTAL				357.72
	AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)				44.25

Other Engineering Organisations PRICE

TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

SILT RAISER ARRANGEMENTS
1 Specification Code: 18.71.1

SUBHEAD : **18.0**

WATER SUPPLY

18.71 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):

18.71.1 100 mm dia C.I Double Flanged Pipe

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 5 metre MATERIAL: 100 mm dia. cast iron pipes double flanged weight of 1m pipe = 27.00 kg Weight of 5 m pipes 27.00 x 5 = 135.00 kg				
7712	Screwed double flanged centrifugally cast (spun) C.I Pipe pf Class B confroming to I.S. 1536.- 100 mm dia	metre	5.0	1310.00	6550.00
2319	Carriage of Spun iron S & S pipes 100 mm dia Labour for laying	100 meter	5.0	226.82	11.34

18.23	Rate as per item Number18.23 of SH: Water Supply	quintal	1.35	229.40	309.69(A)

AddWater Charges @ 1% except on A ie on (6871.03-309.69=6561.34)	65.61
TOTAL	6936.64
AddCPOH @ 15% except on A ie on (6936.64-309.69=6626.95)	994.04
TOTAL	7930.75
Cost of 5.0 metre	7930.75
Cost of 1 metre	1586.15
Say	1586.15

	Cost index **35.59 %**				564.51
	Total with Cost index				2150.66

Other Engineering Organisations
PRICE

2 Specification Code: od215542/2022_2023

od215542/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllying and laying of 100 mm D/F 90oDuck Foot Bend TWAD rate	no	1.00000	2607.00	2607.00
				TOTAL	2607.00
				cost for one each	2607.00
	say				2607.00

	Add Water Charges @ 1.0%				**26.07**
	Add CPOH @ 15.0%				**394.96**

	Cost index **35.59 %**				0.00
	Total with Cost index				3028.03
	Say				3028.03

3 Specification Code: od215543/2022_2023

od215543/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllying and laying of 100 mm dia D/F CI bend 90o bend TWAD rate	no	1.00000	1824.00	1824.00
				TOTAL	1824.00
				cost for one each	1824.00
	say				1824.00

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**18.23**
	Add CPOH @ 15.0%				**276.33**
	Cost index **35.59 %**				0.00
	Total with Cost index				2118.58
	Say				2118.58

4 Specification Code: od215565/2022_2023

od215565/2022_2023 :Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete

Code	Description	Unit	Quantity	Rate	Amount
18.71.1	Rate as per item number 18.71.1 of SH: Water Supply	metre	2.00000	1365.60	2731.21
2.8.1	Rate as per item number 2.8.1 of SH: Earth Work	cum	1.00000	188.55	188.55

9999	Sundries	L.S	10.00000	2.00	20.00

				TOTAL	2939.76
				cost for one each	2939.76
	say				2939.76

	Add Water Charges @ 1.0%				**29.39**
	Add CPOH @ 15.0%				**445.37**
	Cost index **35.59 %**				1215.23
	Total with Cost index				4629.76
	Say				4629.76

5 Specification Code: 18.30.2

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.2 100 mm diameter pipe

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1374	Rubber insertions for 100 mm dia pipe joints	each	10.0	18.00	180.00
1956	Bolts and nuts 16 mm dia 60 mm long	each	80.0	11.00	880.00
9977	Carriage of materialsLABOUR:	L.S	4.16	2.00	8.32
0116	Fitter(grade1)	Day	0.25	738.00	184.50
0117	Assistant Fitter or 2nd class fitter	Day	0.25	679.00	169.75
0114	Beldar	Day	1.0	558.00	558.00
				TOTAL	1980.57
				Add Water Charges @ 1%	19.81
				TOTAL	2000.38

Add CPOH @ 15%	300.06
TOTAL	2300.44
Cost of 10.0 no	2300.44
Cost of each	230.04
Say	230.05

	Cost index **35.59 %**				81.87
	Total with Cost index				311.92

6 Specification Code: od215585/2022_2023

od215585/2022_2023 :Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
MR	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m. TWAD	metre	1.00000	441.00	441.00
				TOTAL	441.00
				cost for one metre	441.00
	say				441.00

	Add Water Charges @ 1.0%				**4.41**
	Add CPOH @ 15.0%				**66.81**
	Cost index **35.59 %**				0.00
	Total with Cost index				512.22
	Say				512.22

Other Engineering Organisations
PRICE

Sewerage System-Muttar -Construction of wet well at StP site Muttar for sewer network Block 3C and 4

General Abstract

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Heading Description	Amount
1	**Colletion well 5.5m dia**	3801731.68
2	**Grit/Screen Chamber 3m dia 5.1m depth**	1391806.95
3	**Silt Pit 1.5mx1.5mx1.2m**	91764.61
4	**Valve chamber 2.1mx3.7mx1.8m**	312644.31
5	**Pumpsets,Pumping main,Interconnections and other connected works works**	3498898.84
6	**Silt riser**	40132.64
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**9136979.00**
	Lumpsum for round off	**63021.00**
		TOTAL Rs 9200000.00
		Rounded Total Rs 92,00,000
		Rupees Ninety Two Lakh Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage System-Muttar -Construction of wet well at StP site Muttar for sewer network Block 3C and 4

Abstract Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

1 Colletion well 5.5m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	100.480 cum
	Say 100.480 cum @ Rs 214.03 / cum	**Rs 21505.73**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	25.120 cum
	Say 25.120 cum @ Rs 106.37 / cum	**Rs 2672.01**
3	od212491/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m ,For 5.5m diameter	
	Net Total Quantity	0.500 metre
	Say 0.500 metre @ Rs 29819.77 / metre	**Rs 14909.89**
4	od212493/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m, For 5.5m diameter	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 31475.42 / metre	**Rs 47213.13**
5	od212496/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m, For 5.5m diameter	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 33133.56 / metre	**Rs 49700.34**

Other Engineering Organisations PRICE

6	od212497/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m, For 5.5m diameter	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 34789.22 / metre	**Rs 52183.83**
7	od212498/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter)	
	Net Total Quantity	0.220 metre
	Say 0.220 metre @ Rs 40461.07 / metre	**Rs 8901.44**
8	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	11.684 cum
	Say 11.684 cum @ Rs 7211.15 / cum	**Rs 84255.08**
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	226.264 sqm
	Say 226.264 sqm @ Rs 249.69 / sqm	**Rs 56495.86**
10	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	18.458 cum
	Say 18.458 cum @ Rs 9413.54 / cum	**Rs 173755.12**

Other Engineering Organisations
PRICE

11	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	94.468 cum
	Say 94.468 cum @ Rs 11065.64 / cum	**Rs 1045348.88**
12	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	112.926 cum
	Say 112.926 cum @ Rs 82.10 / cum	**Rs 9271.22**
13	od212499/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	112.926 cum
	Say 112.926 cum @ Rs 1916.05 / cum	**Rs 216371.86**
14	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	5.937 cum
	Say 5.937 cum @ Rs 7990.86 / cum	**Rs 47441.74**
15	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	355.543 kilogram
	Say 355.543 kilogram @ Rs 101.29 / kilogram	**Rs 36012.95**
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	13899.000 kilogram
	Say 13899.000 kilogram @ Rs 98.30 / kilogram	**Rs 1366271.70**

Other Engineering Organisations PRICE

17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	706.070 sqm
	Say 706.070 sqm @ Rs 223.32 / sqm	**Rs 157679.55**
18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	165.707 sqm
	Say 165.707 sqm @ Rs 542.29 / sqm	**Rs 89861.25**
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	32.531 sqm
	Say 32.531 sqm @ Rs 401.21 / sqm	**Rs 13051.76**
20	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	52.988 cum
	Say 52.988 cum @ Rs 258.57 / cum	**Rs 13701.11**
21	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	266.677 cum
	Say 266.677 cum @ Rs 606.82 / cum	**Rs 161824.94**
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	28.000 each
	Say 28.000 each @ Rs 545.00 / each	**Rs 15260.00**

Other Engineering Organisations
PRICE

23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	32.531 sqm
	Say 32.531 sqm @ Rs 45.29 / sqm	**Rs 1473.33**
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	973.111 kg
	Say 973.111 kg @ Rs 119.79 / kg	**Rs 116568.97**
	2 Grit/Screen Chamber 3m dia 5.1m depth	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	40.836 cum
	Say 40.836 cum @ Rs 214.03 / cum	**Rs 8740.13**
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
	Net Total Quantity	10.209 cum
	Say 10.209 cum @ Rs 106.37 / cum	**Rs 1085.93**
3	od212492/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
	Net Total Quantity	1.000 metre
	Say 1.000 metre @ Rs 10859.75 / metre	**Rs 10859.75**
4	od212494/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 11469.39 / metre	**Rs 17204.09**

Other Engineering Organisations
PRICE

5	od212495/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
	Net Total Quantity	1.500 metre
	Say 1.500 metre @ Rs 12078.90 / metre	**Rs 18118.35**
6	od215570/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)	
	Net Total Quantity	0.500 metre
	Say 0.500 metre @ Rs 16674.35 / metre	**Rs 8337.18**
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	111.416 sqm
	Say 111.416 sqm @ Rs 249.69 / sqm	**Rs 27819.46**
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	8.093 cum
	Say 8.093 cum @ Rs 9413.54 / cum	**Rs 76183.78**
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
	Net Total Quantity	31.687 cum
	Say 31.687 cum @ Rs 11065.64 / cum	**Rs 350636.93**

Other Engineering Organisations PRICE

10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	39.780 cum
	Say 39.780 cum @ Rs 82.10 / cum	**Rs 3265.94**
11	od212499/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	39.780 cum
	Say 39.780 cum @ Rs 1916.05 / cum	**Rs 76220.47**
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
	Net Total Quantity	1.767 cum
	Say 1.767 cum @ Rs 7990.86 / cum	**Rs 14119.85**
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	206.958 kilogram
	Say 206.958 kilogram @ Rs 101.29 / kilogram	**Rs 20962.78**
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	2.804 cum
	Say 2.804 cum @ Rs 7211.15 / cum	**Rs 20220.06**
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
	Net Total Quantity	4888.020 kilogram
	Say 4888.020 kilogram @ Rs 108.47 / kilogram	**Rs 530203.53**
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	248.312 sqm
	Say 248.312 sqm @ Rs 223.32 / sqm	**Rs 55453.04**

Other Engineering Organisations
PRICE

17	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	68.295 sqm
	Say 68.295 sqm @ Rs 542.29 / sqm	**Rs 37035.70**
18	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 401.21 / sqm	**Rs 6869.12**
19	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	26.704 cum
	Say 26.704 cum @ Rs 258.57 / cum	**Rs 6904.85**
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
	Net Total Quantity	17.121 sqm
	Say 17.121 sqm @ Rs 45.29 / sqm	**Rs 775.41**
21	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	86.232 cum
	Say 86.232 cum @ Rs 606.82 / cum	**Rs 52327.30**
22	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
	Net Total Quantity	404.569 kg
	Say 404.569 kg @ Rs 119.79 / kg	**Rs 48463.32**
	3 Silt Pit 1.5mx1.5mx1.2m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	12.936 cum

Other Engineering Organisations
PRICE

	Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	1.176 cum
	Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	0.485 cum
	Say 0.485 cum @ Rs 7211.15 / cum	**Rs 3497.41**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	3.043 cum
	Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	304.300 kilogram
	Say 304.300 kilogram @ Rs 98.30 / kilogram	**Rs 29912.69**
7	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	15.459 sqm
	Say 15.459 sqm @ Rs 223.32 / sqm	**Rs 3452.30**

Other Engineering Organisations
PRICE

8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	21.250 sqm
	Say 21.250 sqm @ Rs 249.69 / sqm	**Rs 5305.91**
9	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	10.050 sqm
	Say 10.050 sqm @ Rs 542.29 / sqm	**Rs 5450.01**
10	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	9.600 sqm
	Say 9.600 sqm @ Rs 401.21 / sqm	**Rs 3851.62**
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	5.533 cum
	Say 5.533 cum @ Rs 258.57 / cum	**Rs 1430.67**
12	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	7.410 cum
	Say 7.410 cum @ Rs 606.82 / cum	**Rs 4496.54**
	4 Valve chamber 2.1mx3.7mx1.8m	
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
	Net Total Quantity	45.215 cum
	Say 45.215 cum @ Rs 214.03 / cum	**Rs 9677.37**
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
	Net Total Quantity	2.886 cum
	Say 2.886 cum @ Rs 2298.93 / cum	**Rs 6634.71**

Other Engineering Organisations
PRICE

3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	1.584 cum
	Say 1.584 cum @ Rs 7211.15 / cum	**Rs 11422.46**
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 9413.54 / cum	**Rs 92582.17**
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 82.10 / cum	**Rs 807.45**
6	od212499/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
	Net Total Quantity	9.835 cum
	Say 9.835 cum @ Rs 1916.05 / cum	**Rs 18844.35**
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
	Net Total Quantity	983.501 kilogram
	Say 983.501 kilogram @ Rs 98.30 / kilogram	**Rs 96678.15**
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
	Net Total Quantity	49.176 sqm
	Say 49.176 sqm @ Rs 223.32 / sqm	**Rs 10981.98**
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	

Other Engineering Organisations PRICE

	Net Total Quantity	52.481 sqm
	Say 52.481 sqm @ Rs 249.69 / sqm	**Rs 13103.98**
10	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
	Net Total Quantity	13.800 metre
	Say 13.800 metre @ Rs 203.93 / metre	**Rs 2814.23**
11	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
	Net Total Quantity	23.180 sqm
	Say 23.180 sqm @ Rs 542.29 / sqm	**Rs 12570.28**
12	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
	Net Total Quantity	28.705 sqm
	Say 28.705 sqm @ Rs 401.21 / sqm	**Rs 11516.73**
13	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
	Net Total Quantity	16.350 cum
	Say 16.350 cum @ Rs 258.57 / cum	**Rs 4227.62**
14	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
	Net Total Quantity	28.860 cum
	Say 28.860 cum @ Rs 606.82 / cum	**Rs 17512.83**
15	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
	Net Total Quantity	6.000 each
	Say 6.000 each @ Rs 545.00 / each	**Rs 3270.00**

Other Engineering Organisations PRICE

5 Pumpsets,Pumping main,Interconnections and other connected works works		
1	od213297/2022_2023 Supplying and laying 350mm Ductile pipes class K9 including cost of all materials , earthwork excavations and backfilling after completion of the work, jointing , testing , cost for pipes and specials etc complete all as per the direction of Engineeer in charge	
	Net Total Quantity	50.000 metre
	Say 50.000 metre @ Rs 6903.42 / metre	**Rs 345171.00**
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
	Net Total Quantity	1.260 cum
	Say 1.260 cum @ Rs 7211.15 / cum	**Rs 9086.05**
3	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
	Net Total Quantity	3.150 sqm
	Say 3.150 sqm @ Rs 249.69 / sqm	**Rs 786.52**
4	od213295/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
	Net Total Quantity	2.000 each set
	Say 2.000 each set @ Rs 315957.04 / each set	**Rs 631914.08**
5	od215707/2022_2023 Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.	
	Net Total Quantity	2.000 set
	Say 2.000 set @ Rs 1034226.31 / set	**Rs 2068452.62**

Other Engineering Organisations
PRICE

6	od213299/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
	Net Total Quantity	12.560 sqm
	Say 12.560 sqm @ Rs 35309.60 / sqm	**Rs 443488.58**
	6 Silt riser	
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe	
	Net Total Quantity	7.000 metre
	Say 7.000 metre @ Rs 2150.66 / metre	**Rs 15054.62**
2	od213291/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend	
	Net Total Quantity	1.000 each
	Say 1.000 each @ Rs 3028.03 / each	**Rs 3028.03**
3	od213292/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 2118.58 / each	**Rs 4237.16**
4	od213293/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete	
	Net Total Quantity	2.000 each
	Say 2.000 each @ Rs 4629.76 / each	**Rs 9259.52**
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe	
	Net Total Quantity	11.000 no
	Say 11.000 no @ Rs 311.92 / no	**Rs 3431.12**

Other Engineering Organisations
PRICE

6	od213294/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	
	Net Total Quantity	10.000 metre
	Say 10.000 metre @ Rs 512.22 / metre	**Rs 5122.20**
	Provision for GST payments (in %) @	**0.0%**
	Amount reserved for GST payments	**0.00**
	Total	**9136979.00**
	Lumpsum for round off	**63021.00**
		TOTAL Rs 9200000.00
		Rounded Total Rs 92,00,000
		Rupees Ninety Two Lakh Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage System-Muttar -Construction of wet well at StP site Muttar for sewer network Block 3C and 4

Detailed Estimate

(Dsor year: **2018**,Cost Index Applied for this estimate is **35.59**%)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
	1 Colletion well 5.5m dia							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	3.14/4	8.000	8.000	1.500		75.360	
	Second depth 1.5m to 3.0m	3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						100.480 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.480 cum	
	Say 100.480 cum @ Rs 214.03 / cum						**Rs 21505.73**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 3m	3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 106.37 / cum						**Rs 2672.01**	
3	od212491/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m ,For 5.5m diameter							
	For 5.5m dia wet well	1	0.500				0.500	
	Total Quantity						0.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.500 metre	
	Say 0.500 metre @ Rs 29819.77 / metre						**Rs 14909.89**	

Other Engineering Organisations
PRICE

4	od212493/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m, For 5.5m diameter							
	5.5m diameter well	1	1.500				1.500	
						Total Quantity	1.500 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	1.500 metre	
						Say 1.500 metre @ Rs 31475.42 / metre	**Rs 47213.13**	
5	od212496/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m, For 5.5m diameter							
		1	1.500				1.500	
						Total Quantity	1.500 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	1.500 metre	
						Say 1.500 metre @ Rs 33133.56 / metre	**Rs 49700.34**	
6	od212497/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m, For 5.5m diameter							
		1	1.500				1.500	
						Total Quantity	1.500 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	1.500 metre	
						Say 1.500 metre @ Rs 34789.22 / metre	**Rs 52183.83**	
7	od212498/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter)							
		1			0.220		0.220	
						Total Quantity	0.220 metre	

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	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.220 metre	
	Say 0.220 metre @ Rs 40461.07 / metre						**Rs 8901.44**	
8	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Bottom plugging	3.14/4	6.100	6.100	0.400		11.684	
	Total Quantity						11.684 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.684 cum	
	Say 11.684 cum @ Rs 7211.15 / cum						**Rs 84255.08**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	5.500	0.600			10.362	
	well Kerb - outer	1*3.14	6.850	1.330			28.607	
	well Kerb - Slope	1	5.500	6.030	0.900		29.849	
	Side wall	1*3.14	6.100		8.220		157.446	
	Total Quantity						226.264 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						226.264 sqm	
	Say 226.264 sqm @ Rs 249.69 / sqm						**Rs 56495.86**	
10	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Kerb, ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1	4.210				4.210	

Other Engineering Organisations PRICE

	'From 4.5m to 9.0m below ground levelBottom slab	1	3.14/4	5.500	5.500	0.6	14.248	
	Total Quantity						18.458 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.458 cum	
	Say 18.458 cum @ Rs 9413.54 / cum						**Rs 173755.12**	
11	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	6.100	0.600	8.220		94.468	
	Total Quantity						94.468 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						94.468 cum	
	Say 94.468 cum @ Rs 11065.64 / cum						**Rs 1045348.88**	
12	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Kerb, ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1	4.210				4.210	
	'From 4.5m to 9.0m below ground levelBottom slab	1	3.14/4	5.500	5.500	0.6	14.248	
	Side wall	3.14	6.100	0.600	8.220		94.468	
	Total Quantity						112.926 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						112.926 cum	
	Say 112.926 cum @ Rs 82.10 / cum						**Rs 9271.22**	
13	od212499/2022_2023							

Other Engineering Organisations
PRICE

	Extra for providing sulphate resistant cement for the structures above plinth level.							
	Kerb, ((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4	1	4.210				4.210	
	'From 4.5m to 9.0m below ground levelBottom slab	1	3.14/4	5.500	5.500	0.6	14.248	
	Side wall	3.14	6.100	0.600	8.220		94.468	
						Total Quantity	112.926 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	112.926 cum	
						Say 112.926 cum @ Rs 1916.05 / cum	**Rs 216371.86**	
14	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	5.500	5.500	0.250		5.937	
						Total Quantity	5.937 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	5.937 cum	
						Say 5.937 cum @ Rs 7990.86 / cum	**Rs 47441.74**	
15	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	6.700	16.900			355.543	
						Total Quantity	355.543 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	355.543 kilogram	
						Say 355.543 kilogram @ Rs 101.29 / kilogram	**Rs 36012.95**	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							

Other Engineering Organisations
PRICE

	120Kg/m3 Concrete Qty Item 5 & 6	1	113.000	120.000			13560.000	
	2.5 % wastage	1	113*0.025	120.000			339.000	
						Total Quantity	13899.000 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	13899.000 kilogram	
						Say 13899.000 kilogram @ Rs 98.30 / kilogram	**Rs 1366271.70**	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	13899.000	0.0508			706.070	
						Total Quantity	706.070 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	706.070 sqm	
						Say 706.070 sqm @ Rs 223.32 / sqm	**Rs 157679.55**	
18	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1*3.14	5.500		8.220		141.960	
	Well floor	3.14/4	5.500	5.500			23.747	
						Total Quantity	165.707 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	165.707 sqm	
						Say 165.707 sqm @ Rs 542.29 / sqm	**Rs 89861.25**	
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer 1m above GL)	1*3.14	6.700	1.000			21.038	
	top of wall thickness	1*3.14	6.100	0.600			11.493	
						Total Quantity	32.531 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	32.531 sqm	
						Say 32.531 sqm @ Rs 401.21 / sqm	**Rs 13051.76**	
20	2.25							

Other Engineering Organisations PRICE

	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty item 1	1	100.480				100.480	
	Volume of well	3.14/4	5.500	5.500	2.000		-47.492	
						Total Quantity	100.480 cum	
						Total Deducted Quantity	-47.492 cum	
						Net Total Quantity	52.988 cum	
						Say 52.988 cum @ Rs 258.57 / cum	**Rs 13701.11**	
21	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Total earth work quantity Item 1	1	100.480				100.480	
	Well sinking	1	3.14/4	6.700	6.700	6.22	219.185	
	Volume of well	1			52.988		-52.988	
						Total Quantity	319.665 cum	
						Total Deducted Quantity	-52.988 cum	
						Net Total Quantity	266.677 cum	
						Say 266.677 cum @ Rs 606.82 / cum	**Rs 161824.94**	
22	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		28					28.000	
						Total Quantity	28.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	28.000 each	
						Say 28.000 each @ Rs 545.00 / each	**Rs 15260.00**	
23	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							

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	Well outer 1m above GL)	3.14	6.700	1.000			21.038	
	top of wall thickness	1*3.14	6.100	0.600			11.493	
						Total Quantity	32.531 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	32.531 sqm	
						Say 32.531 sqm @ Rs 45.29 / sqm	**Rs 1473.33**	
24	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of Pumping station 0.785*6.*6.7=35.239 Sqm, kg of steel for 25x3 flats @30mm spacing	35.239	(33*0.59)+ (17*0.29)				859.832	
	25 x6 SS for outer frame	3.14	1.180	6.700			24.825	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.700	3.920			52.528	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.800	4.470			25.926	
	Misc. items for opening frame	1	10.000				10.000	
						Total Quantity	973.111 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	973.111 kg	
						Say 973.111 kg @ Rs 119.79 / kg	**Rs 116568.97**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia 5.1m depth								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14	2.550	2.550	1.500		30.627	

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	For 1.5m to 3 m	1*3.14	2.550	2.550	0.500		10.209	
						Total Quantity	40.836 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	40.836 cum	
						Say 40.836 cum @ Rs 214.03 / cum	**Rs 8740.13**	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 3m	1*3.14	2.550	2.550	0.500		10.209	
						Total Quantity	10.209 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	10.209 cum	
						Say 10.209 cum @ Rs 106.37 / cum	**Rs 1085.93**	
3	od212492/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
						Total Quantity	1.000 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	1.000 metre	
						Say 1.000 metre @ Rs 10859.75 / metre	**Rs 10859.75**	
4	od212494/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
						Total Quantity	1.500 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	1.500 metre	
						Say 1.500 metre @ Rs 11469.39 / metre	**Rs 17204.09**	
5	od212495/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc.							

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	complete. Total depth 4.5m to 6.0m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 12078.90 / metre						**Rs 18118.35**	
6	od215570/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)							
		1			0.500		0.500	
	Total Quantity						0.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.500 metre	
	Say 0.500 metre @ Rs 16674.35 / metre						**Rs 8337.18**	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.38		0.710		14.224	
	Side wall	1*3.14	3.900	6.500			79.599	
	Total Quantity						111.416 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						111.416 sqm	
	Say 111.416 sqm @ Rs 249.69 / sqm						**Rs 27819.46**	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	

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	Well kerb	1	11.100	0.530	0.450		2.648	Circum=3.14*3.53=11.07
		1	11.100	0.150	0.600		0.999	Circum=3.14*3.53=11.07
		1*.5	11.100	0.380	0.600		1.266	Circum=3.14*3.53=11.07
	Total Quantity						8.093 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						8.093 cum	
	Say 8.093 cum @ Rs 9413.54 / cum						**Rs 76183.78**	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1	3.140	3.450	0.450	6.5	31.687	
	Total Quantity						31.687 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						31.687 cum	
	Say 31.687 cum @ Rs 11065.64 / cum						**Rs 350636.93**	
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Item 4 and 5	1	8.093				8.093	
		1	31.687				31.687	
	Total Quantity						39.780 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.780 cum	
	Say 39.780 cum @ Rs 82.10 / cum						**Rs 3265.94**	
11	od212499/2022_2023							

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	Extra for providing sulphate resistant cement for the structures above plinth level.							
	Item 4 and 5	1	8.093				8.093	
		1	31.687				31.687	
	Total Quantity						39.780 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.780 cum	
	Say 39.780 cum @ Rs 1916.05 / cum						**Rs 76220.47**	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14	1.500	1.500	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						**Rs 14119.85**	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						**Rs 20962.78**	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	3.14/4	3.450	3.450	0.300		2.804	
	Total Quantity						2.804 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.804 cum	

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	Say 2.804 cum @ Rs 7211.15 / cum						**Rs 20220.06**	
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	@120kg/m3 of concrete	1	39.740	120.000			4768.800	
		1	39.74*0.025	120.000			119.220	
	Total Quantity						4888.020 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4888.020 kilogram	
	Say 4888.020 kilogram @ Rs 108.47 / kilogram						**Rs 530203.53**	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	4888.020	0.0508			248.312	
	Total Quantity						248.312 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						248.312 sqm	
	Say 248.312 sqm @ Rs 223.32 / sqm						**Rs 55453.04**	
17	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Well inner	1	3.140	3.000	6.500		61.230	
	Well floor	1*3.14	1.500	1.500			7.065	
	Total Quantity						68.295 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						68.295 sqm	
	Say 68.295 sqm @ Rs 542.29 / sqm						**Rs 37035.70**	
18	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	

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	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 401.21 / sqm						**Rs 6869.12**	
19	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.834				40.834	
	Volume of well	3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.834 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.704 cum	
	Say 26.704 cum @ Rs 258.57 / cum						**Rs 6904.85**	
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						**Rs 775.41**	
21	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Earth work excavation qty	1			40.860		40.860	
	For sinking well	3.14/4	3.900	3.900	3.800		45.372	
	Total Quantity						86.232 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						86.232 cum	
	Say 86.232 cum @ Rs 606.82 / cum						**Rs 52327.30**	
22	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							

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	Area of pumping station kg of steel per sqm for *(25 x 3 flats at 30 mm spacing + 12 x 3 flats at 60 mm spacing)	0.785*3.9*3.9	(33*0.59)+(17*0.28)				289.303	0.59Kg/m
	12 x 3 flats at 60 mm spacing	1*17	11.940	0.280			56.835	.28Kg/m
	25 x6 SS for outer frame	1*3.14	3.900	1.180			14.451	1.18kg/m
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900	3.920			30.576	3.92kg/m
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.880	4.470			8.404	
	Misc. items for opening frame	1	5.000				5.000	
						Total Quantity	404.569 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	404.569 kg	
						Say 404.569 kg @ Rs 119.79 / kg	**Rs 48463.32**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	3 Silt Pit 1.5mx1.5mx1.2m							
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
						Total Quantity	12.936 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	12.936 cum	
						Say 12.936 cum @ Rs 214.03 / cum	**Rs 2768.69**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	

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						Total Quantity	1.176 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.176 cum	
						Say 1.176 cum @ Rs 2298.93 / cum	**Rs 2703.54**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
						Total Quantity	0.485 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	0.485 cum	
						Say 0.485 cum @ Rs 7211.15 / cum	**Rs 3497.41**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
						Total Quantity	3.043 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	3.043 cum	
						Say 3.043 cum @ Rs 9413.54 / cum	**Rs 28645.40**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	

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						Total Quantity	3.043 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	3.043 cum	
						Say 3.043 cum @ Rs 82.10 / cum	**Rs 249.83**	
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
						Total Quantity	304.300 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	304.300 kilogram	
						Say 304.300 kilogram @ Rs 98.30 / kilogram	**Rs 29912.69**	
7	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	304.300	0.0508			15.459	
						Total Quantity	15.459 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	15.459 sqm	
						Say 15.459 sqm @ Rs 223.32 / sqm	**Rs 3452.30**	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
						Total Quantity	21.250 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	21.250 sqm	
						Say 21.250 sqm @ Rs 249.69 / sqm	**Rs 5305.91**	
9	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	Inside	2	1.500		1.200		3.600	

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		2	1.500		1.200		3.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						10.050 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.050 sqm	
	Say 10.050 sqm @ Rs 542.29 / sqm						**Rs 5450.01**	
10	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
		2	2.000		1.200		4.800	
		2	2.000		1.200		4.800	
	Total Quantity						9.600 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.600 sqm	
	Say 9.600 sqm @ Rs 401.21 / sqm						**Rs 3851.62**	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						**Rs 1430.67**	
12	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	1			12.940		12.940	
	Refilling	1			5.530		-5.530	
	Total Quantity						12.940 cum	
	Total Deducted Quantity						-5.530 cum	

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	Net Total Quantity						7.410 cum	
	Say 7.410 cum @ Rs 606.82 / cum						**Rs 4496.54**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 2.1mx3.7mx1.8m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.700	5.200	2.350		45.215	
	Total Quantity						45.215 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.215 cum	
	Say 45.215 cum @ Rs 214.03 / cum						**Rs 9677.37**	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.700	5.200	0.150		2.886	
	Total Quantity						2.886 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.886 cum	
	Say 2.886 cum @ Rs 2298.93 / cum						**Rs 6634.71**	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.300	4.800	0.100		1.584	
	Total Quantity						1.584 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.584 cum	
	Say 1.584 cum @ Rs 7211.15 / cum						**Rs 11422.46**	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of							

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	Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	cover Slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 9413.54 / cum	**Rs 92582.17**	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	cover Slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 82.10 / cum	**Rs 807.45**	
6	od212499/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	cover Slab	1	2.700	4.200	0.180		2.042	
						Total Quantity	9.835 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.835 cum	
						Say 9.835 cum @ Rs 1916.05 / cum	**Rs 18844.35**	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							

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	@100kg per m3 concrete	1	9.835	100.000			983.501	
						Total Quantity	983.501 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	983.501 kilogram	
						Say 983.501 kilogram @ Rs 98.30 / kilogram	**Rs 96678.15**	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	0.0508 sqm/kg	1	983.501			0.05	49.176	
						Total Quantity	49.176 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	49.176 sqm	
						Say 49.176 sqm @ Rs 223.32 / sqm	**Rs 10981.98**	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.100		0.200		1.241	
		2		4.600	0.200		1.840	
	Walls outer	2	2.700		1.900		10.260	
		2		4.200	1.900		15.960	
	Walls inner	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
						Total Quantity	52.481 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	52.481 sqm	
						Say 52.481 sqm @ Rs 249.69 / sqm	**Rs 13103.98**	
10	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.700				5.400	
		2	4.200				8.400	
						Total Quantity	13.800 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	13.800 metre	

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	Say 13.800 metre @ Rs 203.93 / metre						**Rs 2814.23**	
11	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	inside	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
	Total Quantity						23.180 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						23.180 sqm	
	Say 23.180 sqm @ Rs 542.29 / sqm						**Rs 12570.28**	
12	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.700		2.080		11.233	
		2		4.200	2.080		17.472	
	Total Quantity						28.705 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28.705 sqm	
	Say 28.705 sqm @ Rs 401.21 / sqm						**Rs 11516.73**	
13	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	45.215				45.215	
	Sand filling Item 2	1	2.890				-2.890	
	PCC item 3	1	1.580				-1.580	
	RCC item 4	1	7.790				-7.790	
	Chamber size	1	2.300	3.800	1.900		-16.605	
	Total Quantity						45.215 cum	
	Total Deducted Quantity						-28.865 cum	
	Net Total Quantity						16.350 cum	
	Say 16.350 cum @ Rs 258.57 / cum						**Rs 4227.62**	
14	od212500/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							

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	Excavation	1	45.210				45.210	
	deduction for Refilling	1	16.350				-16.350	
						Total Quantity	45.210 cum	
						Total Deducted Quantity	-16.350 cum	
						Net Total Quantity	28.860 cum	
						Say 28.860 cum @ Rs 606.82 / cum	**Rs 17512.83**	
15	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		6					6.000	
						Total Quantity	6.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	6.000 each	
						Say 6.000 each @ Rs 545.00 / each	**Rs 3270.00**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
5 Pumpsets,Pumping main,Interconnections and other connected works works								
1	od213297/2022_2023 Supplying and laying 350mm Ductile pipes class K9 including cost of all materials , earthwork excavations and backfilling after completion of the work, jointing , testing , cost for pipes and specials etc complete all as per the direction of Engineeer in charge							
		1	50.000				50.000	
						Total Quantity	50.000 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	50.000 metre	
						Say 50.000 metre @ Rs 6903.42 / metre	**Rs 345171.00**	
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	End concrete	2	0.630				1.260	
						Total Quantity	1.260 cum	

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	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.260 cum	
	Say 1.260 cum @ Rs 7211.15 / cum						**Rs 9086.05**	
3	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Bottom	2*1	0.500	1.050			1.050	
	Sides	2*2	0.500		1.050		2.100	
	Total Quantity						3.150 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.150 sqm	
	Say 3.150 sqm @ Rs 249.69 / sqm						**Rs 786.52**	
4	od213295/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		2					2.000	
	Total Quantity						2.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						2.000 each set	
	Say 2.000 each set @ Rs 315957.04 / each set						**Rs 631914.08**	
5	od215707/2022_2023 Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.							
		2					2.000	
	Total Quantity						2.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						2.000 set	
	Say 2.000 set @ Rs 1034226.31 / set						**Rs 2068452.62**	

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6	od213299/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
	For pumping station	1	12.560				12.560	
						Total Quantity	12.560 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	12.560 sqm	
						Say 12.560 sqm @ Rs 35309.60 / sqm	**Rs 443488.58**	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
	6 Silt riser							
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe							
	From desilting pump to siltpit	2	0.500				1.000	
		2	1.000				2.000	
		2	2.000				4.000	
						Total Quantity	7.000 metre	
						Total Deducted Quantity	0.000 metre	
						Net Total Quantity	7.000 metre	
						Say 7.000 metre @ Rs 2150.66 / metre	**Rs 15054.62**	
2	od213291/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend							
		1					1.000	
						Total Quantity	1.000 each	
						Total Deducted Quantity	0.000 each	
						Net Total Quantity	1.000 each	
						Say 1.000 each @ Rs 3028.03 / each	**Rs 3028.03**	
3	od213292/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend							

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		2					2.000	
	Total Quantity						2.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 2118.58 / each						**Rs 4237.16**	
4	od213293/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete							
		2					2.000	
	Total Quantity						2.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						2.000 each	
	Say 2.000 each @ Rs 4629.76 / each						**Rs 9259.52**	
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe							
		11					11.000	
	Total Quantity						11.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						11.000 no	
	Say 11.000 no @ Rs 311.92 / no						**Rs 3431.12**	
6	od213294/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.							
		1	10.000				10.000	
	Total Quantity						10.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						10.000 metre	
	Say 10.000 metre @ Rs 512.22 / metre						**Rs 5122.20**	
Provision for GST payments (in %) @							**0.0%**	
Amount reserved for GST payments							**0.00**	
Total							**9136979.00**	

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Lumpsum for round off	**63021.00**
	TOTAL Rs 9200000.00
	Rounded Total Rs 92,00,000
	Rupees Ninety Two Lakh Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Data Analysis

Colletion well 5.5m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

	Cost index **35.59 %**				56.18

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	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59
				Cost per cum	78.46
				Say	78.45

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	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od212491/2022_2023

od212491/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m ,For 5.5m diameter
Quantity for 3.0m depth=3.14/4*6.7*6.7*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	105.72000	445.29	47076.06
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	250.00000	2.00	500.00
				TOTAL	76842.53
	cost for 3.0 metre				76842.53
	cost for one metre				25614.18
	say				25614.18

	Add Water Charges @ 1.0%				**256.14**
	Add CPOH @ 15.0%				**3880.54**
	Cost index **35.59 %**				68.89
	Total with Cost index				29819.77
	Say				29819.77

4 Specification Code: od212493/2022_2023

od212493/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

Other Engineering Organisations
PRICE

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m, For 5.5m diameter
Quantity for 3.0m depth=3.14/4*6.7*6.7*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 358.24*1.3559 =485.74	cum	105.72000	485.74	51352.43
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	250.00000	2.00	500.00
				TOTAL	81118.90
	cost for 3.0 metre				81118.90
	cost for one metre				27039.63
	say				27039.63

	Add Water Charges @ 1.0%				**270.39**
	Add CPOH @ 15.0%				**4096.50**
	Cost index **35.59 %**				68.89
	Total with Cost index				31475.42
	Say				31475.42

5 Specification Code: od212496/2022_2023

od212496/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

Other Engineering Organisations
P R I C E

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m, For 5.5m diameter
Quantity for 3.0m depth=3.14/4*6.7*6.7*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 388.12*1.3559 =485.74	cum	105.72000	526.25	55635.15
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	250.00000	2.00	500.00
				TOTAL	85401.62
	cost for 3.0 metre				85401.62
	cost for one metre				28467.21
	say				28467.21

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	Add Water Charges @ 1.0%				**284.67**
	Add CPOH @ 15.0%				**4312.78**
	Cost index **35.59 %**				68.89
	Total with Cost index				33133.56
	Say				33133.56

6 Specification Code: od212497/2022_2023

od212497/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m, For 5.5m diameter
Quantity for 3.0m depth=3.14/4*6.7*6.7*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	105.72000	566.70	59911.52
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	250.00000	2.00	500.00
				TOTAL	89677.99
	cost for 3.0 metre				89677.99
	cost for one metre				29892.66
	say				29892.66

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	Add Water Charges @ 1.0%				**298.92**
	Add CPOH @ 15.0%				**4528.73**
	Cost index **35.59 %**				68.89
	Total with Cost index				34789.22
	Say				34789.22

7 Specification Code: od212498/2022_2023

od212498/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (For 5.5m diameter)
Quantity for 3.0m depth=3.14/4*6.7*6.7*3=105.72m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.6 - 520.15*1.3559 =705.27	cum	105.72000	705.27	74561.14
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	105.72000	276.83	29266.47
9999	Sundries	L.S	250.00000	2.00	500.00
				TOTAL	104327.61
	cost for 3.0 metre				104327.61
	cost for one metre				34775.87
	say				34775.87

	Add Water Charges @ 1.0%				**347.75**
	Add CPOH @ 15.0%				**5268.54**
	Cost index **35.59 %**				68.89
	Total with Cost index				40461.07
	Say				40461.07

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8 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal

size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79

Other Engineering Organisations
PRICE

TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

9 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations
PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

11 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

Other Engineering Organisations
PRICE

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

Other Engineering Organisations
PRICE

12 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

Other Engineering Organisations
PRICE

13 Specification Code: od212499/2022_2023

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od212499/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

14 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

Other Engineering Organisations
PRICE

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

Other Engineering Organisations
PRICE

15 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)	63.17
TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

16 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86
				TOTAL	1647.25
				Cost of 10.0 sqm	1647.25

Other Engineering Organisations PRICE

Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

18 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25

Other Engineering Organisations PRICE

Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

19 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84

0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

Other Engineering Organisations
PRICE

20 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42

TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

21 Specification Code: od212500/2022_2023

od212500/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82

	Say				606.82

22 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

23 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

24 Specification Code: 10.2

SUBHEAD : **10.0**

Other Engineering Organisations
PRICE

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00
1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00

Other Engineering Organisations
PRICE

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25

Other Engineering Organisations
PRICE

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

Grit/Screen Chamber 3m dia 5.1m depth

1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63

Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
				TOTAL	675.50
				Add Water Charges @ 1%	6.75
				TOTAL	682.25
				Add CPOH @ 15%	102.34
				TOTAL	784.59
				Cost of 10.0 cum	784.59
				Cost per cum	78.46
				Say	78.45

	Cost index **35.59 %**				27.92
	Total with Cost index				106.37

3 Specification Code: od212492/2022_2023

od212492/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	27835.74

	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				**92.78**
	Add CPOH @ 15.0%				**1405.70**
	Cost index **35.59 %**				82.67

Other Engineering Organisations PRICE

	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od212494/2022_2023

od212494/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	29410.38

	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				**98.03**
	Add CPOH @ 15.0%				**1485.22**
	Cost index **35.59 %**				82.67

Other Engineering Organisations PRICE

	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od212495/2022_2023

od212495/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m
Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 421.44*1.3559 =	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	30984.67

	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				**103.28**
	Add CPOH @ 15.0%				**1564.72**
	Cost index **35.59 %**				82.67

Other Engineering Organisations PRICE

	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: od215570/2022_2023

od215570/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)
Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m3
Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 545.99 *1.3559 =740.307	cum	41.54220	740.31	30753.98
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
				TOTAL	42854.11
	cost for 3.0 metre				42854.11
	cost for one metre				14284.70
	say				14284.70

	Add Water Charges @ 1.0%				**142.84**
	Add CPOH @ 15.0%				**2164.13**
	Cost index **35.59 %**				82.67

Other Engineering Organisations PRICE

	Total with Cost index				16674.35
	Say				16674.35

7	Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

8 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

Other Engineering Organisations PRICE

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

9 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

Other Engineering Organisations
PRICE

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index **35.59 %**				2904.54
	Total with Cost index				11065.64

Other Engineering Organisations
PRICE

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

Other Engineering Organisations
PRICE

11 Specification Code: od212499/2022_2023

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od212499/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

Other Engineering Organisations
PRICE

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL	5073.95
Add Water Charges @ 1%	50.74
TOTAL	5124.69
Add CPOH @ 15%	768.70
TOTAL	5893.39
Cost of 1.0 cum	5893.39
Say	5893.4

	Cost index **35.59 %**				2097.46
	Total with Cost index				7990.86

Other Engineering Organisations
PRICE

13 Specification Code: 10.1

SUBHEAD : **10.0**

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)	63.17
TOTAL	6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				26.59
	Total with Cost index				101.29

14 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

15 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

	Cost index **35.59 %**				28.47
	Total with Cost index				108.47

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

17 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

18 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08
				Add CPOH @ 15%	385.96
				TOTAL	2959.04
				Cost of 10.0 sqm	2959.04
				Cost per sqm	295.90
				Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

19 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

20 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whiting

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
				TOTAL	287.76
				Add Water Charges @ 1%	2.88
				TOTAL	290.64
				Add CPOH @ 15%	43.60
				TOTAL	334.24
				Cost of 10.0 sqm	334.24
				Cost per sqm	33.42
				Say	33.4

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				11.89
	Total with Cost index				45.29

21 Specification Code: od212500/2022_2023

od212500/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Other Engineering Organisations
PRICE

22 Specification Code: 10.2

SUBHEAD : **10.0**

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

Other Engineering Organisations
PRICE

1009	Flats exceeding 10 mm in thickness (iii) Gusset plates 10 mm thick: 1x0.74x0.35m = 0.259 sqm.+ Shone 4x0.46x0.46 = 0.845 sqm. Total = 1.104 sqm. 1.104 sqn @ 78.4 kg/m = 86.55 kg 12 mm plates at the point of principal rafter and strut: 2x0.3x0.2 = 0.12 sqm. + Tie beam. brace and strut: 2x0.5x0.3 = 0.30 sqm. + Sole plates:2X0.46X0.46 = 0.42 sqm.+ Anchor plate:2x0.46x0.1 = 0.09sqm. Total = 0.93 sqm. Say 1.00 sqm. 1.00 sqm. @ 94.4 kg/m = 94.40 kg. Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00kg or 1.90 q	quintal	0.53	4600.00	2438.00
1010	Mild steel plates (iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.	quintal	1.9	4800.00	9120.00
1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

Other Engineering Organisations
PRICE

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm.+ Ties 5.4x0.124 = 0.67 sqm.+ Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)	298.32
TOTAL	30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)	4519.47
TOTAL	34898.25
Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				31.44
	Total with Cost index				119.79

Silt Pit 1.5mx1.5mx1.2m
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm

on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
				TOTAL	4578.85
				Add Water Charges @ 1%	45.79
				TOTAL	4624.64

Other Engineering Organisations
PRICE

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

Other Engineering Organisations PRICE

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10

0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: 5.22.6

Other Engineering Organisations
PRICE

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
				TOTAL	6241.51
				Add Water Charges @ 1%	62.42
				TOTAL	6303.93
				Add CPOH @ 15%	945.59
				TOTAL	7249.52
				Cost of 100.0 kilogram	7249.52
				Cost per kilogram	72.50
				Say	72.5

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

Other Engineering Organisations PRICE

7 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
				TOTAL	1418.21
				Add Water Charges @ 1%	14.18
				TOTAL	1432.39
				Add CPOH @ 15%	214.86

Other Engineering Organisations
PRICE

TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

8 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

9 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	3443.25
				Add Water Charges @ 1%	34.43
				TOTAL	3477.68
				Add CPOH @ 15%	521.65
				TOTAL	3999.33
				Cost of 10.0 sqm	3999.33
				Cost per sqm	399.93

Other Engineering Organisations
P R I C E

Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

10 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
				TOTAL	2547.60
				Add Water Charges @ 1%	25.48
				TOTAL	2573.08

Other Engineering Organisations
PRICE

Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

11 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
				TOTAL	1641.80
				Add Water Charges @ 1%	16.42
				TOTAL	1658.22
				Add CPOH @ 15%	248.73
				TOTAL	1906.95
				Cost of 10.0 cum	1906.95
				Cost per cum	190.69
				Say	190.7

Other Engineering Organisations PRICE

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

12 Specification Code: od212500/2022_2023

od212500/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

Valve chamber 2.1mx3.7mx1.8m

1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
				TOTAL	1359.04
				Add Water Charges @ 1%	13.59
				TOTAL	1372.63
				Add CPOH @ 15%	205.89
				TOTAL	1578.52
				Cost of 10.0 cum	1578.52
				Cost per cum	157.85
				Say	157.85

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
				TOTAL	14597.33
				Add Water Charges @ 1%	145.97
				TOTAL	14743.30
				Add CPOH @ 15%	2211.49
				TOTAL	16954.79
				Cost of 10.0 cum	16954.79
				Cost per cum	1695.48
				Say	1695.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount

	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70

Other Engineering Organisations PRICE

TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

Other Engineering Organisations PRICE

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1. 00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20

2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations
PRICE

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index **35.59 %**				2470.89
	Total with Cost index				9413.54

5 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
				TOTAL	52.12
				Add Water Charges @ 1%	.52
				TOTAL	52.64
				Add CPOH @ 15%	7.90
				TOTAL	60.54
				Cost of 1.0 cum	60.54
				Say	60.55

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				21.55
	Total with Cost index				82.10

6 Specification Code: od212499/2022_2023

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od212499/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
				TOTAL	2247.40
				cost for one cum	2247.40
	say				2247.40

	Add Water Charges @ 1.0%				**22.47**
	Add CPOH @ 15.0%				**340.48**
	Cost index **35.59 %**				-694.31
	Total with Cost index				1916.05
	Say				1916.05

Other Engineering Organisations
PRICE

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				25.80
	Total with Cost index				98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations
PRICE

TOTAL	1418.21
Add Water Charges @ 1%	14.18
TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

	Cost index **35.59 %**				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)

Other Engineering Organisations
PRICE

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

10 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				

1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) 4x3x0.15x0.030 = 0.54 cum Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = 57/8 = 7.125 cudm	10 cudm	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal 2x4x0.075x0.1x0.5 = 0.030 Horizontal 2x4x0.075x0.1 x 1.5 = 0.090 (iii) Vertical battens 16x0.15x0.075x0.030m = 0.0054 (iv) Struts 16x0.25x0.07x0.075 = 0.0225 Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = 155/8 = 19.375 cudm	10 cudm	19.375	260.00	503.75
2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = 0.212/8 =0.0265 cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL	1553.85
Add Water Charges @ 1%	15.54

Other Engineering Organisations
PRICE

TOTAL	1569.39
Add CPOH @ 15%	235.41
TOTAL	1804.80
Cost of 12.0 metre	1804.80
Cost per metre	150.40
Say	150.4

	Cost index **35.59 %**				53.53
	Total with Cost index				203.93

11 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84

0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	3443.25
Add Water Charges @ 1%	34.43
TOTAL	3477.68
Add CPOH @ 15%	521.65
TOTAL	3999.33
Cost of 10.0 sqm	3999.33
Cost per sqm	399.93
Say	399.95

	Cost index **35.59 %**				142.34
	Total with Cost index				542.29

Other Engineering Organisations
PRICE

12 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50

0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL	2547.60
Add Water Charges @ 1%	25.48
TOTAL	2573.08
Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				105.31
	Total with Cost index				401.21

13 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40

0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL	1641.80
Add Water Charges @ 1%	16.42
TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

	Cost index **35.59 %**				67.87
	Total with Cost index				258.57

Other Engineering Organisations
PRICE

14 Specification Code: od212500/2022_2023

od212500/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer
First 5km Rs129.71Addition for 20 km 15.20x5km+12.63x10+5x10.44=254.5 Refer Section 1 Carriage of materials 1.1.2 Rate including Wchae=rge,CPOH and Cost Index=254.5x1.01x1.15x1.3559=400.81

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
				TOTAL	490.52
				cost for one cum	490.52
	say				490.52

	Add Water Charges @ 1.0%				**4.90**
	Add CPOH @ 15.0%				**74.31**
	Cost index **35.59 %**				37.08
	Total with Cost index				606.82
	Say				606.82

15 Specification Code: 19.16

SUBHEAD : **19.0**

DRAINAGE

19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Other Engineering Organisations PRICE

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64

4.2.5	Rate as per item Number4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) Ist class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				143.05
	Total with Cost index				545.00

Pumpsets,Pumping main,Interconnections and other connected works works
1 Specification Code: od213297/2022_2023

od213297/2022_2023 :Supplying and laying 350mm Ductile pipes class K9 including cost of all materials , earthwork excavations and backfilling after completion of the work, jointing , testing , cost for pipes and specials etc complete all as per the direction of Engineeer in charge
Rate for 50m pipe laying works

Code	Description	Unit	Quantity	Rate	Amount
18.72.20	Rate as per item number 18.72.20 of SH: Water Supply	metre	50.00000	3522.60	176130.00

2.10.1.3	Rate as per item number 2.10.1.3 of SH: Earth Work	metre	74.25000	493.60	36649.80
18.70.6	Rate as per item number 18.70.6 of SH: Water Supply	joint	11.00000	277.96	3057.55
18.83.8	Rate as per item number 18.83.8 of SH: Water Supply	Each Cut	3.00000	475.16	1425.48
MR	Testing the pipeline after completion of work KWA rate	metre	50.00000	51.80	2590.00

				TOTAL	219852.83
	cost for 50.0 metre				219852.83
	cost for one metre				4397.06
	say				4397.06

	Add Water Charges @ 1.0%				**43.97**
	Add CPOH @ 15.0%				**666.15**
	Cost index **35.59 %**				1796.23
	Total with Cost index				6903.42
	Say				6903.42

Other Engineering Organisations
PRICE

2 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34

Other Engineering Organisations PRICE

				Say	5318.35

	Cost index **35.59 %**				1892.80
	Total with Cost index				7211.15

3 Specification Code: 5.9.12

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = 22/7 x 4.40x1.00 - 13.82 sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood 26.39x0.038 = 1.00 cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = 1200/8 = 150 cudm				

Other Engineering Organisations
PRICE

1198	Second class kail wood in planks 2nd class kail wood battens Inside = 2x25x0.50x0.075 x 0.038 = 0.0712 cum Outside = 2x28x0.50x0.075x0.038 = 0.0798cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = 0.1586/8 = 0.0198 cum	10 cudm	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cudm	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Other Engineering Organisations
PRICE

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

	Cost index **35.59 %**				65.54
	Total with Cost index				249.69

4 Specification Code: od213295/2022_2023

od213295/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 15HP pump= 15hp@Rs.18135=RS. 272025

Code	Description	Unit	Quantity	Rate	Amount
MR	15hp pumpset	each set	1.00000	272025.00	272025.00
				TOTAL	272025.00
				cost for one each set	272025.00
	say				272025.00

	Add Water Charges @ 1.0%				**2720.25**
	Add CPOH @ 15.0%				**41211.78**
	Cost index **35.59 %**				0.00
	Total with Cost index				315957.04
	Say				315957.04

5 Specification Code: od215707/2022_2023

Other Engineering Organisations
PRICE

od215707/2022_2023 :Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	Flushing Tanker Vehicle shall be given to Flush sewers whenever necessary and access narrow roads – Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.	set	1.00000	890423.00	890423.00
				TOTAL	890423.00
				cost for one set	890423.00
	say				890423.00

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**8904.23**
	Add CPOH @ 15.0%				**134899.08**
	Cost index **35.59 %**				0.00
	Total with Cost index				1034226.31
	Say				1034226.31

6 Specification Code: od213299/2022_2023

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od213299/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in vertified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
				TOTAL	30400.00
				cost for one sqm	30400.00
	say				30400.00

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**304.00**
	Add CPOH @ 15.0%				**4605.60**
	Cost index **35.59 %**				0.00
	Total with Cost index				35309.60
	Say				35309.60

Silt riser
1 Specification Code: 18.71.1

SUBHEAD : **18.0**

WATER SUPPLY

18.71 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):

18.71.1 100 mm dia C.I Double Flanged Pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 5 metre MATERIAL: 100 mm dia. cast iron pipes double flanged weight of 1m pipe = 27.00 kg Weight of 5 m pipes 27.00 x 5 = 135.00 kg				
7712	Screwed double flanged centrifugally cast (spun) C.I Pipe pf Class B confroming to I.S. 1536.- 100 mm dia	metre	5.0	1310.00	6550.00
2319	Carriage of Spun iron S & S pipes 100 mm dia Labour for laying	100 meter	5.0	226.82	11.34
18.23	Rate as per item Number18.23 of SH: Water Supply	quintal	1.35	229.40	309.69(A)
	AddWater Charges @ 1% except on A ie on (6871.03-309.69=6561.34)				65.61
	TOTAL				6936.64
	AddCPOH @ 15% except on A ie on (6936.64-309.69=6626.95)				994.04
	TOTAL				7930.75
	Cost of 5.0 metre				7930.75
	Cost of 1 metre				1586.15

Other Engineering Organisations PRICE

				Say	1586.15

	Cost index **35.59 %**				564.51
	Total with Cost index				2150.66

2 Specification Code: od213291/2022_2023

od213291/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllying and laying of 100 mm D/F 90oDuck Foot Bend TWAD rate	no	1.00000	2607.00	2607.00
				TOTAL	2607.00
				cost for one each	2607.00
	say				2607.00

Other Engineering Organisations
PRICE

	Add Water Charges @ 1.0%				**26.07**
	Add CPOH @ 15.0%				**394.96**
	Cost index **35.59 %**				0.00
	Total with Cost index				3028.03
	Say				3028.03

3 Specification Code: od213292/2022_2023

od213292/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend

Code	Description	Unit	Quantity	Rate	Amount

MR	Suppllying and laying of 100 mm dia D/F CI bend 90o bend TWAD rate	no	1.00000	1824.00	1824.00

				TOTAL	1824.00
				cost for one each	1824.00
	say				1824.00

	Add Water Charges @ 1.0%				**18.23**
	Add CPOH @ 15.0%				**276.33**
	Cost index **35.59 %**				0.00
	Total with Cost index				2118.58
	Say				2118.58

4 Specification Code: od213293/2022_2023

od213293/2022_2023 :Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete

Other Engineering Organisations
PRICE

Code	Description	Unit	Quantity	Rate	Amount
18.71.1	Rate as per item number 18.71.1 of SH: Water Supply	metre	2.00000	1365.60	2731.21
2.8.1	Rate as per item number 2.8.1 of SH: Earth Work	cum	1.00000	188.55	188.55
9999	Sundries	L.S	10.00000	2.00	20.00
				TOTAL	2939.76
				cost for one each	2939.76
	say				2939.76

	Add Water Charges @ 1.0%				**29.39**
	Add CPOH @ 15.0%				**445.37**
	Cost index **35.59 %**				1215.23
	Total with Cost index				4629.76
	Say				4629.76

5 Specification Code: 18.30.2

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.2 100 mm diameter pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1374	Rubber insertions for 100 mm dia pipe joints	each	10.0	18.00	180.00
1956	Bolts and nuts 16 mm dia 60 mm long	each	80.0	11.00	880.00
9977	Carriage of materialsLABOUR:	L.S	4.16	2.00	8.32
0116	Fitter(grade1)	Day	0.25	738.00	184.50
0117	Assistant Fitter or 2nd class fitter	Day	0.25	679.00	169.75
0114	Beldar	Day	1.0	558.00	558.00
				TOTAL	1980.57
				Add Water Charges @ 1%	19.81
				TOTAL	2000.38
				Add CPOH @ 15%	300.06
				TOTAL	2300.44
				Cost of 10.0 no	2300.44
				Cost of each	230.04
				Say	230.05

Other Engineering Organisations
PRICE

	Cost index **35.59 %**				81.87
	Total with Cost index				311.92

6 Specification Code: od213294/2022_2023

od213294/2022_2023 :Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m. TWAD	metre	1.00000	441.00	441.00
				TOTAL	441.00
				cost for one metre	441.00
	say				441.00

Other Engineering Organisations PRICE

	Add Water Charges @ 1.0%				**4.41**
	Add CPOH @ 15.0%				**66.81**
	Cost index **35.59 %**				0.00
	Total with Cost index				512.22
	Say				512.22

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59%**				21.55
	Total with Cost index				82.1

Kerala Water Authority
PRICE

38 Specification Code: od119557/2022_2023

od119557/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount	Remarks
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00	
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60	
				TOTAL	2247.40	
				Add Water Charges @ 1%	22.47	
				Add CPOH @ 15%	340.48	
				cost for one cum	2610.36	
				say	2610.36	

Cost index **35.59 %**	-694.31
Total with Cost index	1916.05

39 Specification Code: 5.7

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.7 Reinforced cement concrete work in well - steining excluding the cost of centering, shuttering, finishing and reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (Zone - III) : 3 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
4.1.2	Rate as per item Number4.1.2 of SH: Concrete work LABOUR	cum	1.0	6259.65	6259.65(A)
0115	Coolie Extra labour involved coolie	Day	0.08	558.00	44.64
	AddWater Charges @ 1% except on A ie on (6304.29-6259.65=44.6401)				.45
	TOTAL				6304.74
	AddCPOH @ 15% except on A ie on (6304.74-6259.65=45.0901)				6.76
	TOTAL				6311.50
	Cost of 1.0 cum				6311.50
	Cost of 1 cum				6311.50
	Say				6311.5

Kerala Water Authority
PRICE

Say	72.5

	Cost index **35.59%**				25.80
	Total with Cost index				98.3

41 Specification Code: od119554/2022_2023

od119554/2022_2023 :Extra for providing epoxy coating for reinforcement bars.

Code	Description	Unit	Quantity	Rate	Amount	Remarks
MR	Extra for providing epoxy coating for reinforcement bars.	kg	1.00000	2.00	2.00	
				TOTAL	2.00	
				Add Water Charges @ 1%	.02	
				Add CPOH @ 15%	.30	
				cost for one kg	2.32	
				say	2.32	

Cost index **35.59 %**	.00
Total with Cost index	2.32

42 Specification Code: 4.12

4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .

Code	Description	Unit	Quantity	Rate	Amount

Kerala Water Authority
PRICE

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

	Cost index **35.59%**				21.55
	Total with Cost index				82.1

Kerala Water Authority
PRICE

38 Specification Code: od119557/2022_2023

od119557/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount	Remarks
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00	
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60	
				TOTAL	2247.40	
				Add Water Charges @ 1%	22.47	
				Add CPOH @ 15%	340.48	
				cost for one cum	2610.36	
				say	2610.36	

Cost index **35.59 %**	-694.31
Total with Cost index	1916.05

39 Specification Code: 5.7

SUBHEAD : **5.0**

REINFORCED CEMENT CONCRETE

5.7 Reinforced cement concrete work in well - steining excluding the cost of centering, shuttering, finishing and reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (Zone - III) : 3 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
4.1.2	Rate as per item Number4.1.2 of SH: Concrete work LABOUR	cum	1.0	6259.65	6259.65(A)
0115	Coolie Extra labour involved coolie	Day	0.08	558.00	44.64
	AddWater Charges @ 1% except on A ie on (6304.29-6259.65=44.6401)				.45
	TOTAL				6304.74
	AddCPOH @ 15% except on A ie on (6304.74-6259.65=45.0901)				6.76
	TOTAL				6311.50
	Cost of 1.0 cum				6311.50
	Cost of 1 cum				6311.50
	Say				6311.5

Kerala Water Authority
PRICE

Say	72.5

	Cost index **35.59%**				25.80
	Total with Cost index				98.3

41 Specification Code: od119554/2022_2023

od119554/2022_2023 :Extra for providing epoxy coating for reinforcement bars.

Code	Description	Unit	Quantity	Rate	Amount	Remarks
MR	Extra for providing epoxy coating for reinforcement bars.	kg	1.00000	2.00	2.00	
				TOTAL	2.00	
				Add Water Charges @ 1%	.02	
				Add CPOH @ 15%	.30	
				cost for one kg	2.32	
				say	2.32	

Cost index **35.59 %**	.00
Total with Cost index	2.32

42 Specification Code: 4.12

4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .

Code	Description	Unit	Quantity	Rate	Amount

Kerala Water Authority
PRICE

सत्यमेव जयते

भारत सरकार

GOVERNMENT OF INDIA

केन्द्रीय लोक निर्माण विभाग

CENTRAL PWD

कुरसी क्षेत्र दरें

PLINTH AREA RATES

(1.10.2012)

निर्माण महानिदेशक, के.लो.नि.वि., नई दिल्ली के प्राधिकार से प्रकाशित

Published under the Authority of Director General, CPWD, New Delhi

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FOREWORD TO PAR 2012

Plinth Area Rates w.e.f. 1/10/2007(Reprint) published in 2010 by CPWD is a very useful document for preparation of Preliminary Estimates for all Govt. residential buildings and non-residential buildings e.g. Offices/ Colleges/ Hospitals, Schools, Hostels etc. which is in extensive use by all Central Government Departments, Public Sector Undertakings, Private Sector Builders and Engineers etc.

The rates adopted in the PAR are based on detailed analysis of actual cost of construction of buildings of various types in different parts of the country and provide a realistic basis for assessment of approximate cost of new proposed buildings.

I am sure that this PAR -2012 will be very useful to all concerned.

New Delhi **(Rakesh Misra)**

Dec. 2012 **Director General**

Govt. of India
Central Public Works Department
(Technology Application and Standards Unit)
Nirman Bhawan, New Delhi

No: 62/SE(TAS)/Plinth Area Rates/399 Dated : 24/12/2012

MEMORANDUM

Plinth Area Rates as applicable on 1.10.2007(Reprint) were last circulated under Memo no. SE(S&S)/EE-II/AE-III/ dated 19.7.2010 along with annexure I to IV. Relevant cost indices with reference to base 100 as 1.10.2007 shall continue to be applicable on these plinth area rates for works in progress etc.

However, the need for issuing fresh plinth area rates has been felt to account for rise in prices in the last 5 years as well as the latest development in construction practices such as fire safety measures for high rise buildings and also incorporating the green buildings concept for three star rating of GRIHA.

Accordingly, fresh plinth area rates with reference to base 100 as on 1.10.2012 has been prepared for circulation in the department. In future, Preliminary Estimates may be prepared on the basis of these plinth area rates.

All the rates are based on data of actual expenditure for structures completed recently, as received from various field formations. In case of any discrepancy in Hindi & English versions, English version will prevail.

The latest plinth area rates as on 1.10.2012 is hereby issued with following annexures :

Annexure – I : Fresh Plinth Area Rates with base 100, as on 1.10.2012 (for residential /non residential buildings, services and development) .

Annexure – II : Broad specifications and scale of amenities for sanitary/Electrical fittings for which plinth area rates are applicable.

Annexure – III : Memo no. 29/21/58/WI of 10/83 indicating the rules for working out plinth area from plans, to be observed while adopting these plinth area rates given in Annexure - I.

Annexure –IV : Proforma for calculating cost index for future cost index with base 100 as on 1.10.2012 indicating revised weightages also.

Annexure –V : Specifications for buildings - Non Residential & Residential Buildings.

Encl: Annexure I to V

Director General
CPWD, Nirman Bhawan,
New Delhi

PLINTH AREA RATES AS ON 01.10.2012

ANNEXURE – 1

S. No.	Description	Office/College/Hospital	Schools	Hostels	Residential
1	2	3	4	5	6
1.0 (A)	**RCC FRAMED STRUCTURE (Specifications as per Annexure –II)**	Rates in Rs. per sq. metre			
1.1(A)	RCC framed structure upto six storeys				
1.1.1(A)	Floor ht. 3.35 mtr.	23500	17000		
1.1.2 (A)	Floor ht. 2.90 mtr.			16500	16000
1.0 (B)	**RCC FRAMED STRUCTURE (Normal Buildings) (Specifications as per Annexure –V)**				
1.1 (B)	RCC framed structure upto six storeys				
1.1.1(B)	Floor ht. 3.35 mtr.	19000	15200		
1.1.2 (B)	Floor ht. 2.90 mtr.			15000	14500
1.2	**EXTRAS FOR**				
1.2.1	Every additional storey over six storeys upto nine storeys	560	560	560	560
1.2.2	Every additional storey over nine storeys upto twelve storeys	580	580	580	580
1.2.3	Every 0.3 mt. additional height of floor above normal floor height of 3.35 mt./ 2.90 mts.	270	270	270	270
1.2.4	Every 0.3 mt. higher plinth over normal plinth height of 0.6 mt. (on G.F. area only)	270	270	270	270
1.2.5	Every 0.30 mt. deeper foundations over normal depth of 1.20 metre (on G.F. area only)	270	270	270	270
1.2.6	Making stronger foundations to take load of one additional floor at a later date (on area of additional floor only)	2270	2270	2270	2270
1.2.7	Strip foundations in poor soil having bearing capacity less than 10 tonnes/ sqmt. (on G.F. area only)	520	520	520	520
1.2.8	Resisting Earthquake forces	1140	1140	1140	1140
1.2.9	R.C.C. Raft foundations (ground floor only)	6450	6450	6450	6450

1.2.10	Pile foundation up to a depth of 15 mts (on ground floor area only.)	11750	11750	11750	11750
1.2.11	Stronger structural members to take heavy load above 500 Kgs./sqm. upto 1000 Kgs./Sqm.	1500	1500	1500	1500
1.2.12	Larger modules over 35 sqm.	1500	1500	1500	1500
1.3	**BASEMENT FLOOR**				
1.3.1	Floor ht. 3.35 mtrs with normal water proofing.	19000	-	-	-
1.3.2	**EXTRA FOR BASEMENT WITH**				
1.3.2.1	Every 0.3 mt. addl. Height (above 3.35 mt.)	2320	-	-	-
1.3.2.2	Reduction for every 0.5 m. less height of basement than normal height 3.35 mt.	(- 1280)	-	-	-
1.4	**FIREFIGHTING**				
1.4.1	With wet riser system	500	500	500	500
1.4.2	With sprinkler system	750	750	750	750*
1.5	**FIRE ALARM SYSTEM**				
1.5.1	Manual Fire Alarm System	-	-	-	300
1.5.2	Automatic Fire Alarm System	500	500	500	500*
1.6	**Operation Theatre (OPD) (Extra provision)**	2150	-	-	-
1.7	**Pressurized mechanical ventilation system in the basements (with supply of Exhaust blowers)**	650	650	650	650
1.8	**STILT PORTION**				
1.8.1	**Stilt Portion of Multistorey RCC structure (up to ht of 3.35m) Applicable area only**	9850	9850	9850	9850
1.8.2	**Every 0.30 mt additional height (above 3.35m)**	450	450	450	450

Note :- Rates marked as*under items 1.4.2 & 1.5.2 for residential building are NBC 2005 applicable for apartment houses more than 45m height.

Sl. No.	Description	Non -Residential			Residential		
		Office/College /Hospitals	Schools	Hostel	Type-I, II, III & servant Qtrs.	Type –IV Qtrs.	Type –V, VI and above
1	2	3	4	5	6	7	8
2.0	**LOAD BEARING CONSTRUCTION**						
2.1	**Floor height 3.35 mt.**						
2.1.1	Single storeyed	15000	14000	-	-	-	-
2.1.2	Doubled storeyed	14300	12200	-	-	-	-
2.1.3	Three storeyed	15000	14000	-	-	-	-
2.1.4	Four storeyed	16000	14000	-	-	-	-
2.2	**Floor height 2.90 mt.**						
2.2.1	Single storeyed	-	-	13300	11600	12800	14000
2.2.2	Double storeyed	-	-	11700	11300	12400	13100
2.2.3	Three storeyed	-	-	13300	11600	12800	13400
2.2.4	Four storeyed	-	-	14000	12200	13500	14300
2.3	**Scooter & Cycles sheds**	-	-	-	10500	10500	10500
2.4	**Garrages**	-	-	-	10000	10000	10000
2.5	**Extra for**						
2.5.1	Every 0.3 mt. additional height above normal height 3.35 mt./2.90 mt.	270	270	270	270	270	270
2.5.2	Every 0.3 mt. higher plinth over normal plinth height of 0.60 mt. (on ground floor area only)	270	270	270	270	270	270
2.5.3	Every 0.3 mt. deeper foundations over normal depth of 1.20 mt. (on G.F. area only)	270	270	270	270	270	270
2.5.4	Making stronger foundations to take load of one additional floor at a later date (on area of additional floor only)	780	780	780	780	780	780
2.5.5	Foundations on poor soils having bearing capacity less than 10 T/sqmt.	520	520	520	520	520	520
2.5.6	Foundation on poor soils requiring under reamed pile 6 mt. long	5600	5600	5600	5600	5600	5600
2.5.7	R.C.C. Raft foundation (G.F. area only)	6450	6450	6450	6450	6450	6450
2.5.8	Pile foundation up to a depth of 15 mtr. (G. F. area only)	11750	11750	11750	11750	11750	11750
2.6	**Extra for resisting Earth-quake Forces**						
2.6.1	In Zone V	1050	1050	1050	1050	1050	1050

Sl. No.	Description	Non -Residential			Residential		
		Office/College /Hospitals	Schools	Hostel	Type-I, II, III & servant Qtrs.	Type –IV Qtrs.	Type –V, VI and above
1	2	3	4	5	6	7	8
2.6.2	Buildings of two storeyes or more in Zone III & IV	520	520	520	520	520	520
2.6.3	Resisting earthquake forces in Zone II and single storey buildings in Zone III & IV						
2.7	**Stronger structural members to take heavy loads above 500 Kg /sqm. Up to 1000 Kg/sqmt.**	1500	1500	1500	1500	1500	1500
2.8	**Larger modules over 35 sqmt.**	1800	1800	1800	1800	1800	1800
2.9	**Fire-fighting**						
2.9.1	With wet riser system	500	500	500	500	500	500
2.9.2	With sprinkler system	750	750	750	750	750	750
2.10	**Fire Alarm System**						
2.10.1	a) Manual Fire Alarm system	-	-	-	270	270	270
2.10.2	b) Automatic Fire Alarm system	500	500	500	-	-	-
2.11	**O.P.D. Operation Theatre etc.**	2150	-	-	-	-	-

Note : Rates for items are applicable on entire plinth area except for items 1.2.4, 1.2.5, 1.2.6, 1.2.7, 1.2.9,1.2.10,1.5, 1.6, 1.7, 1.8, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 2.5.7, 2.5.8, 2.8, 2.9, 2.10, and 2.11.

S. No.	Description	Office & College	Hospitals	Schools	Hostels	Type of Quarters				
						I	II	III	IV	V,VI & above
1	2	3	4	5	6	7	8	9	10	11
3.0	**SERVICES.**									
3.1	Internal water supply & sanitary installations	4%	10%	5%	15% with attached toilets, 10% with common toilets.	12%	12%	12%	12%	12%
						% age means % age of building cost of **normal Building (1.0B)**				
3.2	External service connections	5%	5%	5%	5%	5%	5%	5%	5%	5%
3.3	Internal electric installations	12 ½%	12 ½%	12½%	12½%	12½%	12½%	12½%	12½%	12½%
						Note : The above does not include service connection charges & electrification				
3.4	Internal electric installations for laboratories of schools	-	-	15% of building cost of **normal building (1.0B)**	-	-	-	-	-	-
3.5	Internal electric installations for terminal building and other allied structures in airports	15% of building cost	-	-	-	-	-	-	-	-
3.6	Extra for :									
3.6.1	Power wiring and plugs	4%	4%	-	-	-	-	-	-	-
3.6.2	Central Call bell system	1%	-	-	-	-	-	-	-	-
3.6.3	Lightening conductors									
3.6.3.1	Upto 4 storeyed building	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
3.6.3.2	5 to 8 storeys buildings	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
3.6.3.3	Beyond 8 storeyed buildings	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
3.6.4	Telephone conduits	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
3.6.5.	Centralized Intercom system	-	-	-	-	1%	1%	1%	1%	1%
3.6.6	Computer conduiting	0.5%	0.5%	0.5%	0.5%					
3.6.7	Quality assurance	1%	1%	1%	1%	1%	1%	1%	1%	1%

Note :- Quality control charge of 1% should be taken in estimate only when client department request for TPI.

Sl. No.	Type of lift	Capacity/ Persons	Weight	Speed in M/Sec.	Travel	Doors	Control	Price (Rs. In lacs)	Addl. Price for each additional floor (Rs.)
1	2	3	4	5	6	7	8	9	10
4.0	**LIFTS**								
4.1	**Passenger lifts**								
4.1.1	Passenger lift	8	544 Kg.	1.0	G+4	Power operated	ACV VVF	18.00	1,25,000.00
4.1.2	Passenger lift	8	544 Kg.	1.5	G+5	Power operated	ACV VVF	24.00	1,25,000.00
4.1.3	Passenger lift	13	884 Kg.	1.0	G+4	Power operated	ACV VVF	22.00	1,25,000.00
4.1.4	Passenger lift	13	884 Kg.	1.5	G+5	Power operated	ACV VVF	28.00	1,25,000.00
4.1.5	Passenger lift	16	1088 Kg.	1.0	G+4	Power operated	ACV VVF	28.00	1,50,000.00
4.1.6	Passenger lift	16	1088 Kg.	1.5	G+5	Power operated	ACV VVF	34.00	1,50,000.00
4.1.7	Passenger lift	16	1088 Kg.	2.5	G+12	Power operated	ACV VVF	70.00	1,50,000.00
4.1.8	Passenger lift (Bed lift)	20	1360 Kg.	0.75	G+4	Power operated	ACV VVF	24.00	1,50,000.00
4.1.9	Passenger lift	20	1360 Kg.	1.5	G+5	Power operated	ACV VVF	32.00	1,50,000.00
4.1.10	Passenger lift	20	1360 Kg.	2.5	G+12	Power operated	ACV VVF	75.00	1,50,000.00
4.2	**Goods lifts (2 speed)**								
4.2.1		1 Ton	-	0.5	G+4			26.00	85,000.00
4.2.2		2 Ton	-	0.5	G+4			33.00	85,000.00
4.2.3		3 Ton	-	0.25	G+4			41.00	1,00,000.00

Note:- 1. ACVVVF= AC variable voltage variable frequency.
2. Provision for lift may also be taken for the buildings having floor less than G+ 4.

Sl. No.	Description	Rates in Rupees
5	**WATER TANK (RCC ONLY)**	
5.1	Overhead tank without independent staging	15 / Litre.
5.2	Overhead tank upto staging height 20 metres	25/ Litre.
5.3	Overhead tank with staging height between 20 metres and upto 30 metres	30/ Litre.
5.4	Overhead tank with staging height between 30 metres and 40 metres	35/ Litre.
5.5	Underground sump	15 / Litre

Sl. No.	Description	Rates in Rupees
6	**DEVELOPMENT OF SITE**	
6.1	**Levellling**	95/ sqm.
6.2	**Internal roads & paths**	145/ sqm
6.3	**Sewer**	110/ sqm.
6.4	**Filter Water Supply**	
6.4.1	Distribution lines 100 mm dia and below	80/ sqm.
6.4.2	Peripheral grid 150 mm to 300 mm dia pipes	60/ sqm.
6.4.3	Unfiltered water supply distribution lines	45/ sqm.
6.5	**Storm water drains**	85/ sqm.
6.6	**Horticulture Operations**	80/ sqm.
6.7	**Street lighting**	
6.7.1	With fluorescent lamps	95/ sqm.
6.7.2	With HPMV Lamps	130/ sqm.
6.7.3	With HPSV Lamps	165/ sqm.
6.7.4	Exit sign board i/c electric signage.	85/ sqm.

Note :-

(1) The rates are per sqm. and are to be applied on the entire areas of the plinth/ plot to be developed.

(2) These rates will apply to normal conditions and normal layout plans. If any extras are required due to nature of layout involving filling, cutting or bringing services, from large distances, then additional provision should be made.

(3) Cost of bulk services water supply, sewage disposal e.g.
   - (a) Tube wells, pumps, open wells, treatment plant, extension of lines from source of local bodies, head works at water source etc.
   - (b) Sewage pumps, sewage treatment plants, septic tanks, extension of cut-fall sewer up to point of disposal etc. are not included in these rates. Extra provision depending upon site conditions may be made for these.

(4) Cost of HT sub - station equipments, LT distribution system, DG sets, pumps, air-conditioning and other specialized works like aesthetic external lighting with metal halide lamp & facade lighting, addressable fire alarm system, rising mains, UPS, aviation obstruction lights, external service connections, storage water cooler, IBMS, CCTV, access control system for security, solar water heating system, solar lighting etc. are not included in above rates and the same are to be taken as per actual based on functional / utility of the proposed building.

(5) 1.0 (A) shall be adopted for GPO and GPRA.
   1.0 (B) may be adopted for other buildings.

(6) The green measures considered for Civil & Electrical works
   - (a) Over deck insulation and Application of high SRI reflective paint on the roof.
   - (b) Masonry work in super structure with Autoclave Aerated Concrete (AAC) blocks/ fly ash bricks.
   - (c) Window with reflective glass coating / High performance double glazed unit.
   - (d) Paints with low VOC options.
   - (e) Rain water harvesting.
   - (f) Replacement of conventional pillar cock with pillar cock having infrared sensor and foam flow technology (in offices and Hospitals).
   - (g) AC plant with VVVF drives and ECBC complaint chillers, high efficiency motors, plant optimizers etc. (cost of plant not included.)
   - (h) Automated lighting controls with day light sensors and PIRs etc.

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ANNEXURE - II

SPECIFICATIONS FOR RESIDENTIAL BUILDINGS

Item no.	Item	Type I, II, III & Servant Qtrs.	Type –IV	Type –V/VI	Hostel
1.1	Foundation	Bearing capacity 10 tonnes per sq. metre.	Applicable to all		
1.2		Type –spread foundation in RCC isolated /combined, continuous wall footing with lean concrete.			
1.3		Depth upto 1.2 metres below ground level			
2.1	Super structure	RCC framed construction with filler walls in brick work or load bearing construction if brick/stone masonry with intermediate columns where found necessary.			
2.2		Internal partition- half brick masonry in cement mortar 1:4			

S No.	Item	Type I, II, III & Servant Qrs.	Type IV	Type V and VI
3.1	**Frames**			
3.1.1	Window	Pressed steel frames made out of corrosion resistant coated sheet of 1.6 mm thick with double rebate	Pressed steel frames made out of corrosion resistant coated sheet of 1.6 mm thick with double rebate/scratch proof aluminium sheets/poly-propylene windows	Same as Type IV
3.1.2	Door	T-Iron /Pressed steel/Pre-cast R.C.C. frames.	Pressed steel frames made out of corrosion resistant coated sheet of 1.6 mm thick with single rebate/factory manufactured precast RCC frames.	Same as Type IV
3.2	**Shutters**			
3.2.1	Window	M.S. tubular box section corrosion resistant coated shutters. Wire mesh shutters may also be provided at the discretion of Zonal Chief Engineer.	M.S. tubular box section corrosion resistant coated shutters. Wire mesh shutters may also be provided at the discretion of Zonal Chief Engineer /Scratch proof aluminium window. Shutters to match with frame.	Same as Type IV
3.2.2	Main Door	Double door, one with iron grill with wire mesh mosquito proof and other 35 mm thick panelled shutter with hard wood style and rail with panelling of pre-laminated particle board, one side decorative other side balancing.	Same as Type 1 to III.	Same as Type I to III except that panelling will be of both side decorative, pre-laminated particle board.
3.2.3	W.C / Bath room	Solid PVC shutters 28 mm thick	Same as Type I to III	Same as Type I to III
3.2.4	Kitchen door	Partly panelled and partly wire mesh with stainless steel wire mesh. The panelling with pre-laminated particle board, one side decorative-35 mm thick panelled shutter with hard wood style and rails.	Same as Type I to III	Partly panelled and partly wire mesh with stainless steel wire mesh. The panelling with pre-laminated particle board, both sides decorative-35 mm thick panelled shutter with hard wood style and rails.

S No.	Item	Type I, II, III & Servant Qrs.	Type IV	Type V and VI
3.2.5	Other doors	35 mm thick panelled shutters with hard wood style and rail with panelling of pre-laminated board, one side decorative.	Same as Type I to III	35 mm thick panelled shutters with hard wood style and rail with panelling of pre laminated board, both sides decorative.
3.3	**Fittings**	Powder coated M.S. fittings/stainless steel fittings	Powder coated aluminium/ stainless steel fittings	Same as type IV
3.4	Peep hole and security chain for external door only.	Yes	Yes	Yes

Note : 1. In item no. 3 of Wood work, if any other option of local material is available, the same can also be used by the respective Chief Engineers.
2. External sliding door bolt and handles will be in powder coated M.S. or stainless steel.
3. Koba treatment on roofing in all type of quarters.

S No.	Item	Type I, II, III & Servant Qrs.	Type IV	Type V and VI
4 4.1	**Flooring** Bedrooms/ living rooms	Grey/Beige color ceramic floor tiles (size 12″ × 12″ Matt finish) of approved design	Same as Type 1 to III	Grey/Beige color rectified ceramic floor tiles (size 16″ × 16″ Matt finish) of approved design.
4.2	Kitchen, internal circulation area	Ceramic floor tiles (size 12″ × 12″ Matt finish) of approved design.	Same as Type 1 to III	Rectified ceramic floor tiles (size 16″ × 16″ Matt finish) of approved design.
4.3	Common circulation area, staircase	(i) Kota stone flooring and matching skirting. In staircase, single piece pre-polished kota stone slab with pre-finished nosing be used. (ii) Dado of ceramic tile light grey/ dull green shade 12″ × 12″ size upto 120 cm ht. above skirting i/c green marble nosing.	Same as type I to III	Same as type IV
4.4	Kitchen work top	Green marble pre-polished with pre-moulded nosing	Same as type I to III	Granite with **pre-polished and premoulded nosing**
4.5	Toilets	Ceramic floor tiles (Size 12″ × 12″) Matt finish/anti skid of approved design.	Same as type I to III	Rectified ceramic floor tiles (size 16″ × 16″)Matt finish/ anti skid of approved design
4.6	Skirting/Dado in toilets	Ceramic white glazed tiles (min. size 8″ × 12″) upto door lintel level.	Same as type I to III	Ceramic white giazed tiles **(min. size 8″ × 12″)** upto ceiling ht. with decorative band of tiles.
5.0 5.1	**Finishing** External	Acrylic smooth exterior finish or washed stone grit plaster or exposed brick work	Premium Acrylic smooth exterior finish with additive of silicone or washed mosaic plaster in ordinary cement or exposed brick work	Premium Acrylic smooth exterior finish with additives of silicone or washed mosaic plaster in ordinary cement or exposed brick work.
5.2	Internal	All walls and ceilings to be treated with the 2 mm thick POP followed with a coat of acrylic/ oil bound distemper except ceiling which will be done with white wash. Synthetic enamel paint on all wood work and steel work.	Same as type I to III	All walls and ceilings to be treated with the 2 mm thick POP followed by plastic emulsion paint except ceiling which will be done with white wash. Synthetic enamel paint on all wood work and steel work.

SCALE OF AMENITIES FOR GENERAL POOL ACCOMMODATION

Item No.	Item	Type I	Type II	Type III	Type IV	Type V/VI
1 (i)	**Kitchen** Shelves in tiers not more than 400mm wide along one wall 1 " thick	Yes	Yes	Yes	Covered cup boards above sill level with pre-laminated decorative board.	Same as Type IV
(ii)	**Kitchen sink**	Stainless steel sink without drain board	Same as type -I	Same as type - I	Stainless steel sink with drain board	Same as type -IV/vitreous china sink with draining board
(iii)	Dado Ceramic glazed tiles (size 8″ × 12″) for 60cm. above and along work top and around and below kitchen sink	Yes	Yes	Yes	Yes	Ceramic glazed tiles (size 8″ × 12″) 60cm high dado from skirting level upto 60cm/-ht. above kitchen platform above and along the work top and around and below kitchen sink excluding areas where built in cupboards are fixed.
(iv)	Built in cupboard with open shelves below cooking platform shutters of pre-laminated particle board 18mm thick below window sill level of cooking platform along one wall	Yes	Yes	Yes	Yes with 2 drawers	Yes with 2 drawers
(v)	Cooking platform standing	Yes	Yes	Yes	Yes	Yes
2(i)	**Wardrobes** Built in cupboard with R.C.C./pre-laminated particle board/Kota stone shelves and shutter upto ceiling height	(One in each Bed Room) 7'- 00" height	One in each Bed Room, 7'-00" height	(One in each Bed Room) 7'-00" height	(One in each Bed Room) upto ceiling height	One in each Bed Room upto ceiling height
(ii)	Magic eye in front door	One	One	One	One	One
(iii)	Window sill lining 18mm thick projected with Kota stone/marble	Kota Stone	Kota Stone	Kota Stone	Kota Stone	Marble
(iv)	Curtain rods with brackets	All rooms	All rooms	All rooms	Drapery rods	Drapery rods
(v)	Set of Pegs	In bath and bed rooms	In bath and bed rooms	In bath, bed and wardrobes	In bath, bed and wardrobes	In bath, bed and wardrobes

SCALES OF SANITARY FITTINGS FOR GENERAL POOL RESIDENTIAL QUARTERS

Item No.	Item	Type I	Type II	Type III	Type IV	Type V/VI
1.	Indian W.C. Pan with dual flushing cistern	One WC Pan Orissa pattern with low level PVC Flushing Cistern	One Same as Type I	One same as Type I	One same as Type I	One + One for servant quarter
2.	European type W.C. with low level dual flushing cistern	-	-	-	One with low level dual PVC flushing cistern	One (syphonic type)with matching low level cistern
2(a)	Water Jet with low level European W.C.	-	-	-	One	One
3.	Wash basin with one pillar tap each	One	One	One	**Two CP** Brass mixer type for hot and cold water **with single lever**	Three **CP Brass** mixer type for hot and cold water **with single lever**
4.	Tap (kitchen bath & W.C.) C.P. Brass/ PTMT bib cock	4 PTMT	4 PTMT	4 C.P. brass	5 C.P. brass	12 (1 PTMT + 11 CP brass)
5	Shower C.P. Brass / PTMT	One PTMT	One PTMT	One PTMT	Two C.P.brass	Three C.P. brass
6.	Towel rail C.P. Brass/ PTMT	One PTMT	One PTMT	One PTMT	Two C.P. brass	Two C.P. brass
7.	Mirror / Bevelled edge / P.V.C. frame with PTMT glass shelf	One	One	One	Two	Three
8.	Soap rack (Nitch in W.C./ Bath)	One	One	One	Two	Three
9.	Liquid soap container	-	-	-	Two	Three
10.	Storage tank	500 ltr.	500 ltr.	500 ltr.	750 litre	1000 litre + 500 litre for servant quarters
11.	Nitch with Kota stone sill in bath room	One	One	One	Two	3 + 1 for servant quarter
12.	Plumbing for water purifier and Geyser	Yes	Yes	Yes	Yes	Yes

Note : Waste coupling in wash basins and grating over the floor trap shall be only of PTMT.

SPECIFICATIONS FOR ELECTRICAL INSTALLATION IN RESIDENTIAL QUARTERS

Item No.	Description	Type I	Type II	Type III	Type IV	Type V (excluding servant quarter & Garage)	Type VI (excluding servant quarter & garage)	Servant Qtrs & Garage
1.	Power Points (15 amperes, 6 pins	2	3	4	5	6	7	1
2.	MCB connected socket outlet for A.C. unit /Geyser complete with wiring	1	1	1	2	4	5	-
3.	Ceiling Fans	2	3	4	5	6	7	1
4.	Exhaust Fans	1	1	2	2	3	3	-
5.	Call bells	1	1	1	1	2	3	-
6.	Light/Fans/Call bell/5A Plug Points	17	20	23	27	38	44	5
7.	F.I. Fittings excluding Tube and Starter	2	3	4	5	7	8	1
	Type of Wiring	Recessed Conduit wiring			Concealed conduit wiring			
8.	EDB MCB Type							
	A. Single Phase	1	1	1	-	-	-	1
	B. 3 Phase	-			1	1	1	-
9.	Cable TV Point	1	1	1	1	2	2	-
10.	Telephone Point	-			1	2	2	-

SPECIFICATION FOR NON - RESIDENTIAL BUILDING

ITEM NO.	DESCRIPTION	SPECIFICATION
1.0	**FOUNDATION**	As per structural design based on soil investigation.
2.0	**SUPER STRUCTURE**	
2.1	Structure	R.C.C. framed construction with filler walls with fly ash bricks /brick work or load bearing construction in fly ash brick/brick/ stone masonry with intermediate columns as per design.
2.2 2.2.1 2.2.2 2.2.3 2.2.4	Internal partitions.	 Light weight auto claved aerated concrete blocks. Gypsum Blocks. Non asbestos double skin cement boards. Fly ash bricks.
3.0	**DOORS & WINDOWS**	
3.1	Frames:	
3.1.1		Door frames of 2nd class Indian teakwood or equivalent in officer's room.
3.1.2		Anodized / Powder coated/ Polyester powder coated Aluminium windows/doors.
3.1.3		Glazing with reflective glass or double glass using float glass**.**
3.2	Door Shutters:	
3.2.1		Panelled type in 2nd class teak wood or flush door with teak veneered ply/ commercial ply as per CPWD Specifications/as per design.
3.2.2		Anodized/powder coated/ Polyester powder coated Aluminium shutters with float glass panelling where required.
3.2.3		PVC/FRP door frames & shutters in wet areas.
3.3	Window shutters	Factory made Anodised/ powder coated/ Polyester powder coated 'Z' section aluminium frames & shutters for windows.
3.4	Fittings	Anodized aluminium /stainless steel or equivalent.
3.5	Fire check door	As per fire safety specifications
4.0	**FLOORING**	
4.1	Main entrance hall	Pre polished granite flooring.
4.2	Corridors	Matt finished vitrified tiles/Granite flooring.
4.3	Rooms	Granite tiles/Vitrified tiles/Ceramic tile flooring.
4.4	Lavatory Blocks	Granite flooring.
4.5	Flooring in basement	Vacuum dewatered concrete.
4.6	Rest of the area	Kota Stone flooring.
5.0	**STAIRCASE**	
5.1	Internal staircases	Single piece Granite or marble flooring in treads & risers with dado of matching permanent finish specifications.
5.2	Fire escape staircase	Single piece Kota stone flooring in treads & risers with dado of matching permanent finish specifications.
6.0	**RAILING**	Stainless steel railings.
7.0	**TOILETS**	Granite flooring. Glazed tiles of size not less than 300 x 450 mm in dado. Granite counters. Stainless steel sinks. Mirrors with moulded PVC frame. FRP/ PVC doors with frames.

8.0	**ROOFING**	
8.1	Roof treatment	Coba treatment/over deck insulation with Puf slab.
8.2	False ceiling	False ceiling in office area & toilets to cover the services as per design requirement.
9.	**FINISHING**	
9.1	External	Dry stone cladding, washed grit plaster, water proof weather coat paints, structural glazing, ACP cladding conforming to **Energy Conservation Building Code.**
9.2	Internal	
9.2.1		Gypsum plaster in dry areas.
9.2.2		Cement plaster in wet areas
9.2.3		Dry distemper in service area & basement.
9.2.4		Oil bound distemper/Acrylic emulsion paint/ Textured paint (low V.O.C)
9.3	Painting	Doors & windows – Painting/polishing on wood work as per design requirement.
10.0	**PROVISION FOR BARRIER FREE BUILDING**	Ramps, toilets for physically challenged, chequered tiles use of Braille signages & lifts etc.GRC (Glass reinforced concrete) tiles in Ramp area.
11.0	**LANDSCAPING**	10% of the building cost will be kept in Preliminary Estimate for murals and/ Landscape related construction i/c pavement/ paving.

ANNEXURE –III

Central Public Works Department

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Copy of the Memo no. 29/21/58/WI Dated: New Delhi, Oct. 1983

Subject: **Rules for working out plinth area from plans**

In order to ensure the adoption of a uniform method of working out plinth areas from plans, the following rules are laid down. These rules are general in nature and should be taken as a guide. They are based on the fundamental principle that the plinth area of a building should present a true picture of the covered floor area provided in the plan.

1. GENERAL

(a) The total plinth area of a building shall be the sum total of the plinth area at every floor including the basement, if any.

(b) Internal sanitary shafts shall not be included in the plinth area in the case of a residential building at any floor level.

(c) In case of non-residential building internal shafts for sanitary installations, air-conditioning ducts, lifts etc. shall be included in the plinth area at all floor levels.

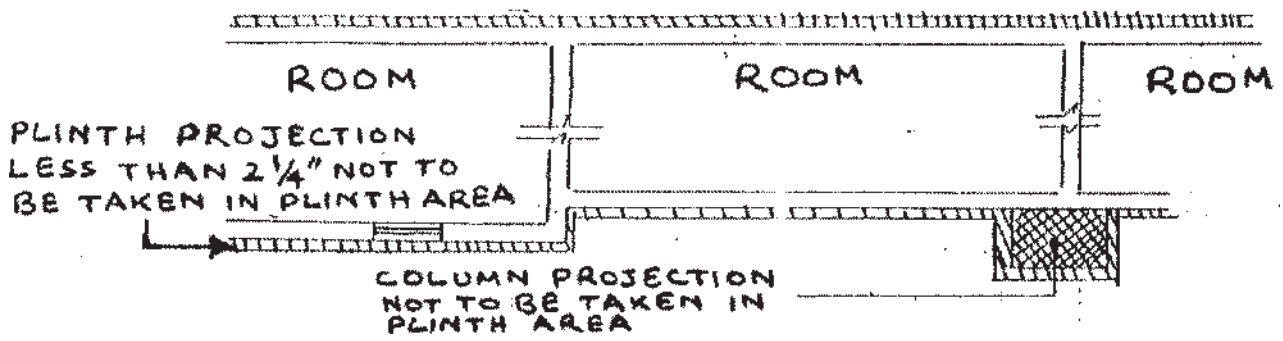
(d) The area of the mumty at terrace level shall not be included in the plinth area. If a Barsati is provided jointly with mumty then the area of the Barsati excluding mumty at the terrace level shall be included in the plinth area as shown below in the hatched area.

TERRACE PLAN

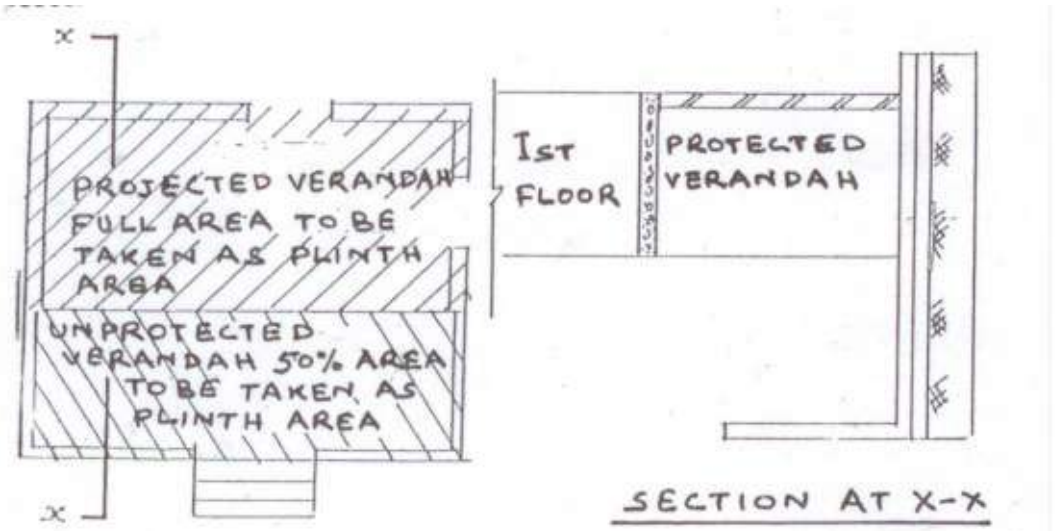
(e) Towers, turrets domes projecting above the terrace shall not be included in the plinth area at terrace level, but shall be allowed for separately for costing purposes.

PLINTH AREA OF GROUND FLOOR

The plinth area of the ground floor shall be calculated at the plinth level excluding the plinth off-sets provided such plinth off-sets are not more than 2 ¼" . In cases where the building consists of – columns projecting beyond cladding, the plinth area shall be taken up to the external face of the cladding and shall not be included the projections of the columns.

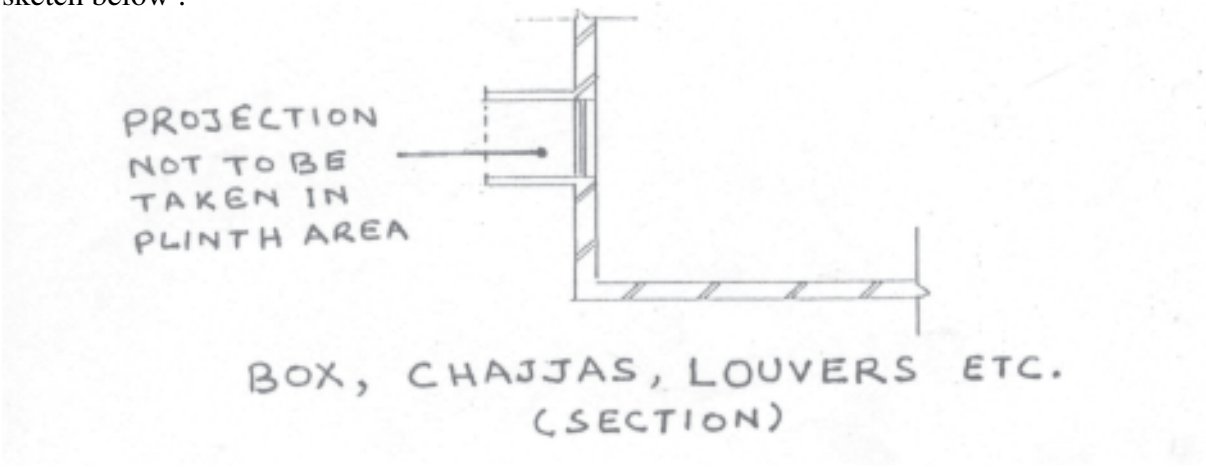


In case open verandah with parapets are protected at the ground floor projecting out of the building, the full area shall be taken up to the outer line of the external verandah lintel and only 50% of area shall be taken for the unprotected verandah. Open platform without parapets and terraces at ground floor and porches, shall not be included in the plinth area but shall be allowed for separately for costing purposes.

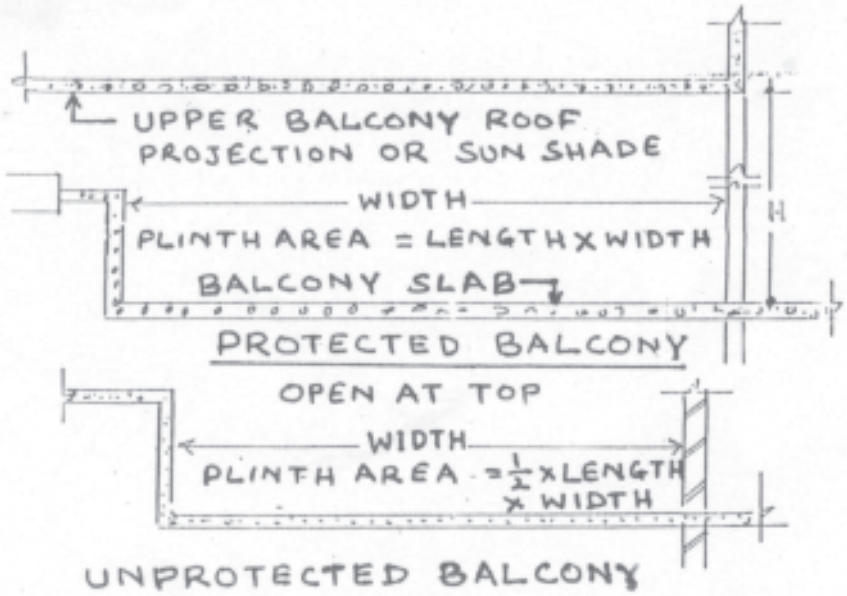


PLINTH AREA AT FIRST AND HIGHER FLOORS

The plinth area of first and higher floors shall be calculated at the relevant floor levels. Architectural bonds, cornice etc. shall not be included in the plinth area even though they may occur at the floor level, vertical sun breakers or box louvers projecting out also shall not be include in plinth area. See illustrative sketch below :



In the case of projecting balconies protected to their full width by the shades full width roof projections or by upper in the case of unprotected balconies equivalent area to the extent of 50% of the area of the balconies shall be included in the plinth area. See illustrative sketch given below:



IV) GALLARIES, MEZZANINE FLOORS, LOFTS

(a) Area of galleries i.e. upper floor of seats in an assembly hall, Auditorium, theatres, etc. shall be fully included in the plinth area.

(b) Area of mezzanine floor i.e. an intermediate floor introduced between two main floors, shall be included in the plinth area, if no separate provision is made for the same.

(c) The area of a loft i.e. an intermediate slab just beneath the floor of roof without any direct staircase leading to it and used for storage purpose shall not be included in the plinth area.

Sd/-
Chief Engineer
Central P.W.D.

(Er. RAM DIYA)	(Er. K.L.LANGAR)	(Er. M.K.KANCHAN)
ASSTT. ENGINEER-III	EXECUTIVE ENGINEER	SUPTDG.ENGINEER(S&S)
S&S- II, CPWD	(S&S) II, CPWD	CPWD, NIRMAN BHAWAN
NIRMAN BHAWAN, N.D.	NIRMAN BHAWAN, N.D.	NEW DELHI

ANNEXURE - 4

PROFORMA FOR CALCULATION OF COST INDEX

S.No.	Description		Unit	Rate as on 1.10. 2012 in Rs.	Weightage	Rate at the time of revision of cost Index	Cost Index
1.	BRICKS		1000 Nos.	3867.00	8.00		
2.	CEMENT(OPC)		QTL.	587.00	14.50		
3.	STEEL a) 8 & 10 MM(TOR STEEL) b) 12 & 16 MM (TOR STEEL)	 50% 50 %	QTL.	4669.00	19.50		
4.	AGGREGATE 20 MM SIZE		CUM.	1350.00	6.50		
5.	SAND(COARSE SAND)		CUM.	1293.00	3.00		
6.	FLOORING ITEMS (a) MOSAIC TILES (b) CERAMIC TILES (c) KOTA STONE (d) GRANITE STONE	 40% 40% 10% 10%	SQM.	467.00	3.00		
7.	PAINTS (a) SYNTHETIC ENAMEL PAINT (b) O.B.D. (c) PLASTIC EMULSION PAINT	 33.33% 33.33% 33.33%	LITRE	151.00	3.00		
8.	PLY AND COMM. WOOD (i) 12 MM THICK PARTICLE BOARD (ii) STEEL WINDOW STANDARD Z SECTION (iii) ALUMINIUM WINDOW	 33.33% 33.33% 33.33%	SQM.	1476.00	5.00		
9.	PIPES (i) 15 MM G.I. PIPE (ii) 100MM SCI PIPES (iii) 20 MM Black Conduit	 33.33% 33.33% 33.33%	MTR.	300.00	2.50		
10.	LAMPS & FANS (i) CEILING FANS 48" (ii) 1.20 M FLUORSCENT TUBE WITH FITTINGS	 50 % 50 %	EACH	1024.00	3.50		
11.	ELECT MACHINERY FITTING MOTORS 7.5 HP (PUMP SET) 1500 RPM (KIRLOSKAR)		EACH	30380.00	2.50		
12.	WIRES & CABLES COPPER WIRES` (a) 1.5 SQMM (b) 4.0 SQMM	 70% 30%	100 MTR.	1790.00	4.00		
13.	LABOUR (i) SKILLED (ii) UNSKILLED	 50 % 50 %	EACH	309.38	25.00		

ANNEXURE - V

SPECIFICATIONS FOR BUILDINGS

NON- RESIDENTIAL

S.No.	Description	Item no.	Office	Hospitals	Schools
1	2	3	4	5	6
1	FOUNDATIONS	1.1	Bearing capacity 10 tonnes/square metre.		
		1.2	Type – Spread foundations isolated/ combined		
		1.3	Depth.- Upto 1.2 metres below ground level		
2.	SUPER STRUCTURES	2.1	RCC framed construction with filler walls in brick work or load bearing construction in brick/stone masonry with intermediate columns where found necessary.		
		2.2	Internal partition in brick masonry		
		2.3	RCC chajjas, fins, jalis etc.		
3.	DOORS & WINDOWS	3.1	Frames of 2nd class Indian teakwood or equivalent or T-iron frame, pressed steel frame as per CPWD Specifications		
		3.2	Door shutters; Panelled type in 2nd class teak wood or flush door with commercial ply as per CPWD Specifications		
		3.3	Window shutters 2nd class Indian teak wood	Window shutters 2nd class Indian teak wood. Fly proof shutters for all doors & windows and iron grills for windows in ground floor shall be provided for which provision for extra rate will be made or steel windows.	Window shutters 2nd class Indian Teak wood or Steel windows.
		3.4	Fittings	Anodized aluminium or equivalent	
4.	FLOORING	4.1	Main entrance hall terrazzo tiles, kota stone and the like. Lavatory blocks and corridors & some officers room. Mosaic limited upto 25% of total area.	Main entrance hall terrazzo tiles, kota stone & the like. Lavotory blocks corridors and other rooms except stores, weather-maker rooms etc. mosaic flooring with dado upto 7'0" height. In corridors & upto sill level in other rooms, the flooring & dado to be limited to 50% in ordinary cement and 50% in white cement.	Main entrance hall, staircase, lavatory blocks in-situ mosaic
		4.2	Rest of the area ordinary cement concrete	Rest of the area ordinary cement concrete	Rest of the area ordinary cement concrete
5.	ROOFING	5.1	Filling for drainage lime concrete	Filling for drainage lime concrete	Filling of drainage lime concrete finished with brick tiles
		5.2	Water-proofing treatment 4 course treatment finished with brick tiles	Water-proofing treatment 4 course treatment finished with brick tiles.	Water-proofing treatment 4 course treatment finished with brick tiles.
6.	FINISHING	6.1	External water proofing cement paint	External water proofing cement paint	External water proofing cement paint
		6.2	Internal Officers rooms & important rooms such as Committee Rooms dry distemper to be limited upto 25% of the total area. Rest either colour or white wash. Main entrance hall plastic emulsion paint or the like. (Low V.O.C)	Internal dry distemper in doctors room, operation theatre other important rooms, such as committee room, X-ray room etc. Limited upto 25% of total area. Rest either colour or white wash. Main entrance hall, OPD Plastic emulsion paint or the like. (Low V.O.C)	Internal – entrance hall, principals room, Committee room etc. dry distemper. Rest of the area white or colour wash. (Low V.O.C)
		6.3	Door & windows- painting	Doors & windows painting	Doors & windows painting

SPECIFICATIONS FOR RESIDENTIAL BUILDINGS

Item no.	Item	Type I, II, III & Servant Qtrs.	Type –IV	Type –V/VI	Hostel
1.1	Foundation	Bearing capacity 10 tonnes per sq. metre.	Applicable to all		
1.2		Type –spread foundation in RCC isolated /combined, continuous wall footing with lean concrete.			
1.3		Depth upto 1.2 metres below ground level			
2.1	Super structure	RCC framed construction with filler walls in brick work or load bearing construction in brick/stone masonry with intermediate columns where found necessary.			
2.2		Internal partition- half brick masonry in cement mortar 1:4			

S No.	Item	Type I, II, III & Servant Qrs.	Type IV	Type V and VI
3.1	**Frames**			
3.1.1	Window	Pressed steel frames made out of corrosion resistant coated sheet of 1.6 mm thick with double rebate	Pressed steel frames made out of corrosion resistant coated sheet of 1.6 mm thick with double rebate/scratch proof aluminium sheets/poly-propylene windows	Same as Type IV
3.1.2	Door	T-Iron /Pressed steel/Pre-cast R.C.C. frames.	Pressed steel frames made out of corrosion resistant coated sheet of 1.6 mm thick with single rebate/factory manufactured precast RCC frames.	Same as Type IV
3.2	**Shutters**			
3.2.1	Window	M.S. tubular box section corrosion resistant coated shutters. Wire mesh shutters may also be provided at the discretion of Zonal Chief Engineer.	M.S. tubular box section corrosion resistant coated shutters. Wire mesh shutters may also be provided at the discretion of Zonal Chief Engineer /Scratch proof aluminium window. Shutters to match with frame.	Same as Type IV
3.2.2	Main Door	Double door, one with iron grill with wire mesh mosquito proof and other 35 mm thick panelled shutter with hard wood style and rail with panelling of pre-laminated particle board, one side decorative other side balancing.	Same as Type I to III.	Same as Type I to III except that panelling will be of both side decorative, pre-laminated particle board.
3.2.3	W.C / Bath room	Solid PVC shutters 28 mm thick	Same as Type I to III	Same as Type I to III
3.2.4	Kitchen door	Partly panelled and partly wire mesh with stainless steel wire mesh. The panelling with pre-laminated particle board, one side decorative-35 mm thick panelled shutter with hard wood style and rails.	Same as Type I to III	Partly panelled and partly wire mesh with stainless steel wire mesh. The panelling with pre-laminated particle board, both sides decorative-35 mm thick panelled shutter with hard wood style and rails.

S No.	Item	Type I, II, III & Servant Qrs.	Type IV	Type V and VI
3.2.5	Other doors	35 mm thick panelled shutters with hard wood style and rail with panelling of prelaminated board, one side decorative.	Same as Type I to III	35 mm thick panelled shutters with hard wood style and rail with panelling of pre laminated board, both sides decorative.
3.3	**Fittings**	Powder coated M.S. fittings/ stainless steel fittings	Power coated aluminium/ stainless steel fittings	Same as type IV
3.4	Peep hole and security chain for external door only.	Yes	Yes	Yes

Note : 1. In item no. 3 of Wood work, if any other option of local material is available, the same can also be used by the respective Chief Engineers.
2. External sliding door bolt and handles will be in powder coated M.S. or stainless steel.
3. Over deck insulation with PUF Slab/Koba treatment on roofing in all type of quarters.

S No.	Item	Type I, II, III & Servant Qrs.	Type IV	Type V and VI
4 4.1	**Flooring** In rooms, kitchen, internal circulation area	Mosaic flooring and skirting with ordinary cement except in common circulation area and staircase	Same as Type 1 to III	Mosaic/ Terrazzo tile flooring with white cement. In kitchen, ceramic tiles/marbles flooring
4.2	Common circulation area, staircase	Kota stone flooring and matching skirting. In staircase, single piece Kota stone shall be used	Same as Type I to III	Same as Type IV
4.3	Kitchen work top	Kota stone	Udaipur green marble/Granite stone	Granite stone
4.4	Toilets	Mosaic	Ceramic Tiles	Ceramic Tiles
4.5	Skirting/Dado	Ceramic glazed tiles in Indian Type WC upto 90 cm. height and bath room upto door jamb height.	Same as Type I to III	Ceramic glazed tiles upto ceiling height with a decorative band of tiles.
5.0 **5.1**	**Finishing** **External**	Acrylic smooth exterior finish or washed stone grit plaster or exposed brick work	Premium Acrylic smooth exterior finish with additive of silicone or washed mosaic plaster in ordinary cement or exposed brick work	Premium Acrylic smooth exterior finish with additives of silicone or washed mosaic plaster in ordinary cement or exposed brick work.
5.2	**Internal**	All walls and ceilings to be treated with the 2 mm thick POP followed with a coat of acrylic/ oil bound distemper except kitchen, bath & WC and all ceiling, which will be done with white wash. Synthetic enamel paint on all wood work and steel work.	All walls & ceiling to be treated with 2 mm thick POP followed with a coat of acrylic / oil bound distemper except kitchen, bath & WC and all ceilings, which will be done with white wash. Synthetic enamel paint on all wood work and steel work.	All walls & ceiling to be treated with 2mm thick POP plaster and cornices followed with a coat of plastic emulsion paint except kitchen, bath and WC and all ceilings, which will be done with white wash. Synthetic enamel paint on all wood work and steel work.

SCALE OF AMENITIES FOR GENERAL POOL ACCOMMODATION

Item No.	Item	Type I	Type II	Type III	Type IV	Type V/VI
1 (i)	**Kitchen** Shelves in tiers not more than 400mm wide along one wall 1 " thick	Yes	Yes	Yes	Covered cup boards above sill level with pre-laminated decoarative board.	Same as Type IV
(ii)	**Kitchen sink**	Stainless steel sink without drain board size 610 X 510 mm with bowl depth 200 mm.	Same as Type -I	Same as Type - I	Stainless steel sink with drain board size 510 X 1040 mm with bowl depth 200 mm	Stainless steel sink of size 510 x 1040 mm with bowl depth of 250 mm with draining board/ vitreous china sink with draining board of size 600 x 450 x 250 mm
(iii)	Dado Ceramic glazed tiles for 60cm. above work top and around sunken floor	Yes	Yes	Yes	Yes	Ceramic glazed tiles upto 60 cm above cooking platform all around
(iv)	Built in cupboard with open shelves below cooking platform shutters of pre-laminated particle board 18mm thick below window sill level of cooking platform along one wall	Yes	Yes	Yes	Yes with 2 drawers	Yes with 2 drawers
(v)	Cooking platform standing	Yes	Yes	Yes	Yes	Yes
2(i)	**Wardrobes** Built in cupboard with R.C.C./pre-laminated particle board/Kota stone shelves and shutter upto ceiling height	One in each Bed Room 7'- 00" height	One in each Bed Room, 7'-00" height	One in each Bed Room 7'-00" height	One in each Bed Room upto ceiling height	One in each Bed Room upto ceiling height
(ii)	Magic eye in front door	One	One	One	One	One
(iii)	Window sill lining 18mm thick projected with Kota stone/marble	Kota Stone	Kota Stone	Kota Stone	Kota Stone	Marble
(iv)	Curtain rods with brackets	All rooms	All rooms	All rooms	Drapery rods	Drapery rods
(v)	Set of Pegs	In bath and bed rooms	In bath and bed rooms	In bath, bed rooms and wardrobes	In bath, bed rooms and wardrobes	In bath, bed rooms and wardrobes

SCALES OF SANITARY FITTINGS FOR GENERAL POOL RESIDENTIAL QUARTERS

Item No.	Item	Type I	Type II	Type III	Type IV	Type V/VI
1.	Indian W.C. Pan with flushing cistern	One WC Pan Orissa pattern with low level PVC Flushing Cistern	One Same as Type I	One same as Type I	One same as Type I	One + One for servant quarter
2.	European type W.C. with low level flushing cistern	-	-	-	One with low level PVC flushing cistern	One (syphonic type)with matching low level cistern
2(a)	Water Jet with low level European W.C.	-	-	-	One	One
3.	Wash basin with one tap each	One	One	One	Two mixer type for hot & cold water	Three mixer type for hot & cold water
4.	Tap (kitchen bath & W.C.) C.P. Brass/ PTMT bib cock	4 PTMT	4 PTMT	4 C.P. brass	5 C.P. brass	12 (1 PTMT + 11 CP brass)
5	Shower C.P. Brass / PTMT	One PTMT	One PTMT	One PTMT	Two C.P.brass	Three C.P. brass
6.	Towel rail C.P. Brass/ PTMT	One PTMT	One PTMT	One PTMT	Two C.P. brass	Two C.P. brass
7.	Mirror / Bevelled edge/ P.V.C. frame with PTMT glass shelf	One	One	One	Two	Three
8.	Soap rack (Nitch in W.C./ Bath)	One	One	One	Two	Three
9.	Liquid soap container	-	-	-	Two	Three
10.	Storage tank	500 ltr.	500 ltr.	500 ltr.	750 litre	1000 litre + 500 litre for servant quarter
11.	Nitch with Kota stone sill in bath room	One	One	One	Two	3 + 1 for servant quarter

Note : Waste coupling in wash basins and grating over the floor trap shall be only of PTMT.

SPECIFICATIONS FOR ELECTRICAL INSTALLATION IN RESIDENTIAL QUARTERS

Item No.	Description	Type I	Type II	Type III	Type IV	Type V (excluding servant quarter & Garage)	Type VI (excluding servant quarter & garage)	Servant Qtrs & Garage
1.	Power Points (15 amperes, 6 pins	2	3	4	5	6	7	1
2.	MCB connected socket outlet for A.C. unit /Geyser complete with wiring	1	1	1	2	4	5	-
3.	Ceiling Fans	2	3	4	5	6	7	1
4.	Exhaust Fans	1	1	1	1	1	1	-
5.	Call bells	1	1	1	1	2	3	-
6.	Light/Fans/Call bell/5A Plug Points	17	20	23	27	38	44	5
7.	F.I. Fittings excluding Tube and Starter	2	3	4	5	7	8	1
	Type of Wiring	Recessed Conduit wiring			Concealed conduit wiring			
8.	EDB MCB Type							
	A. Single Phase	1	1	1	-	-	-	1
	B. 3 Phase	-	-	-	1	1	1	-
9.	Cable TV Point	1	1	1	1	2	2	-
10.	Telephone Point	-	-	-	1	2	2	-

भारत सरकार
केंद्रीय लोक निर्माण विभाग
(प्रौद्योगिकी अनुप्रयोग एवं मानक एकक)
निर्माण भवन, नई दिल्ली

सं: 62/एस ई (टी ए एस)/प्लिन्थ एरिया रेट्स/399 दिनांक: 24.12.2012

ज्ञापन

कुरसी क्षेत्र की दरे जो 1–10–2007 (पुनः मुद्रित) को लागू थी पिछली बार दि. 19–07–2010 के ज्ञापन सं 62/ अ. अभि/पी0 ए0 आर 2007/10.11/192 के अन्तर्गत अनुबन्ध–1 से 4 सहित परिचालित की गई थी। 1–10–2007 को आधार 100 के संदर्भ में संबंधित लागत सूचकांक चालू कार्यो के लिए इस कुरसी क्षेत्र दरों पर आगे भी लागू रहे।

तथपि ग्रिहा के तीन स्टार रेटिंग के लिए हरितभवन की संकल्पना को शामिल करते हुए पिछले पाँच वर्षो मे मूल्य वृद्धि तथा, निर्माण कार्यो मे नयी पद्धतियो के विकास जैसे कि गगन चुम्भी भवनो के लिए अग्नि शमन के उपायो की वजह से नये कुर्सी क्षेत्र दरो को जारी किये जाने की आवश्यकता अनुभव की जा रही हैं।

तदानुसार 1–10–2012 को आधार 100 के संदर्भ में नई कुरसी क्षेत्र दरें विभाग में परिचालित करने के लिए तैयार कर ली गई है। भविष्य में प्रारंभिक अनुमान इन कुरसी क्षेत्र दरो के आधार पर तैयार किए जाएंगे।

सभी दरें विभिन्न फील्ड ढॉचों से प्राप्त हाल ही के निष्पादित संरचनाओं के वास्तविक कार्य के आंकड़ो पर आधारित है। हिन्दी तथा अग्रेजी रूपांतर में यदि कोई विसंगति पाई जाती है, ऐसी स्थिति में अंग्रेजी रूपांतर मान्य होगा।

1–10–2012 की स्थिति के अनुसार नवीन कुरसी क्षेत्र दरें निम्नलिखित अनुबंधो सहित जारी की जाती है।

अनुबंध 1 : 1–10–2012 को नई कुरसी क्षेत्र आधार 100 सहित (आवासीय/ गैर आवासीय भवनो, सेवाओं और विकास के लिए)

अनुबंध 2 : व्यापक विनिर्देश और स्वच्छता वैधुत अन्वायुक्तियों फिटिंग्स जिन पर कुरसी क्षेत्र दरें लागू है, के लिए सुविधाओं का मान।

अनुबंध 3 : अनुबंध 1 में दी गई कुरसी क्षेत्र दरों को लागू करते समय आयोजना से कुरसी क्षेत्र का पता लगाने के लिए 10/83 के ज्ञापन सं 29/21/58 डब्लू–1 मे दिए गए नियमो का पालन किया जाना चाहिए।

अनुबंध 4 : 1–10–2012 को आधार 100 के साथ भावी लागत सूचकांक के लिए लागत सूचकांक की गणना के लिए प्रपत्र जिससे संशोधित अधिमूल्यों का भी उल्लेख किया जाए।

अनुबंध 5 : भवनों के लिए विनिर्देश– गैररिहायशी और रिहायशी भवनों

अनुलग्नकः अनुबंध 1 से 5

हस्ता.
(राकेश मिश्रा)
निर्माण महानिदेशक
के.लो.नि.वि, निर्माण भवन, नई दिल्ली

01.10.2012 की स्थिति के अनुसार कुरसी क्षेत्र दरें

अनुबन्ध – 1

क्रम संख्या	विवरण	कार्यालय / कालेज / अस्पताल	स्कूल	हॉस्टल	आवासीय
1	2	3	4	5	6
1.0 (अ)	**प्रबलित सीमेंन्ट कंक्रीट ढांचेदार संरचना (विनिर्देश अनुबंध –II के अनुसार)**	दर रूपये प्रति वर्ग मीटर			
1.1(अ)	छः मंजिल तक प्रबलित सीमेंन्ट कंक्रीट ढांचेदार संरचना				
1.1.1(अ)	तल की ऊंचाई 3.35 मीटर	23500	17000		
1.1.2 (अ)	तल की ऊंचाई 2.90 मीटर			16500	16000
1.0 (ब)	प्रबलित सीमेंट कंक्रीट ढाँचेदार संरचना (सामान्य भवन) विनिर्देश अनुबंध –V के अनुसार)				
1.1 (ब)	छः मंजिल तक प्रबलित सीमेंट को कीट ढाँचे से संरचना				
1.1.1 (ब)	तल की ऊंचाई 3.35 मीटर	19000	15200		
1.1.2 (ब)	तल की ऊंचाई 2.90 मीटर			15000	14500
1.2	**निम्नलिखित के लिये अतिरिक्तः**				
1.2.1	नौ मंजिल तक छः मंजिल के ऊपर प्रत्येक अतिरिक्त मंजिल	560	560	560	560
1.2.2	बारह मंजिल तक नौः मंजिल के ऊपर प्रत्येक अतिरिक्त मंजिल	580	580	580	580
1.2.3	3.35 मी / 2.90 मी की सामान्य तल ऊंचाई के ऊपर तल की प्रत्येक 0.3 मी अतिरिक्त उंचाई	270	270	270	270
1.2.4	0.6 मी / ऊंचाई की सामान्य तल कुरसी उंचाई के उपर प्रत्येक 0.3 मी उच्चतर कुरसी (केवल भूतल क्षेत्र पर)	270	270	270	270
1.2.5	1.20 मी की सामान्य गहराई के ऊपर प्रत्येक 0.30 मी अधिक गहरी नींव (केवल भूतल क्षेत्र पर)	270	270	270	270
1.2.6	बाद में एक अतिरिक्त तल का भार वहन करने के लिए ठोस नींव बनाना (केवल भूतल क्षेत्र पर)	2270	2270	2270	2270
1.2.7	10 टन प्रति वर्ग मी से कम क्षमता सहने वाली घटिया मिटटी में पट्टी नींव (केवल भूतल क्षेत्र पर)	520	520	520	520
1.2.8	भूकम्प बल प्रतिरोधक	1140	1140	1140	1140
1.2.9	प्रबलित सीमेंन्ट कंक्रीट राफ्ट नींव (केवल भूतल क्षेत्र पर)	6450	6450	6450	6450
1.2.10	15 मीटर की गहराई तक स्थूण नींव (केवल भूतल क्षेत्र पर)	11750	11750	11750	11750
1.2.11	ज्यादा ठोस संरचना घटक जो 500 कि. ग्राम प्रति वर्ग मी से अधिक व 1000 कि. ग्राम प्रति वर्ग मी तक भार धारण क्षमता के हों	1500	1500	1500	1500
1.2.12	35 वर्ग मी. से ज्यादा बड़े मापांक	1500	1500	1500	1500
1.3	**तहखाना तल**				
1.3.1	सामान्य जल सह उपचार युक्त तल 3.35 मी ऊंचा तल	19000	-	-	-

1.3.2	**निम्न के साथ तहखानों के लिये अतिरिक्त**				
1.3.2.1	प्रति 0.3 मी की अतिरिक्त ऊंचाई (3.35 मी से उपर)	2320	-	-	-
1.3.2.2	तह खाने की 3.35 मीं की सामान्य उंचाई से प्रत्येक 0.5 मीं कम उंचाई के लिये कटौती	(-1280)	-	-	-
1.4	**अग्निशमन**				
1.4.1	आर्द्र उद्रवाही तंत्र	500	500	500	500
1.4.2	छिड़काव तंत्र युक्त	750	750	750	750*
1.5	**अग्नि चेतावनी प्रणाली**				
1.5.1	हस्त चालित अग्नि चेतावनी तंत्र	-	-	-	300
1.5.2	स्वचालित अग्नि चेतावनी तंत्र	500	500	500	500*
1.6	**शल्य किया कक्ष (ओ. पी. डी) (अतिरिक्त प्रावधान)**	2150	-	-	-
1.7	**तहखानो में पाष्वरीकृत यांत्रिक सवातन तंत्र (इग्जॉस्ट ब्लोएर तंत्र सहित)**	650	650	650	650
1.8	स्टिल्ट पोर्षन				
1.8.1	बंहुमजिलि आ सी सी संरचना का स्टिल्ट पोर्षन (3.35 मी की ऊंचाई तक) केवल प्रयोज क्षेत्र	9850	9850	9850	9850
1.8.2	प्रत्येक 0.30 मी अतिरिक्त ऊंचाई (3.35 मी से ऊपर)	450	450	450	450

*तारांकित मद सं. 1.4.2 एवं 1.5.2 रिहायशी भवन, एन.वी.सी. 2005 के अनुसार जिनकी ऊंचाई 45 मी. से ज़्यादा है के लिए लागू है ।

क्रम संख्या	विवरण	गैर आवासीय			आवासीय		
		कार्यालय/ कालेज/ अस्पताल	स्कूल	हॉस्टल	टाईप -I, II, III और सर्वेण्ट क्वार्टर	टाईप–IV	टाईप–V, VI और इनसे ऊपर
1	2	3	4	5	6	7	8
2.0	**भार धारक निर्माण**						
2.1	**तल की ऊंचाई 3.35 मी.**						
2.1.1	एक मंजिला	15000	14000	-	-	-	-
2.1.2	दो मंजिला	14300	12200	-	-	-	-
2.1.3	तीन मंजिला	15000	14000	-	-	-	-
2.1.4	चार मंजिला	16000	14000	-	-	-	-
2.2	**तल की ऊंचाई 2.90 मी.**						
2.2.1	एक मंजिला	-	-	13300	11600	12800	14000
2.2.2	दो मंजिला	-	-	11700	11300	12400	13100
2.2.3	तीन मंजिला-	-	-	13300	11600	12800	13400
2.2.4	चार मंजिला-	-	-	14000	12200	13500	14300
2.3	**स्कूटर व साइकिल शेड**	-	-	-	10500	10500	10500
2.4	**गैराज**	-	-	-	10000	10000	10000
2.5	**निम्नलिखित के लिये अतिरिक्तः**						
2.5.1	3.35 मी/ 2.90 मी की सामान्य उंचाई से अधिक प्रत्येक 0.3 मी. की अतिरिक्त उंचाई	270	270	270	270	270	270
2.5.2	0.60 मी की सामान्य कुरसी ऊंचाई के उपर प्रत्येक 0.3 मी अधिक ऊंचाई कुरसी (केवल भूतल क्षेत्र पर)	270	270	270	270	270	270
2.5.3	1.20 मी. की सामान्य गहराई पर प्रत्येक 0.3 मी. अधिक गहरी नींव (केवल भूतल क्षेत्र पर)	270	270	270	270	270	270
2.5.4	बाद में एक अतिरिक्त तल का भार धारण करने के लिए ज्यादा ठोस नींव तल बनाना (केवल अतिरिक्त तल के क्षेत्र पर)	780	780	780	780	780	780
2.5.5	10 टन/ वर्ग मी. से कम धारक क्षमता वाली घटिया मिट्टी पर नींव	520	520	520	520	520	520
2.5.6	घटिया मिट्टी पर नींव जिस में 6 मी, लम्बी अन्तः परिवेधित स्थूणा की आवश्यकता हो	5600	5600	5600	5600	5600	5600
2.5.7	प्रबलित सीमेंट कंक्रीट राफट नींव (केवल भूतल क्षेत्र)	6450	6450	6450	6450	6450	6450
2.5.8	15 मीं की गहराई तक स्थूणा नींव (केवल भूतल क्षेत्र पर)	11750	11750	11750	11750	11750	11750
2.6	**भूकंप बल प्रतिरोधी के लिये अतिरिक्त**						
2.6.1	अंचल 5 में	1050	1050	1050	1050	1050	1050

क्रम संख्या	विवरण	गैर आवासीय			आवासीय		
		कार्यालय/ कालेज/ अस्पताल	स्कूल	हॉस्टल	टाईप -I, II, III और सर्वेण्ट क्वार्टर	टाईप–IV	टाईप–V, VI और इनसे ऊंपर
1	2	3	4	5	6	7	8
2.6.2	अंचल 3 व 4 में दो मंजिल या अधिक मंजिलों वाले भवन	520	520	520	520	520	520
2.6.3	अंचल 2 में और अंचल 3 व 4 में एक मंजिल वाले भवनों में भूकम्प बल प्रतिरोधी	-	-	-	-	-	-
2.7	**500 कि. ग्रा./ वर्ग मीं से अधिक 1000 कि. ग्रा. / वर्ग मीं तक का भार धारण करने के लिए ठोस संरचना अवयव**	1500	1500	1500	1500	1500	1500
2.8	**35 वर्ग मी से उपर मापांक**	1800	1800	1800	1800	1800	1800
2.9	**अग्नि शमन**						
2.9.1	आर्द्र उद्रवाही तंत्र युक्त	500	500	500	500	500	500
2.9.2	छिड़काव तंत्र युक्त	750	750	750	750	750	750
2.10	**अग्नि भय चेतावनी तंत्र**						
2.10.1	हस्त चालित अग्नि चेतावनी तंत्र	-	-	-	270	270	270
2.10.2	स्वचालित अग्नि चेतावनी तंत्र	500	500	500	-	-	-
2.11	**ओ. पी. डी शल्य क्रिया कक्ष आदि**	2150		-	-	-	- -

टिप्पणी : मदो की दरें समस्त कुर्सी क्षेत्र पर लागू होंगी परन्तु इसमें निम्नलिखित मदें षामिल नहीं है।

1.2.4, 1.2.5, 1.2.6, 1.2.7 1.2.9, 1.2.10, 1.5, 1.6, 1.7, 1.8, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2:5:6 2.5.7, 2.5.8, 2.8, 2.9, 2.10 और 2.11

क्रम संख्या	विवरण	कार्यालय / कालेज	अस्पताल	स्कूल	हॉस्टल	क्वार्टरों के प्रकार				
						I	II	III	IV	V,VIतथा इससे उपर
1	2	3	4	5	6	7	8	9	10	11
3.0	**सेवाएं**									
3.1	आन्तरिक जल आपूर्ति एवं स्वच्छता संस्थापनाएं	4%	10%	5%	15% संलग्न, शौचालय युक्त 10% शौचालय युक्त	12%	12%	12%	12%	12%
						प्रतिषत का अर्थ सामान्य भवन (1.0B) लागत की प्रतिशतता है।				
3.2	बाहय सेवा संयोजन	5%	5%	5%	5%	5%	5%	5%	5%	5%
3.3	आन्तरिक वैद्युत संस्थापनाएं	12½%	12½%	12½%	12½%	12½%	12½%	12½%	12½%	12½%
						टिप्पणीः उपर्युक्त में सेवा संयोजन प्रभार तथा विद्युतीकरण शामिल नहीं है।				
3.4	स्कूलों में प्रयोगषालाओं के लिये आन्तरिक वैद्युत संस्थापनाएं			15% सामान्य भवन की लागत (1.0B) का	.	.	.	.	.	.
3.5	टर्मिनल भवन और विमान पत्तनों में अन्य संबद्ध संरचनाओं में आन्तरिक वैद्युत संस्थापन	15% भवन लागत का	.	.	.	.	.	.	.	.
3.6	निम्न के लिए अतिरिक्त									
3.6.1	पावर वायरिंग और प्लग	4%	4%	.	.	.	.	.	.	.
3.6.2	सैंट्रल कॉल बेल सिस्टम	1%	-	.	.	.	.	.	.	.
3.6.3	तड़ित चालक									
3.6.3.1	चार मंजिला भवन तक	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
3.6.3.2	पांच से आठ मंजिलें भवन	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
3.6.3.3	आठ मंजिलें भवनों के परे	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
3.6.4	दूरभाषा कंड्यूट्स	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
3.6.5.	केंद्रीय कृत आंतरिक संचार तंत्र	-	-	-	-	1%	1%	1%	1%	1%
3.6.6	कंप्यूटर कंडयूटिंग	0.5%	0.5%	0.5%	0.5%					
3.6.7	गुणवत्ता आश्वासन	1%	1%	1%	1%	1%	1%	1%	1%	1%

गुणवत्ता आश्वासन के लिए 1% प्राविधान केवल तभी लिया जाए जब ग्राहक विभाग द्वारा किसी अन्य विभाग को निरीक्षण हेतु नियुक्त करना सुनिश्चित किया जाए।

क्र.सं.	लिफ्ट की किस्म	क्षमता / व्यक्ति	भार	मीटर / सेकेण्ड मे गति	यात्रा	दरवाजे	नियंत्रण	कीमत (लाख रूपयो में)	प्रत्येक अतिरिक्त तल के लिये अतिरिक्त कीमत (रूपए)
1	2	3	4	5	6	7	8	9	10
4.0	**लिफ्ट**								
4.1	**यात्री लिफ्ट**								
4.1.1	यात्री लिफ्ट	8	544 कि.ग्रा.	1.0	भूतल +4	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	18	125000
4.1.2	यात्री लिफ्ट	8	544 कि.ग्रा.	1.5	भूतल +5	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	24	125000
4.1.3	यात्री लिफ्ट	13	884 कि.ग्रा.	1.0	भूतल +4	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	22	125000
4.1.4	यात्री लिफ्ट	13	884 कि.ग्रा.	1.5	भूतल +5	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	28	125000
4.1.5	यात्री लिफ्ट	16	1088 कि.ग्रा.	1.0	भूतल +4	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	28	150000
4.1.6	यात्री लिफ्ट	16	1088 कि.ग्रा.	1.5	भूतल +5	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	34	150000
4.1.7	यात्री लिफ्ट	16	1088 कि.ग्रा.	2.5	भूतल +12	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	70	150000
4.1.8	यात्री लिफ्ट	20	1360 कि.ग्रा.	0.75	भूतल +4	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	24	150000
4.1.9	यात्री लिफ्ट	20	1360 कि.ग्रा.	1.5	भूतल +5	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	32	150000
4.1.10	यात्री लिफ्ट	20	1360 कि.ग्रा.	2.5	भूतल +12	विद्युत चालित	ए.सी.वी.वी.वी.एफ.	75	150000
4.2	**भारवाहक लिफ्ट (दो गति वाली)**								
4.2.1		1 टन	.	0.5	भूतल +4			26	85000
4.2.2		2 टन	.	0.5	भूतल +4			33	85000
4.2.3		3 टन	.	0.25	भूतल +4			41	100000

(**नोट** 1. ए.सी0बी.बी.एफ.त्र ए.सी. वैरियेबल वोल्टेज वैरियेबल फ्रीक्वैंसी)

2. चार मंजिल से कम मंजिलों के भवनों के लिए भी लिफ्ट का प्राविघान लिया जा सकता है।

क्रम संख्या	विवरण	दर रूपयों में
5.0	**पानी की टंकी ;केवल प्रबलित सीमेंन्ट कंकीटबद्ध**	
5.1	शिरोपरि टंकी स्वतंत्र पद रहित	15 / लीटर
5.2	20 मी. पद ऊंचाई तक की शिरोपरि टंकी	25 / लीटर
5.3	20 मी. तथा 30 मी. तक के बीच पद कीं ऊंचाई सहित शिरोपरि टंकी	30 / लीटर
5.4	30 मी. से 40 मी. के बीच की पद ऊंचाई सहित शिरोपरि टंकी	35 / लीटर
5.5	भूमिगत हौदी	15 / लीटर

क्रम संख्या	विवरण	दर रूपयों में
6.	**स्थल का विकास**	
6.1	**समतलन**	95 / वर्ग मी.
6.2	**आंतरिक सडकें व मार्ग**	145 / वर्ग मी.
6.3	**मल – जल निपटान**	110 / वर्ग मी.
6.4	**फिल्टर जल आपूर्ति**	
6.4.1	100 मि.मी और उससे कम व्यास की लाइनों का वितरण	80 / वर्ग मी.
6.4.2	150 मि.मि से 300 मिमि व्यास के परिधीय ग्रिड पाईप	60 / वर्ग मी.
6.4.3	कच्चा जल आपूर्ति वितरण लाइन 27.00 / वर्ग मी.	45 / वर्ग मी.
6.5	**वर्षा जल नालियॉ**	85 / वर्ग मी.
6.6	**उद्यान संक्रियाएं**	80 / वर्ग मी.
6.7	**मार्ग प्रकाष व्यवस्था**	
6.7.1	प्रदीप्ति लैम्प सहित	95 / वर्ग मी.
6.7.2	एच पी. एम. वी लैम्प सहित	130 / वर्ग मी.
6.7.3	एच पी.एस. वी. लैम्प सहित	165 / वर्ग मी.
6.7.4	वैद्युत संकेतो सहित निकास संकेत पट्ट	85 / वर्ग मी.

टिप्पणी

1. दर प्रति किमी. है तथा इन्हें सम्पूण कूर्सी क्षेत्र / विकसित किए जाने भूखंड पर लागू किया जाना हैं ।
2. ये दरें सामान्य शर्तों तथा सामान्य लेआउट प्लानों पर लागू होंगी । यदि भरने, काटनें या ज्यादा दूरी से सेवा देने में लगें लेआउट की प्रकृति के कारध अतिरिक्त प्रभार अपेक्षित है तो अतिरिक्त प्रांवधान किया जाना चाहिए ।
3. बन्क सर्विसिज़ जलापूर्ति, मलक जल निपटाना आदि की लागत अर्थात ।
   क. नलकूप, पम्प, खुले कूप, शोधन संयंत्र, स्थानीय निकायों के स्त्रोंतों से लाइनों का विस्तार, जल स्त्रोतों पर मुख्य कार्यों आदि ।
   ख. मलक जल पम्प, मलक जल शोधन संयंत्र, सेप्टिक टैंक निपटान बिंदु तक कट फाल सीवर का विस्तार आदि इन दरों में शामिल नहीं है। कार्यस्थल शर्तों को देखते हुए इनमें अतिरिक्त प्रावधान किया जा सकता हैं ।
4. एच.टी. उपकेन्द्र उपकरणों की लागत, एल टी वितरण प्रणाली, डी.जी. सेट पम्प, वातानुकूलन तथा सौंदर्यपरक बाह्य प्रकाश मेटल हैडलाइट लैम्प तथा फैकेड प्रकाश सहित, ऐड्रेशेबल अग्नि चतावनी प्रणाली, राइज़िंग मैस, यू.पी. एस. एविएशन आब्स्ट्रक्शन लाइट्स बाह्य सेवा संयोजन, भंडारन जल कूलर, आई बी एम एस, सी.सी.टी.वी. सुरक्षा के लिए एक्सेस नियंत्रण प्रणाली, सोलर वाटर हीटिंग सिस्टम लाइटिंग आदि उक्त दरों में शामिल नहीं है तथा इन्हें प्रस्तावित भवन में कार्यशील /उपयोगिता पर आधारित वास्तिक में अनुसार लिया जाना है ।
5. (क) को सामान्य पूल कार्यालय तथा सामान्य पूल रिहायश आवास के लिए चुना जाएगा ।
   (ख) को अन्य भवनों के लिए चुना जाएगा ।
6. सिविल तथा विद्युत कार्यों के लिए विचारित ग्रीन मैजर्स :
   क. छत पर ओवरडेक इंसुलेशन तथा हाई एस आर आई रिफ्लैक्टिव पेंट का प्रयोग ।
   ख. आटोक्लेव एइरेटेड कंक्रीट (ए.एसी.) ब्लाक/फ्लाई ऐश/ ईंटों से अधिसंरचनाओं का चिनाई कार्य ।
   ग. रिफ्लैक्टिव ग्लास कोटिंग / हाई परफारमेंस डबल ग्लैंण्ड एकक सहित खिड़की ।
   घ. निम्न वी.ओ.सी. विकल्प वाला पैंट्स
   ङः वर्षा जल संचयन ।
   च. इंफ्रारेड सेंसर तथा फोम फ्लो टैक्नोलॉजी वाला परंपरागत पिलर कॉक का प्रतिस्थापन (कार्यालय तथा अस्पताल में)
   छ. वी.वी.वी.एफ. ड्राइक्स तथा ईसी बी.सी. कंपलैंट चिलर्स सहित ए.सी. संयत्र उच्च कार्यक्षमता मोटर, प्लांट ऑप्टिमाइज़र आदि संयंत्र की लागत शामिल नहीं) ।
   ज. दिन रात सेंसर्स तथा पी.आई आर. सहित ऑटोमेटेड लाइटिंग नियंत्रण आदि ।

हस्ता.	हस्ता.	हस्ता
कार्यपालक अभियन्ता –I (टास)	अधीक्षण अभियन्ता (टास)	मुख्य अभियन्ता; (संविदा, विनिर्देष एव गुणता)
के लो नि वि, निर्माण भवन	के लो नि वि, निर्माण भवन	के लो नि वि, निर्माण भवन
नई दिल्ली	नई दिल्ली	नई दिल्ली

अनुबन्ध–2

आवासीय भवनों के लिए विनिर्देश

मद सं0	मद	टाइप I,II,III, और सर्वेंट क्वार्टर	टाइप–IV	टाइप–V/VI	होस्टल
1.1	नींव	धारण क्षमता 10 टन प्रति वर्ग मी0	सभी पर लागू		
1.2		प्रबलित सीमेंट कंक्रीट विलगकारी/संयुक्त में टाइप स्प्रेड नींव, अल्प सीमेंट कंक्रीट के साथ अविच्छिनभित्ति संपूर्ति।			
1.3		भूमि तल के नीचे 1.2 मी0 तक की गहराई			
2.1	अधिरचना	ईंटो की पूरक दीवारों सहित प्रबलित सीमेंट कंक्रीट ढांचेदार संरचना या ईट पत्थर की चिनाई और आवश्यकतानुसार माध्यमिक स्तम्भों सहित भार धारक संरचना			
2.2		आन्तरिक विभाजन–सीमेंट मसाले में अर्ध ईंट चिनाई 1:4			

क्रम सं0	मद	टाइप I,II,III, और सर्वेंट क्वार्टर	टाइप–IV	टाइप–V/VI
3.1	**चौखट**			
3.1.1	खिड़कियाँ	दोहरे पताम युक्त संक्षारण रोधी आस्तारण वाले इस्पात की 1.6 मिमी मोटाई की चादर से बने दबित इस्पात के चौखट।	पोलि प्रोपिलीन खिड़कियाँ/स्क्रैचप्रूफ एल्यूमिनियम शीट/दोहरे पताम युक्त संक्षारण रोधी आक्तरण वाले इस्पात की चादर से बने दाबित इस्ताप के चौखट।	टाइप IV के समान।
3.1.2	दरवाजे	टी लौह/ दाबित इस्पात/प्री–कास्ट ढलित प्रबलित सीमेंट कंक्रीट चौखट।	फैक्टरी निर्मित प्री कास्ट प्रबलित सीमेंट कंक्रीट चौखट शीट/एकल पताम युक्त संक्षारण रोधी आस्तरण वाले इस्पात की* चादर से बने चौखट।	टाइप IV के समान।
3.2	**शटर**			
3.2.1	खिड़की	मृदु इस्पात नलिकाकार पेटिकाकार परिच्छेद संक्षारण रोधी आस्तारण वाले शटर। अंचल के मुख्य अभियंता के विवेकानुसार तार की जाली वाले शटर भी उपलब्ध कराए जा सकते हैं।	मृदु इस्पात नलिकाकार पेटिकाकार परिच्छेद संक्षारण रोधी आस्तरण वाले शटर। अंचल के मुख्य अभियंता के विवेकानुसार तार की जाली वाले शटर भी उपलब्ध कराए जा सकते हैं। स्क्रैचप्रूफ एल्यूमिनियम खिड़की पल्ले चौखट से मेल खाते हुए।	टाइप IV के समान।
3.2.2	मुख्य दरवाजा	दोहरा दरवाजा, एक दरवाजा जो मच्छर रोधक तार की जाली और लोहे की जाली युक्त हो और दूसरा दरवाजा 35 मिमी मोटाई के दिल्लेदार शटर वाला, सख्त लकड़ी के प्रकार का हो तथा जिसमें पूर्व पटलित पार्टिकल बोर्ड के पैनल वाली पटरी हो जिसकी एक सतह सजावटी और दूसरी संतोलक हो।	टाइप I से III के समान।	टाइप I से III के समान सिवाय इसके कि दोनों तरफ सजावटी पूर्व पटलित पार्टिकल बोर्ड का पैनल होगा।
3.2.3	शौच कुंड/ स्नानागार	28 मिमी मोटाई के ठोस पी0वी0सी0 शटर	टाइप I से III के समान।	टाइप I से III के समान।
3.2.4	रसोई का दरवाजा	आंशिक दिल्लेदार और आंशिक तार की जाली वाला जिसमें स्टेनलस इस्पात की तार जाली हो। पैनलिंग पूर्व पटलित पार्टिकल बोर्ड से होगी जिसकी एक सतह सजावटी होगी, 35 मिमी मोटाई का दिल्लेदार शटर जो सख्त काष्ठ के स्टाइल और रेल से बने हों।	टाइप I से III के समान।	आंशिक दिल्लेदार और आंशिक तार की जाली वाला जिसमें स्टेनलस इस्पात की तार जाली हो। पैनलिंग पूर्व पटलित पार्टिकल बोर्ड से होगी जिसकी दोनों सतहें सजावटी होगी, 35 मिमी मोटाई का दिल्लेदार शटर जो सख्त काष्ठ के स्टाइल और रेल से बने हों।

* 1.6 मिमी मोटाई की

क्रम सं0	मद	टाइप I,II,III, और सर्वेंट क्वार्टर	टाइप–IV	टाइप–V/VI
3.2.5	अन्य दरवाजे	35 मिमी मोटाई के दिल्लेदार शटर जो सख्त काष्ठ प्रकार और पटरी का हों तथा पूर्व पटलित बोर्ड से पैनलिंग हो, एक तरफ सजावटी।	टाइप I से III के समान।	35 मिमी मोटाई के दिल्लेदार शटर जो सख्त काष्ठ के प्रकार और पटरी के हों तथा पूर्व पटलित बोर्ड से पैनलिंग हो, दोनों तरफ सजावटी।
3.3	**फिटिंग्स**	चूर्ण आस्तरण वाली मृदु इस्पात फिटिंग्स/ स्टेनलैस इस्पात फिटिंग्स।	चूर्ण आस्तरण वाली एल्यूमिनियम/ स्टेनलैस इस्पात फिटिंग्स।	टाइप IV के समान।
3.4	केवल बाहरी दरवाजों के लिए झांक छिद्र और सुरक्षा चेन	हाँ	हाँ	हाँ

नोटः–1.काष्ठ कार्य की मद संख्या 3 में, यदि स्थानीय सामग्री का कोई और विकल्प उपलब्ध हो तो उसे संबंधित मुख्य अभियंता द्वारा प्रयोग में लाया जा सकता है।

2. बाहरी सरकावाँ दरवाजे चिटकनियाँ और मूठें, चूर्ण आस्तरण वाले मृदु इस्पात या स्टेनलैस इस्पात के होंगे।

3. सभी प्रकार के रिहाइसी मकानों में छत पर कोबा ट्रीटमेन्ट करना होगा।

क्रम सं0	मद	टाइप I,II,III, और सर्वेंट क्वार्टर	टाइप–IV	टाइप–V/VI
4.0	**फर्श बिन्दी**			
4.1	शयन कक्ष/ बैठक कक्ष	ग्रे/बीज रंग की (12''x12'' आकार मैट फिनिश) की अनुमोदित अभिकल्प की कांचित सिरेमिक फर्श टाइलें।	टाइप I से III के समान।	ग्रे/बीज रंगों की अनुमोदित अभिकल्प की परिशोधित सिरेमिक फर्श टाइलें (16''x16'' मैट फिनिश)।
4.2	रसोई, आंतरिक सर्कुलेशन क्षेत्र	अनुमोदित अभिकल्प की सिरेमिक कांचित टाइलें (12''x12'' आकार, मैट फिनिश)	टाइप I से III के समान।	अनुमोदित अभिकल्प की परिशोधित सिरेमिक टाइलें (16''x16'' आकार मैट फिनिश)
4.3	कॉमन सर्कुलेशन क्षेत्र, सीढ़ियाँ।	(i) कोटा पत्थर की फर्शबिन्दी और उससे मेल खाती स्कर्टिंग/ सीढ़ियों में एकल खण्ड पालिश किया हुआ तथा नोजिंग बनाया हुआ कोटा पत्थर प्रयोग में लाया जाएगा। (ii) हल्के ग्रे/मन्द हरे रंग की सिरेमिक टाइल्स (12''x12'' आकार) की डैडो–स्कर्टिंग से 120 सेमी ऊचाई तक, हरे संगमरमर की नोजिंग सहित।	टाइप I से III के समान।	टाइप IV के समान।
4.4	रसोई वर्क – टॉप।	हरा संगमरमर पहले से पालिश किया हुआ तथा पहले से नोजिंग बनाया हुआ।	टाइप I से III के समान।	ग्रेनाइट पत्थर पहले से पालिश किया और नोजिंग बनाया हुआ।
4.5	शौचालय	अनुमोदित अभिकल्प की सिरेमिक टाइलें (12''x12'' आकार) मैट फिनिश व एण्टीस्किड	टाइप I से III के समान।	परिशोधित सिरेमिक टाइलें (16''x16'') मैट फिनिश। एन्टी–स्किड अनुमोदित अभिकल्प की

4.6	स्कर्टिगं/डैडो।	सिरेमिक काँचित टाइलें। दरवाजे की ऊँचाई तक। (न्यूनतम 8''x12'' आकार)	टाइप I से III के समान।	छत की ऊँचाई तक सिरेमिक काचित टाइलें (न्यूनतम 8''x12'' आकार) जिसमें सजावटी टाइलों की पट्टी हो।
5.1	**बाहय संपूर्ति**	एक्रीलिक मसृण बाहय संपूर्ति या प्रक्षालित स्टोन ग्रिट प्लस्तर या आनावृत ईंट कार्य।	सिलिकॉन के योजक सहित प्रीमियम एक्रीलिक मसृण बाहय संपूर्ति या साधारण सीमेन्ट में प्रक्षालित मोजैक पलस्तर या अनावृत ईंट कार्य।	सिलिकॉन के योजक सहित प्रीमियम एक्रीलिंगक मसृण बाहय संपूर्ति या साधारण सीमेंट में प्रक्षालित मोजेक प्लस्तर या अनावृत ईट कार्य।
5.2	**आन्तरिक संपूर्ति**	छत और सभी दीवारों को 2 मिमी मोटाई के ओ0 पी0 से उपचारित किया जाएगा तत्पश्चात् एक्रीलिक/तेल आधारित डिस्टेम्पर किया जाएगा, सिवाय, छत के जिस पर सफेदी की जाएगी। सभी काष्ठ कार्य और इस्पात् कार्य पर सिंथेटिक एनेमिल रोगन किया जाएगा।	टाइप I से III के समान।	छत और सभी दीवारों को 2 मिमी मोटाई के पी0 ओ0पी0 से उपचारित किया जाएगा तत्पश्चात् प्लास्टिक एमेलश्न रोगन किया जाएगा। सिवाय छत के जिन पर सफेदी की जाएगी। सभी काष्ठ कार्य और इस्पात कार्य पर सिथेंटिक एनेमिल रोगन किया जाएगा।

सामान्य पूल आवास में सुविधाओं संबंधी पैमाना

मद सं.	मद	टाइप I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V/VI
1.	**रसोई**					
(i)	एक दीवार के साथ क्रम (टिअर) में शेल्फें जो 400 मिमी से अधिक चौड़ी न हो	हाँ	हाँ	हाँ	सिल स्तर से ऊपर पूर्व पटलित सजावटी बोर्ड वाली ढकी हुई अलमारियाँ	टाइप–IV के समान
(ii)	**रसोई का सिंक**	निकासी बोर्ड के बिना स्टेनलैस इस्पात सिंक	टाइप – I के समान	टाइप – I के समान	निकासी बोर्ड युक्त स्टेनलैस इस्पात सिंक	निकासी बोर्ड युक्त स्टेनलस स्टील सिंक /निकासी बोर्ड युक्त चीनी मिट्टी से निर्मित सिंक
(iii)	**डैडो** वर्क टॉप से उपर तथा चारो ओर 60 सेमी. तक तथा किचन सिंक के नीचे के लिए सिरेमिक काँचित टाइलें 8''X12''	हाँ	हाँ	हाँ	हाँ	सिरेमिक काँचित टाइलें (8''X12'' आकार) 60 सेमी0 ऊँचा डैडो स्कर्टिंग से 60 सेमी की ऊँचाई तक किचन प्लेट फार्म के ऊपर तथा चारों ओर तथा सिंक के चारों ओर नीचे सिवाय उन क्षेत्रों की छोड़ कर जहाँ किचेन कैबिनट लगी हों।
(iv)	कुकिंग प्लेटफार्म से नीचे खुले शटर वाली बिल्ट–इन अलमारी, 18 मिमी वाले पूर्व पटलित पार्टिकल बोर्ड के शटर जो कुकिंग प्लेटफार्म की खिड़की की देहल के तल से नीचे हों और एक दीवार के साथ लगे हों।	हाँ	हाँ	हाँ	हाँ, 2 दराजों वाला	हाँ, 2 दराजों वाला
(v)	कुकिंग प्लेटफार्म स्टैंडिग	हाँ	हाँ	हाँ	हाँ	हाँ
2 (i)	**वार्डरोब** प्रबलित सीमेंट कंक्रीट /पूर्व प्रटलित पार्टिकल बोर्ड / कोटा पत्थर की शैल्फों युक्त बिल्ट इन अलमारियाँ जिनमें छत की ऊँचाई तक के शटर लगे हों।	(प्रत्येक शयन कक्ष में एक) –7^1–00'' ऊँचाई की	(प्रत्येक शयन कक्ष में एक)–7^1–00'' ऊँचाई की	(प्रत्येक शयन कक्ष में एक)–7^1–00''ऊँचाई की	(प्रत्येक शयन कक्ष में एक) छत तक ऊँचाई की	(प्रत्येक शयन कक्ष में में एक) छत तक ऊँचाई की
(ii)	आगे के दरवाजे में झाँक छिद्र	एक	एक	एक	एक	एक
(iii)	कोटा पत्थर / संगमरमर से सज्जित 18 मिमी मोटी लाइनिंग वाली खिड़की देहल	कोटा पत्थर	कोटा पत्थर	कोटा पत्थर	कोटा पत्थर	संगमरमर
(iv)	बैक्रेट युक्त परदों की छड़े	सभी कक्ष	सभी कक्ष	सभी कक्ष	परदों के लिए सजावटी छड़े	परदों के लिए सजावटी छड़े
(v)	खूंटियों का सेट	शयन कक्ष और स्नानागार में	शयन कक्ष और स्नानागार में	स्नानागार, शयन कक्ष और वस्त्रधानियों में	स्नानागार, शयन कक्ष और वस्त्रधानियों में	स्नानागार,शयन कक्ष औरं वस्त्रधानियों में

सामान्य पूल रिहायशी क्वार्टरों के लिए स्वच्छता अन्वायुक्ति के मान

मद सं.	विवरण	टाइप I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V/VI
1.	द्वि–धावन टंकी युक्त भारतीय प्रकार का शौचकुण्ड।	निम्न स्तर पी0 वी0 सी0 धावन टंकी युक्त उड़ीसा प्रकार का एक शौचकुण्ड।	टाइप–I के समान	टाइप–I समान	टाइप–I समान	एक + एक सर्वेट क्वार्टर के लिए
2.	निम्न स्तर की द्वि–धावन टंकी युक्त यूरोपीय प्रकार का शौच कुण्ड।	–	–	–	एक निम्न स्तर पी0 वी0 सी0 द्वि–धावन टंकी युक्त	एक (साइफोनिक टाइप) मेल खाता निम्न स्तरीय कुण्ड युक्त
2.(a)	कम लेबल के यूरोपीय शौच कुण्ड युक्त जल प्रधार	–	–	–	एक	एक
3.	धावन पात्र प्रत्येक एक पिलर नल के साथ	एक	एक	एक	गर्म और ठण्डे पानी के लिए दो सी.पी. पीतल मिश्रक प्रकार एक लीवर के साथ	गर्म और ठण्डे पानी के लिए तीन सी.पी. पीतल मिश्रक प्रकार एक लीवर के साथ
4.	नल (रसोईघर, स्नानघर शौचकुण्ड) सी0 पी0 पीतल/ पी0 टी0 एम0 टी0 मुड़ी टोंटी	4 पी0टी0एम0टी0	4 पी0टी0एम0टी0	4 सी0 पी0 पीतल	5 सी0 पी0 पीतल	12 (1 पी0 टी0 एम0टी0 + 11 सी0 पी0 पीतल)
5.	फव्वारा सी0 पी0 पीतल/ पी0 टी0 एम0 टी0	1 पी0टी0एम0टी0	1 पी0टी0एम0टी0	1 पी0टी0एम0 टी0	दो सी0 पी0 पीतल	तीन सी0 पी0 पीतल
6.	टॉवल रेल सी0 पी0 पीतल/ पी0 टी0 एम0 टी0	1 पी0टी0एम0टी0	1 पी0टी0एम0टी0	1 पी0टी0एम0 टी0	दो सी0 पी0 पीतल	दो सी0 पी0 पीतल
7.	शीशा बेवेलित कोर/पी0 टी0 एम0 टी0 काँच शैल्फ युक्त पी0 वी0 सी0 फ्रेम।	एक	एक	एक	दो	तीन
8.	साबुन रैक (स्नान/शोचकुण्ड में निच)	एक	एक	एक	दो	तीन
9.	तरल साबुन पात्र	–	–	–	दो	तीन
10.	भंडारण टंकी	500 लीटर	500 लीटर	500 लीटर	750 लीटर	1000 ली0 + सर्वेंट क्वार्टरों के लिए 500 ली0
11.	स्नानघर में कोटा पत्थर की सिल युक्त निच	एक	एक	एक	दो	3 + 1 सर्वेंट क्वार्टर के लिए
12.	जल शोधक तथा गीजर के लिये नलसाजी	हाँ	हाँ	हाँ	हाँ	हाँ

टिप्पणी :– धावन पात्रों में जलहानि युग्मक तथा फर्श ट्रैप पर जाली केवल पी0टी0एम0टी0 की ही होनी चाहिए।

रिहायसी क्वार्टरों में विद्युत अधिष्ठापन के लिए विनिर्देश

मद सं.	विवरण	टाइप–I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V (सर्वेंट क्वार्टर और गैराज को छोड़कर)	टाइप–VI (सर्वेंट क्वार्टर और गैराज को छोड़कर)	सर्वेंट क्वार्टर और गैराज
1.	पावर प्वाइंट (15 एम्पियर ,6 पिन)	2	3	4	5	6	7	1
2.	वायरिंग सहित ए0 सी0 यूनिट/गीजर के लिए एम0 सी0 बी0 के साथ जुड़ा सॉकेट निर्गम	1	1	1	2	4	5	–
3.	सीलिंग पंखे	2	3	4	5	6	7	1
4.	एग्ज़ॉस्ट पंखे	1	1	2	2	3	3	–
5.	कॉल बैल	1	1	1	1	2	3	–
6.	प्रकाश/पंखे/कॉल बैल /5 एम्पियर प्लग प्वाइंट	17	20	23	27	38	44	5
7.	टयूब और स्टार्टर को छोड़कर एफ0 आई0 अन्वायुक्तियाँ	2	3	4	5	7	8	1
	वायरिंग के प्रकार	**झिरीदार कंडयूट वायरिंग**				**गुप्त कंडयूट वायरिंग**		
8.	ई0 डी0 बी0 एम0 सी0 बी0 टाइप							
	(क) एकल फेज	1	1	1	–	–	–	1
	(ख) 3 फेज	–	–	–	1	1	1	–
9.	केवल टी0 वी0 प्वाइंट	1	1	1	1	2	2	–
10.	टेलीफोन प्वाइंट	–	–	–	1	2	2	–

गैर – रिहायशी भवनों के लिए विनिर्देश

मद सं0	विवरण	विनिर्देश
1.0	**नींव**	मृदा अन्वेषण पर आधारित संरचनात्मक अभिकल्प के अनुसार।
2.0	**अधिरचना**	
2.1	संरचना	फ्लाई ऐश ईंटों/ईंट कार्य सहित पूरक दीवारों के साथ प्रबलित सीमेंट कंक्रीट फ्रेमयुक्त निर्माण या अभिकल्प के अनुसार मध्यवर्ती स्तंभो सहित फ्लाई ऐश ईंटे/ईंट/पत्थर चिनाई से भार धारण निर्माण
2.2 2.2.1 2.2.2 2.2.3 2.2.4	आंतरिक विभाजन	 कम भार वाले ऑटो क्लेव वातित कंक्रीट ब्लॉक जिप्सम ब्लॉक गैर – एस्बेस्टॉस दोहरी त्वचा वाले सीमेंट बोर्ड फ्लाई ऐश की ईंटें
3.0	**दरवाज़े और खिड़कियाँ**	
3.1 3.1.1 3.1.2 3.1.3	चौखट	 अधिकारी कक्ष में भारतीय सागौन की लकड़ी या समतुल्य के द्वितीय श्रेणी दरवाज़े के फ्रेम अनोडिकृत/पाऊडर कोटयुक्त/पॉलिरस्टर पाऊडर कोटयुक्त एल्युमिनियम खिड़कियाँ/दरवाजे। प्लवी काँच का प्रयोग करते हुए दोहरे काँच या परावर्ती काँच लगाना।
3.2 3.2.1 3.2.2 3.2.3	दरवाजे के किवाड़	 के0 लो0 नि0 वि0 विनिर्देशों/अभिकल्प के अनुसार सागौन पृष्ठावरित प्लाई/सामान्य प्लाई सहित सपाट दरवाज़ा या द्वितीय श्रेणी सागौन लकड़ी में पेनलयुक्त प्रकार। जहाँ आवश्यक हो वहाँ फ्लोट काँच पेनलिंग सहित, अनोडिकृत/पाउडर कोटयुक्त/पोलिस्टर पाऊडर कोटयुक्त एल्युमीनियम किवाड़। गीले क्षेत्रों में पी0 वी0 सी0/एफ0 आर0 पी0 दरवाज़ो के फ्रेम किवाड़।
3.3	खिड़कियों के किवाड़	खिड़कियों के लिए फैक्टरी निर्मित एनोडिकृत/पाऊडर कोटयुक्त पोलिस्टर पाऊडर कोटयुक्त 'जैड' सेक्शन एल्युमिनियम फ्रेम और किवाड़।
3.4	अन्वायुक्तियाँ	एनोडिकृत एल्युमिनियम/स्टेनलैस स्टील या समतुल्य
3.5	फायर चैक दरवाजा	अग्नि सुरक्षा विनिर्देश के अनुसार
4.0	**फर्शबन्दी**	
4.1	मुख्य प्रवेश हॉल	प्री पॉलिस ग्रेनाइट फर्शबन्दी
4.2	प्रांगण	मैट फिनिश वाली काचित टाइलें /ग्रेनाइट फर्शबन्दी
4.3	कमरे	ग्रेनाइट टाइलें/काँचित टाईलें/ सिरेमिक टाइल फर्शबन्दी
4.4	लैवेटरी ब्लॉक	ग्रेनाइट फर्शबन्दी
4.5	तहखानें में फर्शबंदी	निर्वात जलापचयनिल कंक्रीट
4.6	शेष क्षेत्र	कोटा पत्थर फर्शबन्दी
5.0	**सीढ़ियाँ**	
5.1	आंतरिक सीढ़ियाँ	ट्रैड और राइजर में मेल खाती स्थायी परिष्कृत विनिर्देशों वाले डैडो सहित एकल खण्ड ग्रेनाइट या संगमरमर फर्शबंदी।
5.2	अग्निसंकट निर्गम सीढ़ियाँ	ट्रैड और राइजर में मेल खाती स्थायी परिष्कृत विनिर्देशों वाले डैडो सहित एकल खण्ड कोटा पत्थर फर्शबन्दी।
6.0	**रेलिंग**	स्टेंललैस स्टील रेलिंग।
7.0	**शौचालय**	ग्रेनाइट फर्शबन्दी/डैडो में काँचित टाइलें जिनका आकार 300x450 मि.मी. से कम न हो । ग्रेनाइट काउण्टर। स्टेनलस स्टील सिंक/शीशा बेवलित कोर जिसका फ्रेम पी0वी0सी0 साँचित हो। एफ0 आर0 पी0/पी0 वी0 सी0 दरवाजें फ्रेम युक्त।

8.0	**छतक्रिया**	
8.1	छत उपचार	कोबा उपचार/पफ के साथ डैक इन्सुलेशन
8.2	कृत्रिम अंतश्छद	अभिकल्प आवश्यकता के अनुसार सेवाओं को कवर करने के लिए कार्यालय और शौचालय में कृतिम अंतश्छद।
9.	**परिष्कृति**	
9.1	बाहरी	सूखे पत्थर का परिलेपन, प्रक्षालित ग्रिट प्लस्तर, जल सह वैदर कोट पेंट, संरचनात्मक काचन, ऊर्जा संरक्षण भवन संहिता के अनुरूप ए0 सी0 पी0 परिलेपन
9.2 9.2.1 9.2.2 9.2.3 9.2.4	आंतरिक	 सूखे क्षेत्रों में जिप्सम प्लस्तर गीले क्षेत्रों में सीमेंट प्लस्तर सर्विस क्षेत्र एवं तहखाने में सूखा डिस्टेम्पर तेल सहित डिस्टेम्पर/एक्रिलिक इमल्शन रोगन/रेशेदार रोगन। (कम वी. ओ. सी.)
9.3	रोगन करना	दरवाजे एवं खिड़कियाँ – अभिकल्प आवश्यकता के अनुसार लकड़ी के काम पर रोगन/पॉलिश करना।
10.0	**अवरोध मुक्त भवन के लिए प्रावधान**	रैम्प, शारीरिक रूप से विक्लांगो के लिए शौचालय, चारखानेदार टाइलें, ब्रेल साइनेज एवं लिफ्ट आदि रैम्प क्षेत्र में जी0 आर0 सी0 (प्रबलित काँच टाइलें)
11.0	**भूदृश्यन**	भवन निर्माण का होने वाली लागत का 10 प्रतिशत कुट्टितम/कुट्टिम निर्माण सहित भित्ति चित्रों और भूदृश्यन निर्माण के लिए प्रारंभिक अनुमान में रखा जाएगा।

अनुंबध . 3

केन्द्रीय लोक निर्माण विभाग

ज्ञापन संख्या : 29/21/58/ डब्लू –1 की प्रति दिनांक नई दिल्ली अक्टूबर 1983

विषयः **नक्शों से कुरसी क्षेत्र निकालने के लिए नियम**

नक्शों से कुरसी क्षेत्रों को निकालने के लिए समान विधि के प्रयोग को सुनिश्चित करने के लिये निम्नलिखित नियम बनाए गए है। ये सामान्य प्रकृति के है और इन्हें मार्गदर्शक के रुप में लिया जाना चाहिए । ये इस मूलभूत सिद्धान्त पर आधारित है कि भवन के कुरसी क्षेत्र से नक्शे में दिये गये आवरित तल क्षेत्र की वास्तविक तस्वीर सामने आ जाए।

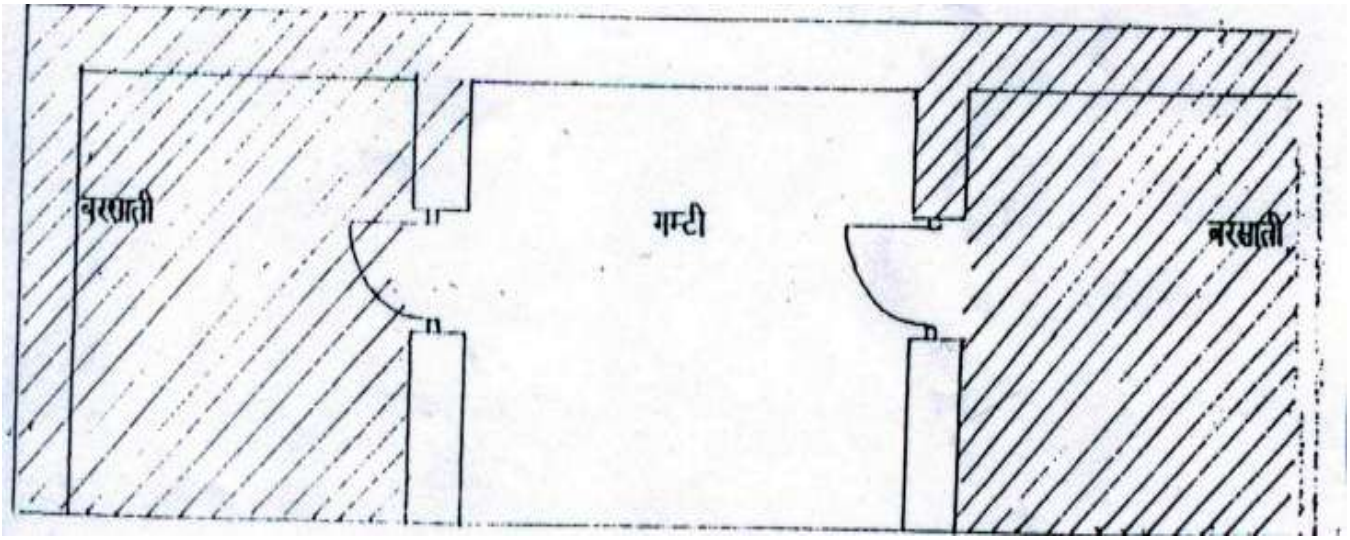
(1) सामान्य

(क) भवन का कुल कुरसी क्षेत्र प्रत्येक तल के कुल कुरसी क्षेत्रों का योग होगा इसमें तहखाना यदि हो, सम्मिलित है।

(ख) आवासीय भवन के मामले में किसी भी तल सतह पर आन्तरिक स्वच्छता शाफट को कुरसी क्षेत्र में सम्मिलित नहीं किया जायेगा।

(ग) गैर आवासीय भवन के मामले में स्वच्छता संस्थापनाओं, वातानकूलन वाहिनी, लिफ्ट आदि के लिये आन्तरिक शैफट को प्रत्येक तल सतह पर कुरसी क्षेत्र में शामिल किया जाएगा।

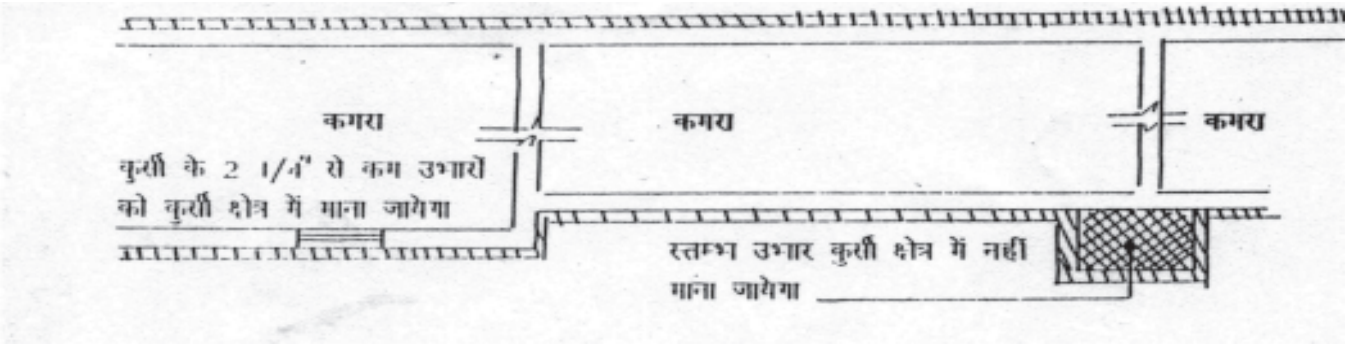
(घ) टैरेस सतह पर मम्टी के क्षेत्र को कुरसी क्षेत्र में शामिल नहीं किया जाएगा, यदि मम्टी के साथ सयुंक्त रुप से बरसाती दी गई है। तब टैरेस सतह पर मम्टी को छोड़कर बरसाती के क्षेत्र में शामिल किया जाएगा जैसा कि नीचे रेखाकिंत है। क्षेत्र में दिखाया गया है।



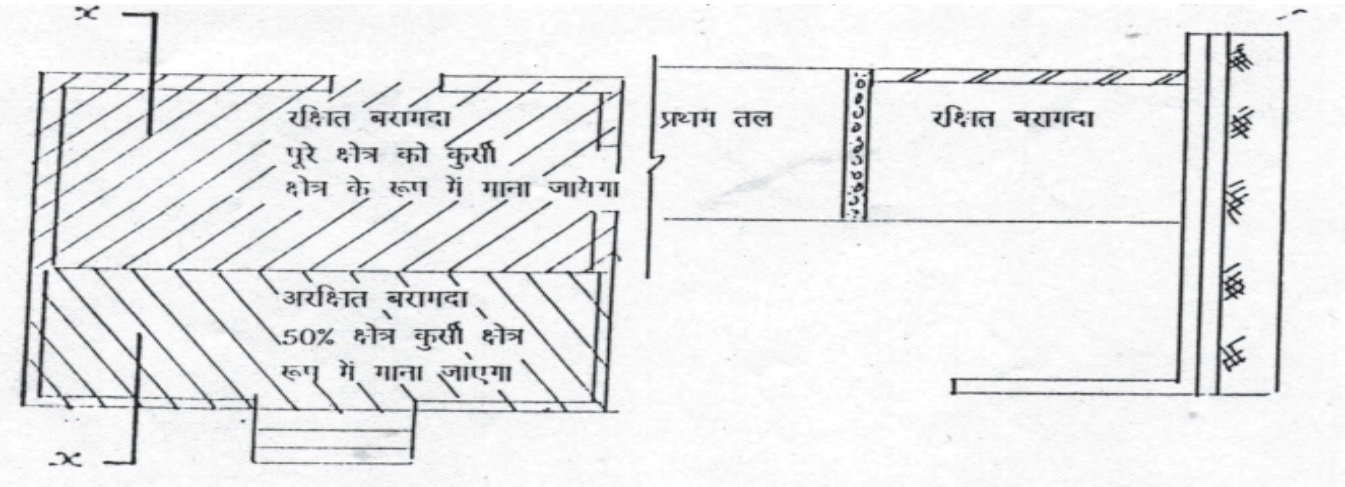
(ड.) टैरेस के ऊपर उभरे हुए टावर टूरेट गुंबद टैरेस सतह पर कुरसी क्षेत्र में शामिल नहीं किए जायेंगे लेकिन लागत के प्रयोजन से अलग स्वीकार्य होंगे।

(2) भूतल का कुरसी क्षेत्र

भूतल के कुरसी क्षेत्र की गणना कुरसी खसकों को छोडकर कुरसी सतह के आधार पर की जाएगी बशर्ते ऐसे कुरसी खसके $2\frac{1}{4}''$ से अधिक न हों ऐसे मामलों में जहां भवन में आवरण से बाहर उभरें हुए स्तम्भ हों, कुरसी क्षेत्र आवरण के बाह्य मुख्य तक लिया जाऐगा और स्तम्भों के उभार को शामिल नहीं किया जाएगा।

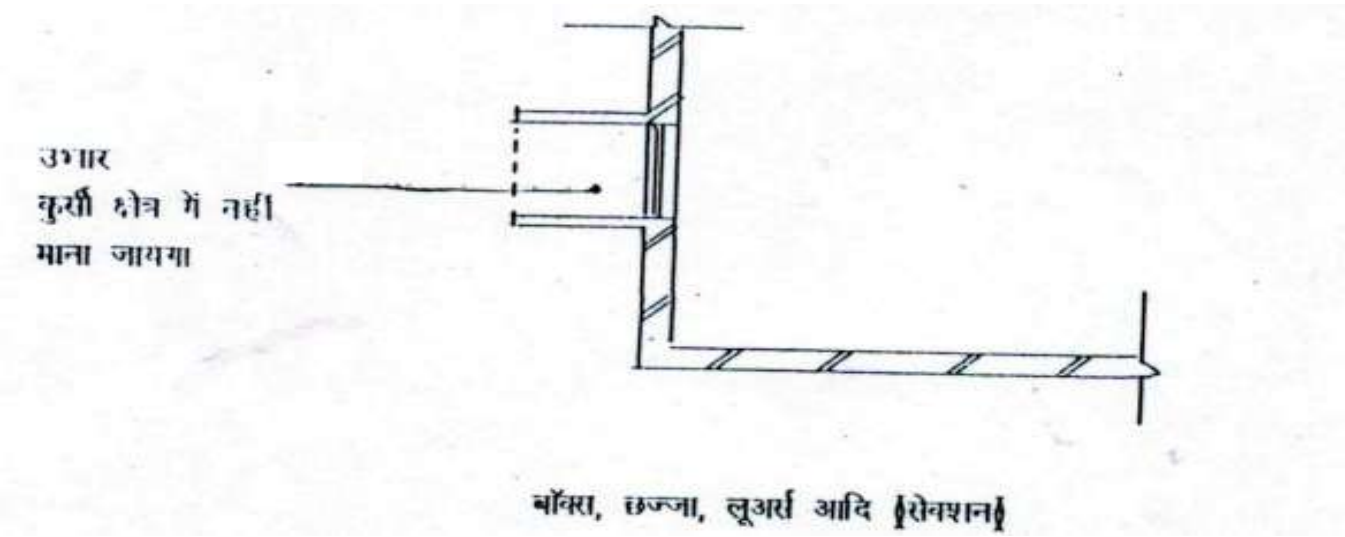


यदि भवन से बाहर प्रक्षेपित भूतल पर पैरापेट सहित खुला बरामदा रखा गया है। तो बाहरी बरामदा लिन्टल की बाहरी लाइन तक का पूरा क्षेत्र लिया जाएगा और बरामदें के अरक्षित भाग पर अरक्षित बरामदे के लिए केवल 50% क्षेत्र लिया जाएगा । भूतल पर बिना पैरापेट के खुला पलेट फार्म एवं टैरेस और पोर्च को कुरसी क्षेत्र में शामिल नहीं किया जाएगा लेकिन लागत के प्रयोजन से ये अलग से स्वीकार्य होंगे।

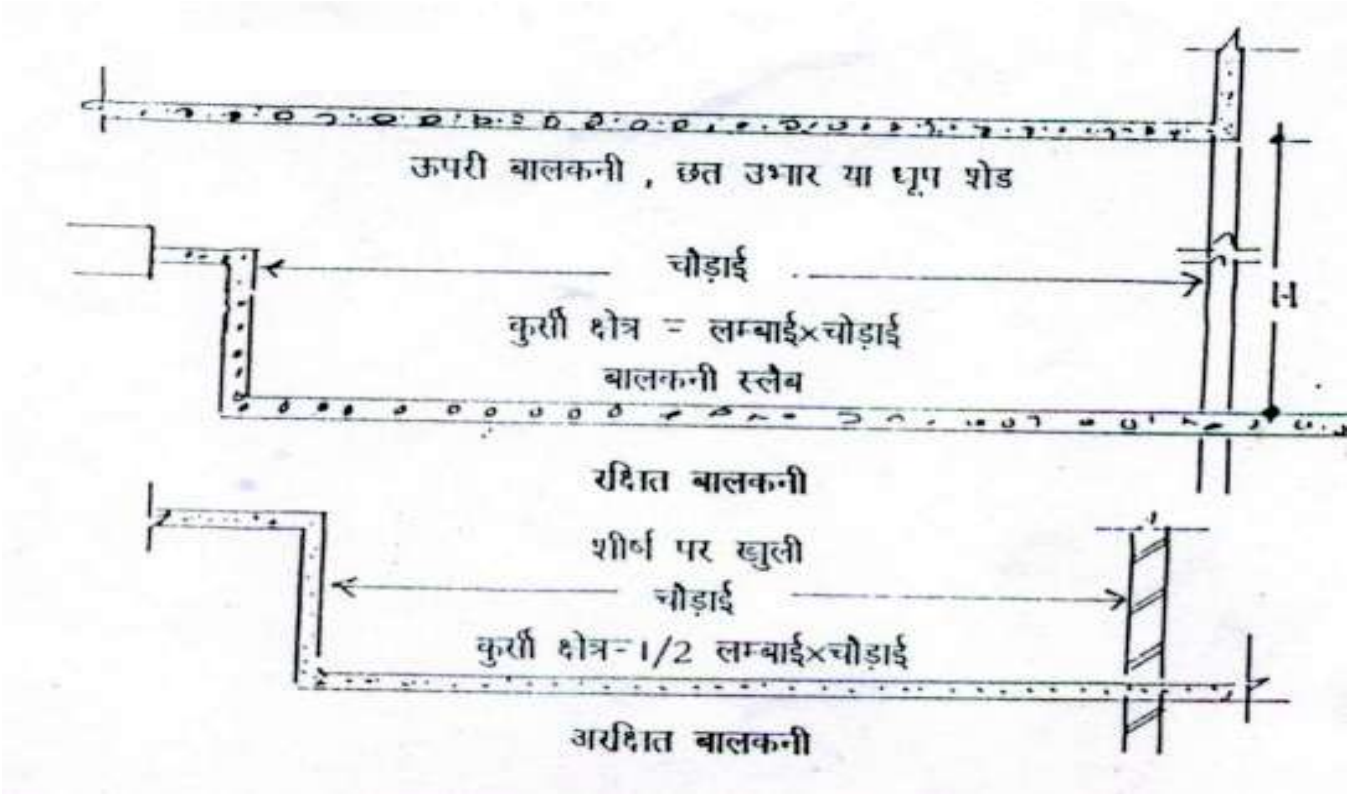


(3) प्रथम एवं उच्चतर तलों पर कुरसी क्षेत्र

प्रथम और उच्चतर तलों के कुरसी क्षेत्र की गणना संबधित तल सतह पर की जाएगी। वास्तुकीय बाण्ड, कॉरनिस आदि कुरसी क्षेत्र में शामिल नहीं किए जाएगे चाहे वे तल सतह पर ही हो, उर्ध्वाधर धूप अवरोधन अथवा बाहय उभरी बॉक्स लूअर भी कुरसी क्षेत्र में शामिल नहीं किए जाएंगे। नीचे निदर्शक चित्र देखें।



बहिर्वेशित बालकनियां जो धूप शेड या संपूर्ण चौड़ाई की बहिर्वेशित छत या ऊपरी बालकनी द्वारा संपूर्ण रुप से रक्षित होती है उनके मामले में उनका पूरा क्षेत्र कुरसी क्षेत्र में शामिल किया जायेगा । अरक्षित बालकनियों के मामले में बालकनियों के 50% तक के क्षेत्र के समतुल्य क्षेत्र को कुरसी क्षेत्र में शामिल किया जायेंगा। नीचे निदर्शक चित्र देखें।



(4) गैलरिया, मेंजनिंग तल, लाफट्स

(क) गैलरियों का क्षेत्र अर्थात असेम्बली हाल, आडीटोरियम, थियेटर आदि में सीटों की उपरी तल को कुरसी क्षेत्र में शामिल किया जायेगा

(ख) मेंजनिंग तल का क्षेत्र अर्थात दो मुख्य तलों के बीच में बनाया गया मध्यवर्ती तल, कुरसी क्षेत्र में शामिल किया जायेगा यदि उसके लिये अलग से प्रावधान न हों ।

(ग) लाफट का क्षेत्र छत के तल के ठीक नीचे बनायी गयी मध्यवर्ती स्लैब जिसमें पहुंचने के लिये कोई सीधी सीढी नहीं होती और इसे भण्डारन के लिये प्रयोग किया जाता है, इसे कुरसी क्षेत्र में शामिल नहीं किया जायेगा ।

हस्ता/–
मुख्य इंजीनियर
केन्द्रीय लोक निर्माण विभाग

हस्ता/–
(ई. डी. आर. शर्मा)
सहायक इंजीनियर –2
एस एण्ड एस, के.लो.नि.वि
निर्माण भवन,नई दिल्ली

हस्ता/–
(ई. के. एल. लांगर)
कार्यपालक इंजीनियर
एस.एण्ड एस –2 के.लो.नि.वि.
नई दिल्ली

हस्ता/–
(ई. एम. के. कंचन)
अधीक्षक इंजीनियर (एस एण्ड एस)
के.लो.नि.वि. नई दिल्ली

अनुबन्ध–4

लागत सूचकांक के परिकलन के लिए प्रोफार्मा

क्र सं0	विवरण		इकाई	1.10.2012 की कुरसी क्षेत्र दरो के अनुसार दर	अधिमूल्य सूचकांक	लागत इंडैक्स के संशोधन के समय दर	लागत सूचकांक
1.	ईटें		1000 नं.	3867.00	8.00		
2.	सीमेंट (ओ0 पी0 सी0)		क्विंटल	587.00	14.50		
3.	इस्पात (अ) 8 एवं 10 मि0 मी0 (टोर इस्पात) (ब) 12 एवं 16 मि0 मी0 (टोर इस्पात)	 50% 50%	क्विंटल	4669.00	19.50		
4.	मिलावा		घन मीटर	1350.00	6.50		
5.	बालू (मोटी रेत)		घन मीटर	1293.00	3.00		
6.	फर्शबंदी मदें (अ) मोजेक टाइलें (ब) सिरेंमिक टाइलें (स) कोटा पत्थर (द) ग्रेनाइट पत्थर	 40% 40% 10% 10%	वर्ग मीटर	467.00	3.00		
7.	रोगन (अ) सिंथिटिक इनेमल पैंट (ब) ओ0 बी0 डी0 (स) प्लास्टिक इमलसन पेंट	 33.33% 33.33% 33.33%	लीटर	151.00	3.00		
8.	प्लाई व साधारण लकड़ी (i) 12 मि0 मी0 मोटा पार्टिकल बोर्ड (ii) इस्पात की खिड़की Z सेक्शन (iii) एलुमिनियम खिड़की	 33.33% 33.33% 33.33%	वर्ग मीटर	1476.00	5.00		
9.	पाइपें (i) 15 मि0 मी0 जस्ती लोहे के पाइप (ii) 100 मि0 मी0 एस0 आई0 पाईप (iii) 20 मिमी काला कन्डयूट	 33.33% 33.33% 33.33%	मीटर	300.00	2.50		
10.	लैम्प और पंखे (i) सीलिंग पंखे 48" (ii) अन्वायुक्तियों सहित 1.20 एम फ्लोरिसेंट टयूब	 50% 50%	प्रत्येक	1024.00	3.50		
11.	वैद्युत मशीनरी अन्वायुक्ति मोटर 7.5 एच0 पी0 (पम्प सेटू) 1500 आर0 पी0 एम0 (किरलॉस्कर)		प्रत्येक	30380.60	2.50		
12.	तारें और केबल ताँबें के तारें (i) 1.5 वर्ग मी0 (ii) 4.0 वर्ग मी0	 70% 30%	100 मीटर	1790.00	4.00		
13.	श्रम (i) कुशल (ii) अकुशल	 50% 50%	प्रत्येक	309.38	25.00		

अनुबन्ध– 5

गैर–रिहायशी भवनों के लिए विनिर्देश

क्रमांक	विवरण	मद सं0	कार्यालय	अस्पताल	विद्यालय
1	2	3	4	5	6
1.	नींव	1.1	धारण क्षमता 10 टन प्रति वर्गमीटर		
		1.2	प्रकारः– स्प्रैड नींव (पृथक/सयुक्त)		
		1.3	गहराईः– भूमि तल से 1.20 मीटर नीचे तक		
2.	अधिरचना	2.1	ईटों की पूरक दीवारों सहित प्रबलित सीमेंट कंक्रीट ढांचेदार संरचना या ईट/पत्थर की चिनाई और आवश्यकतानुसार माध्यमिक स्तम्भों सहित भार धारक संरचना।		
		2.2	आंतरिक विभाजन–सीमेंट मसाले में ईट–चिनाई		
		2.3	प्रबलित सीमेंट–कंक्रीट के छज्जे, फिन्स और जाली इत्यादि।		
3.	दरवाजे और खिड़कियाँ	3.1	चौखटः– द्वितीय श्रेणी की भारतीय सागौन या समकक्ष या टी–लौह चौखट या दाबित इस्पात चौखट, के.लो.नि.वि. विनिर्देशों के अनुसार।		
		3.2	दरवाजे के किवाड़ः– द्वितीय श्रेणी सागौन लकड़ी के दिल्लेदार या सामान्य प्लाई युक्त सपाट दरवाजे, के.लो.नि.वि. विनिर्देशों के अनुसार।		
		3.3	खिडकी के किवाड़ः– द्वितीय श्रेणी भारतीय सागौन की लकड़ी के।	खिड़की के किवाड़ः– द्वितीय श्रेणी के भारतीय सागौन की लकड़ी, मच्छर–रोधक किवाड़ सभी दरवाजे और खिड़कियों के लिये और भूतल में खिड़कियो में लोहे की ग्रिल लगाई जाएगी जिसके लिए अतिरिक्त दर का प्रावधान किया जाएगा, अथवा लोहे की खिड़कियॉ।	खिड़की के किवाड़ः– द्वितीय श्रेणी के भारतीय सागौन की लकडी या लोहे की खिडकी।
		3.4	फिटिंगः– एनोडीकृत एल्यूमिनियम या समकक्ष		
4.	फर्शबन्दी	4.1	मुख्य प्रवेश कक्ष में टेरेजों टाईले, कोटा पत्थर या समकक्ष। शौचालय ब्लाक तथा प्रांगण तथा कुछ अधिकारी कक्षों में मोजैक (कुल क्षेत्रफल का 25 प्रतिशत तक सीमित)	मुख्य प्रवेश कक्ष में टेरेजों टाईले, कोटा पत्थर या समकक्ष। शौचालय ब्लाक, प्रागण और अन्य कमरो में (सिवाय स्टोरं, वेदर मेकर कक्ष आदि मोजैक फर्श तथा 7'.0' ऊचाई तक डैडो। प्रांगण में तथा सिल लेवल तक अन्य कमरों में – फर्श व डैडों 50 प्रतिशत तक सामान्य सीमेंट में तथा 50 प्रतिशत सफेद सीमेंट में।	मुख्य प्रवेश कक्ष, सीढ़ियां, शौचालय ब्लाक–स्थाने–विरचित मोजैक फर्श।
		4.2	बचे हुए क्षेत्र में सामान्य सीमेंट कंक्रीट फर्श।	बचे हुए क्षेत्र में सामान्य सीमेंट कंक्रीट फर्श	बचे हुए क्षेत्र में सामन्य सीमेंट कंक्रीट फर्श
5.	छतक्रिया	5.1	जल निकासी के लिए भराई चूना–कंक्रीट से।	जल निकासी के लिए भराई चूना–कंक्रीट सें।	जल निकासी के लिए भराई चूना– कंक्रीट से तथा ईटों की टाइल्स से सम्पूर्ति।
		5.2	जल–रोधी उपचार चौपरती जल रोधन उपचार तथा ईटों की टाइल्स से संपूर्ति।		

क्रमांक	विवरण	मद सं0	कार्यालय	अस्पताल	विद्यालय
6.	सम्पूर्ति	6.1	बाह्य जल रोधक सीमेंट रोगन।		
		6.2	आंतरिकः– अधिकारी कक्षों एवं महत्वपूर्ण कक्षों जैसे कि सभा कक्ष आदि में सूखा डिस्टेम्पर (कुल क्षेत्र का 25 प्रतिशत तक सीमित) बचे हुए क्षेत्र में रंग या चुने की पुताई रंग या चुने की पुताई। मुख्य प्रवेश कक्ष–प्लास्टिक इमल्शन रोगन या समकक्ष। (कम वी.ओ.सी.)	आंतरिकः– डाक्टरों के कक्ष, शल्य कक्ष एवं अन्य महत्वपूर्ण कक्ष (जैसे सभा, एक्स–रे कक्ष इत्यादि) में सूखा डिस्टेम्पर (कुल क्षेत्र का 25 प्रतिशत तक सीमित) बचे हुए क्षेत्रों में रंग या चूने की पुताई। मुख्य प्रवेश कक्ष–ओ0पी0डी0–प्लास्टिक इमल्शन रोगन या समकक्ष। (कम वी.ओ.सी.)	आंतरिकः– प्रवेश हल, प्रधानाचार्य कक्ष, सभा कक्ष आदि में–सूखा डिस्टेम्पर। बकाया क्षेत्र में–सफेदी या रंग पुतई। (कम वी.ओ.सी.)
		6.3	दरवाजे खिड़किया–रोगन		

आवासीय भवनों के लिए विनिर्देश

मद सं0	मद	टाइप I, II, III और सर्वेंट क्वार्टर	टाइप – IV	टाइप – V/VI	होस्टल
1.1	नींव	घारण क्षमता 10 टन प्रति वर्ग मी0	सभी पर लागू		
1.2		प्रकार प्रबलित सीमेंट कंक्रीट विलगकानी/संयुक्त टाइप स्प्रेड नींव, अल्प सीमेंट कंक्रीट के साथ अविच्छिन भित्ति संपूर्ति।			
1.3		भूमि तल के नीचे 1.2 मी0 तक की गहराई			
2.1	अधिरचना	ईंटो की पूरक दीवारों सहित प्रबलित सीमेंट कंक्रीट ढांचेदार संरचना या ईट पत्थर की चिनाई और आवश्यकतानुसार माध्यमिक स्तम्भों सहित भार धारक संरचना			
2.3		आन्तरिक विभाजन–सीमेंट मसाले में अर्ध ईंट चिनाई 1:4			

क्र0 सं0	मद	टाइप I, II, III और सर्वेंट क्वार्टर	टाइप– IV	टाइप– V/VI
3.1	**चौखट**			
3.1.1	चौखट खिड़कियाँ	दोहरे पताम युक्त संक्षारण रोधी आस्तारण वाले इस्पात की 1.6 मिमी मोटाई की चादर से बने दबित इस्पात के ढाँचे।	पोलि प्रोपिलीन खिड़कियाँ/स्क्रैचप्रूक एल्यूमिनियम शीट/दोहरे पताम युक्त संक्षारण रोधी आस्तरण वाले इस्पात की चादर से बने दाबित इस्पात के ढाँचे।	टाइप– IV के समान।
3.1.2	दरवाजे	टी लौह/दाबित इस्पात/पूर्व ढलित प्रबलित सीमेंट कंक्रीट ढाँचे।	फैक्टरी निर्मित प्री कास्ट प्रबलित सीमेंट कंक्रीट ढाँचे एकल पताम युक्त संक्षारण रोधी आस्तरण वाले इस्पात की चादर से बने दाबित इस्पात के ढाँचे।	टाइप– IV के समान।
3.2	**शटर**			
3.2.1	खिड़की	मृदु इस्पात नलिकाकार पेटिकाकार परिच्छेद संक्षारण रोधी आस्तारण वाले शटर। अंचल के मुख्य अभियंता के विवेकानुसार तार की जाली वाले शटर भी उपलब्ध कराए जा सकते है।	मृदु इस्पात नलिकाकार पेटिकाकार परिच्छेद संक्षारण रोधी आस्तरण वाले शटर। अंचल के मुख्य अभिंयता के विवेकानुसार तार की जाली वाले शटर भी उपलब्ध कराए जा सकते हैं। स्क्रैचप्रूक एल्यूमिनियम खिड़की। शटर चोखट से मैच करते हुए।	टाइप– IV के समान।
3.2.2	मुख्य दरवाजा	दोहरा दरवाजा, एक दरवाजा जो मच्छर रोधक तार की जाली और लोहे की जाली युक्त हो और दूसरा दरवाजा 35 मिमी मोटाई के दिल्लेदार शटर वाला, सख्त लकड़ी के प्रकार का हो तथा जिसमें पूर्व पटलित पार्टिकल बोर्ड के पैनल वाली पटरी हो जिसकी एक सतह सजावटी और दूसरी संतोलक हो।	टाइप– I से III के समान।	टाइप I से III के समान सिवाय इसके कि दोनों तरफ सजावटी पूर्व पटलित पार्टिकल बोर्ड का पैनल होगा।
3.2.3	शौच कुंड/स्नानागार	28 मिमी मोटाई के ठोस पी0वी0सी0 शटर	टाइप– I से III के समान।	टाइप– I से III के समान।

क्र0 सं0	मद	टाइप I, II, III और सर्वेंट क्वार्टर	टाइप– IV	टाइप– V/VI
3.2.4	रसोई का दरवाजा	आंशिक दिल्लेदार और आंशिक तार की जाली वाला जिसमें स्टेनलेस इस्पात की तार जाली है। पैनलिंग पूर्व पटलित पार्टिकल बोर्ड से होगी जिसकी एक सतह सजावटी होगी, 35 मिमी मोटोई का दिल्लेदार शटर जो सख्त काष्ठ के स्टाइल और रेल से बने हों।	टाइप– I से III के समान।	आंशिक दिल्लेदार और आंशिक तार की जाली वाला जिसमें स्टेनसंस इस्पात की तार जाली है। पैनलिंग पूर्व पटलित पार्टिकल बोर्ड से होगी जिसकी दोनों सतहें सजावटी होगी, 35 मिमी मोटाई का दिल्लेदार शटर जो सख्त काष्ठ के स्टाइल और रेल से बने हों।
3.2.5	अन्य दरवाजे	35 मिमी मोटाई के दिल्लेदार शटर जो सख्त काष्ठ की स्टाइल और रेल के हों तथा पूर्व पटलित बोर्ड से पैनलिंग हो, एक तरफ सजावटी।	टाइप– I से III के समान।	35 मिमी मोटाई के दिल्लेदार शटर जो सख्त काष्ठ की स्टाइल और रेल के हों तथा पूर्व पटलित बोर्ड से पैनलिंग हो, दोनों तरफ सजावटी।
3.3	फिटिंग्स	चूर्ण आस्तरण वाली मृदु इस्पात फिटिंग्स/स्टेनलैस इस्पात फिटिंग्स।	चूर्ण आस्तरण वाली एल्यूमिनियम स्टेनलैस इस्पात फिटिंग्स।	टाइप– I से III के समान।
3.4	केवल बाहरी दरवाजों के लिए झांक छिद्र और सुरक्षा चेन	हाँ	हाँ	हाँ

नोटः– 1 काष्ठ कार्य की मद संख्या 3 में, यदि स्थानीय सामग्री का कोई और विकल्प उपलब्ध हो तो उसे संबंधित मुख्य अभियंता द्वारा प्रयोग में लाया जा सकता है।

2 बाहरी सरकावाँ दरवाजे चिटकनियाँ और मूठें, चूर्ण आस्तरण वाले मृदु इस्पात या स्टेनलैस इस्पात के होंगे।

3 सभी प्रकार के रिहायशी मकानों में छत पर कोबा ट्रीटमेंट करना।

क्र0 सं0	मद	टाइप I, II, III और सर्वेंट क्वार्टर	टाइप– IV	टाइप– V/VI
4.0	**फर्श बन्दी**			
4.1	कमरों, रसोई और आंतरिक सर्कुलेशन क्षेत्र	कॉमन सर्कुलेशन क्षेत्र और सीढ़ियों को छोड़कर साधारण सीमेंट से मोजेक फर्शबन्दी और स्कर्टिंग।	टाइप– I से III के समान।	सफेद सीमेंट से मोजेक/टराजो फर्श बिन्दी रसोई में सिरेमिक टाइलें/संगमरमर फर्श बंदी।
4.2	कॉमन सर्कुलेशन क्षेत्र, सीढ़ियाँ।	कोटा पत्थर की फर्श बन्दी और उससे मेल खती स्कटिंग/सीढ़ियों में एकल खण्ड कोटा पत्थर प्रयोग में लाया जाएगा।	टाइप– I से III के समान।	टाइप– IV के समान।
4.3	रसोई वर्क टॉप।	कोटा पत्थर	उदयपुर हरा संगमरमर/ग्रेनाइट पत्थर	ग्रेनाइट पत्थर
4.4	शौचालय	मोजेक	सिरेमिक टाइलें।	सिरेमिक टाइलें
4.5	स्कर्टिंग/डैडों।	भारतीय प्रकार के शौचालय कुंड में 90 सेमी ऊचाई तक एवं स्नानागार में दरवाजे की ऊचाई तक, सिरेमिक काचित टाइलें।	टाइप I से III के समान।	छत की ऊंचाई तक सिरमिक काचित टाइलें जिसमे सजावटी टाइलों की एक पट्टी हो।

क्र0 सं0	मद	टाइप I, II, III और सर्वेंट क्वार्टर	टाइप– IV	टाइप– V/VI
5.0	**संपूर्ति**			
5.1	बाहय संपूर्ति	एक्रीलिक मसृण बाहय संपूर्ति या प्रक्षालित स्टोन ग्रिट प्लस्तर या अनावृत्त ईंट कार्य	सिलिकॉन के योजक सहित प्रीमियम एक्रीलिक मसृण बाहय संपूर्ति या प्रक्षालित मोजेक प्लस्तर या अनावृत्त ईंट कार्य।	सिलिकॉन के योजक सहित प्रीमियम एक्रीलिक मसृण बाहय संपूर्ति या साधारण सीमेंट में प्रक्षालित मोजेक प्लस्तर या अनावृत्त ईंट कार्य।
5.2	आन्तरिक	छत और सभी दीवारों को 2 मिमी मोटाई पी.ओ.पी. से उपचारित किया जाएगा, तत्पश्चात् एक्रोलिक। तेल आधारित डिस्टेम्पर किया जाएगा, सिवाय रसोई घर, स्नानागार और शौच कुण्ड तथा सभी छत जिन पर सफेदी की जाएगी। सभी काष्ठ कार्य और इस्पात कार्य पर सिथेंटिक एनेमिल रोगन किया जाएगा।	छत और सभी दीवारों को 2 मिमी मोटाई पी.ओ.पी. से उपचारित किया जाएगा तत्पश्चात् एक्रीलिक/तेल डिस्टेम्पर किया जाएगा, सिवाय रसोई घर, स्नानागार और शौच कुण्ड तथा सभी छत के जिन पर सफेदी की जाएगी। सभी काष्ठ कार्य और इस्पात् कार्य पर सिथेंटिक एनेमिल रोगन किया जाएगा।	छत और सभी दीवारों को 2 मिमी मोटाई पी.ओ.पी. और कार्निस से उपचारित किया जाएगा तत्पश्चात् प्लास्टिक एमेलश्न रोगन की एक परत लगाई जाएगी, सिवाय रसोई घर, स्नानागार और शौच कुण्ड तथा सभी छत के जिन पर सफेदी की जाएगी। सभी काष्ठ कार्य और इस्पात् कार्य पर सिथेंटिक एनेमिल रोगन किया जाएगा।

सामान्य पूल आवास में सुविधाओं संबंधी पैमाना

मद सं0	मद	टाइप–I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V/VI
1.	**रसोई**					
(i)	एक दीवार के साथ श्रेणीबद्व 1'' मोटी शैल्फ जो 400 मिमी से अधिक चौड़ी न हों	हाँ	हाँ	हाँ	सिल स्तर से ऊपर पूर्व पटलित सजावटी बोर्ड वाली ढकी हुई अलमारियाँ	टाइप– IV के सामान
(ii)	रसोई का सिंक	निकासी बोर्ड के बिना स्टेनलैस इस्पात सिंक जो 200 मिमी गहराई वाले बाऊल युक्त हो और 610 x 510 मिमी आकार का हो।	टाइप–I के सामान	टाइप–I के सामान	निकासी बोर्ड युक्त स्टेनलैस इस्पात सिंक जो 200 मिमी गहराई वाले बाऊल युक्त हो और 510 x 1040 मिमी आकार का हो	निकासी बोर्ड युक्त स्टेनलैस इस्पात सिंक आकार 510 x 1040 मिमी तथा 250 मिमी बाउल की गहराई वाला/निकासी बोर्ड युक्त चीनी मिट्टी से निर्मित सिंक आकार 600 x 450 x 250 मिमी
(iii)	डैडो वर्क टॉप से ऊपर 60 सेमी तक तथा धंसे हुए फर्श के चारों ओर के लिए काचित टाइलें	हाँ	हाँ	हाँ	हाँ	कुकिंग प्लेटफार्म के चारों ओर और 60 सेमी0 ऊपर तक सिरेमिक काचित टाइलें
(iv)	कुकिंग प्लेटफार्म से नीचे खुले शटर वाली बिल्ट–इन अलमारी, 18 मिमी वाले पूर्व पटलित पार्टिकल बोर्ड के शटर जो कुकिंग प्लेटफार्म की खिड़की की देहल के तल से नीचे हों और एक दीवार के साथ लगे हों।	हाँ	हाँ	हाँ	हाँ, 2 दराजों वाला	हाँ, 2 दराजों वाला
(v)	कुकिंग प्लेटफार्म स्टैंडिग	हाँ	हाँ	हाँ	हाँ	हाँ
2	**वस्त्रधानी**					
(i)	वस्त्रधानी प्रबलित सीमेंट कंक्रीट/पूर्व प्रटलित पार्टिकल बोर्ड/कोटा पत्थर की शैल्फों युक्त बिल्ट–इन अलमारियाँ जिसने छत की ऊंचाई तक के शटर लगे हों।	(प्रत्येक शयन कक्ष में एक) –7'– 00'' ऊँचाई की	(प्रत्येक शयन कक्ष में एक) – 7'–00'' ऊँचाई की	(प्रत्येक शयन कक्ष में एक) –7'–'00'' ऊँचाई की	(प्रत्येक शयन कक्ष में एक) छत तक ऊँचाई की	(प्रत्येक शयन कक्ष में एक) छत तक ऊँचाई की

मद सं0	मद	टाइप–I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V/VI
(ii)	आगे के दरवाजे में मैजिक आई	एक	एक	एक	एक	एक
(iii)	कोटा पत्थर/संगमरमर से सज्जित 18 मिमी मोटी लाइनिंग वाली खिड़की देहल	कोटा पत्थर	कोटा पत्थर	कोटा पत्थर	कोटा पत्थर	संगमरमर
(iv)	बैक्रेट युक्त परदों की छड़े	सभी कक्ष	सभी कक्ष	सभी कक्ष	परदों के लिए सजावटी छड़े	परदों के लिए सजावटी छड़े
(v)	खूंटियों का सेट	शयन कक्ष और स्नानागार में	शयन कक्ष और स्नानागार में	स्नानागार, शयन कक्ष और वस्त्रधानियों में	स्नानागार, शयन कक्ष और वस्त्रधानियो में	शयन कक्ष और स्नानागार और व़स्त्रधानियो में

सामान्य पूल रिहायशी क्वार्टरों के लिए स्वच्छता अन्वायुक्ति के मान

मद सं0	मद	टाइप–I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V/VI
1.	धावन टंकी युक्त भारतीय प्रकार का शौचकुण्ड।	निम्न स्तर पी.वी.सी. धावन टंकी सहित उड़ीसा प्रकार का एक शौचकुण्ड।	टाइप–I के सामान	टाइप–I के सामान	टाइप–I के सामान	एक + एक सर्वेंट क्वार्टरों के लिए
2.	ऊंचे स्तर की धावन टंकी युक्त यूरोपीय प्रकार की शौच कुण्ड।	–	–	–	एक निम्न स्तर पी.वी.सी. धावन टंकी युक्त	एक (साइफोनिक टाइप) मेल खात निम्न स्तरीय कुण्ड युक्त
2(क)	कम लेबल के यूरोपीय शौचकुण्ड युक्त जल प्रधार।	–	–	–	एक	एक
3.	प्रत्येक एक नल के साथ धावन पात्र	एक	एक	एक	गर्म और ठंडे पानी के लिए दो मिश्रक प्रकार	गर्म और ठंडे पानी के लिए तीन मिश्रक प्रकार
4.	नल (रसोईघर, स्नानघर एंव शौचकुण्ड) सी.पी. पीतल/पी.टी. एम.टी. मुड़ी टोंटी	4 पी.टी.एम.टी.	4 पी.टी.एम.टी.	4 पी.टी.एम.टी.	5 सी.पी. पीतल	12 (1 पी.टी.एम.टी + 11 सी.पी. पीतल)
5.	फव्वारा सी.पी. पीतल/पी.टी.एम.टी.	1 पी.टी.एम.टी.	1 पी.टी.एम.टी.	1 पी.टी.एम.टी.	दो सी.पी. पीतल	तीन सी.पी. पीतल
6.	टॉवल रेल सी.पी. पीतल/पी.टी.एम.टी.	1 पी.टी.एम.टी.	1 पी.टी.एम.टी.	1 पी.टी.एम.टी.	दो सी.पी. पीतल	दो सी.पी. पीतल
7.	शीशा/बेवेलित कोर/पी.टी.एम.टी. कॉंच शैल्फ युक्त पी.वी.सी. फ्रेम।	एक	एक	एक	दो	तीन
8.	साबुनदानी (स्नान/शोचकुण्ड में निच)	एक	एक	एक	दो	तीन
9.	तरल साबुन पात्र	–	–	–	दो	तीन
10.	भंडारण टंकी	500 लीटर	500 लीटर	500 लीटर	750 लीटर	1000 ली. + सर्वेंट क्वार्टरों के लिए 500 ली.
11.	स्नानघर में कोटा पत्थर की सिल युक्त निच	एक	एक	एक	दो	3 + 1 सर्वेंट क्वार्टरों के लिए

टिप्पणीः–

धावन पात्रों में जलहानि युग्मक तथा फर्श ट्रैप पर जाली केवल पी.टी.एम.टी. की ही होनी चाहिए।

रिहायशी क्वार्टरों में विद्युत अधिष्ठापन के लिए विनिर्देश

मद सं0	विवरण	टाइप–I	टाइप–II	टाइप–III	टाइप–IV	टाइप–V (सर्वेंट क्वार्टर और गैराज को छोड़कर)	टाइप–VI (सर्वेंट क्वार्टर और गैराज को छोड़कर)	(सर्वेंट क्वार्टर और गैराज
1.	पावर प्वाइंट (15 एम्पियर, 6 पिन)	2	3	4	5	6	7	1
2.	ए.सी.यूनिट/गीजर के लिए एम.सी.बी. के साथ जुड़ा सॉकेट निर्गम, वायरिंग सहित	1	1	1	2	4	5	–
3.	सीलिंग पंखे	2	3	4	5	6	7	1
4.	एग्जॉस्ट पंखे	1	1	1	1	1	1	–
5.	कॉल बैल	1	1	1	1	2	3	–
6.	प्रकाश/पंखे/कॉल बैल/5 एम्पियर प्लग प्वांइट	17	20	23	27	38	44	5
7.	टयूब और स्टार्टर को छोड़कर एफ.आई. अन्वायुक्तियाँ	2	3	4	5	7	8	1
	वायरिंग के प्रकार		**झिरीदार कंडयूट वायरिंग**				**गुप्त कंडयूट वायरिंग**	
8.	ई.डी.बी. एम.सी.बी. टाइप (क) एकल फेज़ (ख) 3 फेज	 1 –	 1 –	 1 –	 – 1	 – 1	 – 1	 1 –
9.	केवल टी.वी. प्वाइंट	1	1	1	1	2	2	–
10.	टेलिफोन प्वाइंट	–	–	–	1	2	2	–

Providing New Sewer Connection for households									
Sl. No	Description	Unit	No	Length	Breadth	Depth	Quantity	Rate	Amount
1	Demolishing cement concrete manually /by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge. Nominal concrete 1:4:8 leaner mix (including equivalent design mix)	cum	1	2	0.5	0.15	0.15	801.85	120.28
2	Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidatingeach deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50m All kinds of soil (KWA rate Including Cost index)	cum	1	5	0.5	1	2.5	409.7	1024.25
3	Providing and fixing PVC pipes includes joints of pipes with one step PVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in CHarge. 110 mm dia 4 Kg/cm2	M	1	5			5	349.2	1746.00
4	Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	each	1				1	4431.38	4431.38

5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	cum	1	2	0.5	0.15	0.15	5073.96	761.09
	TOTAL cost for one no								**8083.00**
	Add Water Charges @ 1.0%								80.83
	TOTAL								8163.83
	Add CPOH Profit @ 15.0%								1224.57
	Total								9388.41
	Cost index **35.59 %**								2512.21
	Total with Cost index								11900.62
	Say Grand total for 1 no of Household connection								**11900.62**
6	KWA sewer connection fee & Documentati	eac	1				1		3000.00
									14900.62

MUTTAR STP - Abstract of Pipes at Various Depths																									
	upto 1.5m			upto 3.0M						upto 4.0M					upto 4.5M					above 4.5M-6m					
	DWC	DWC	DWC	DWC	DWC	DWC	HDPE	HDPE	HDPE	DWC	DWC	DWC	HDPE	HDPE	DWC	DWC	DWC	HDPE	HDPE	DWC	DWC	DWC	HDPE	HDPE	
PIPE Size	**200mm**	**250mm**	**300mm**	**200mm**	**250mm**	**300mm**	**400 mm**	**450 mm**	**500 mm**	**200mm**	**250mm**	**300mm**	**400 mm**	**450 mm**	**200mm**	**250mm**	**300mm**	**400 mm**	**450 mm**	**200mm**	**250mm**	**300mm**	**400 mm**	**450 mm**	**Grand Total**
BLOCK 2	9077.32	43	0	9543.46	180.00	202.79	283.95	0	10	1263.35	464.27	237.55	201.37		416.12	61	315.5	210.18		176	307	0	58.00		23050.86
BLOCK 3A	9307	0	0	9676	236	0	260			1249	167	29	200	20	426	60				1031	505				23166
BLOCK 3B	7282	0	0	8241	192	0	288	60		613	65	0	258	157	50	206	126	16	0	92	0	182	0	0	17828
BLOCK 3C	9331	0	42	7058	84	318	581	173		1244	70	0	229	90	539	104	0	0	60	528	0	147	192	499	21289
BLOCK 4	7671.26	557	0	5870.01	331.97	0	123.00	102		1175.37	403	0	380	86	485	393.14	0	105	46	357	20	0	199	0	18304.75
TOTAL	**42668.58**	**600**	**42**	**40388.47**	**1023.97**	**520.79**	**1535.95**	**335**	**10**	**5544.72**	**1169.27**	**266.55**	**1268.37**	**353**	**1916.12**	**824.14**	**441.5**	**331.18**	**106**	**2184**	**832**	**329**	**449**	**499**	**103638.61**

NAME OF SCHEME SEWER NETWORK DESIGN -Revised-Muttar Block 02, 3A, 3B, 3C & 4

Av depth	Dia	Block 02	Block 3A	Block 3B	Block 3C	Block 4	Total	Rate	Amount
		No	No	No	No	No			
1.3	1.2	359	371	301	355	347	1733	**68961.79**	**119510782.1**
1.75	1.2	189	234	213	210	107	953	**80605.98**	**76817498.94**
2.25	1.2	127	153	138	104	89	611	**114929.53**	**70221942.83**
2.75	1.5	103	75	88	82	62	410	**162133.49**	**66474730.9**
3.25	1.5	57	63	36	47	46	249	**185860.97**	**46279381.53**
3.75	1.5	44	26	16	18	38	142	**207092.24**	**29407098.08**
4.25	1.5	25	12	17	25	36	115	**233782.73**	**26885013.95**
4.75	1.5	32	26	17	33	19	127	**256017.54**	**32514227.58**
5.25	1.5	9	23	6	16	7	61	**277606.71**	**16934009.31**
5.75	1.5	0	26	0	1	2	29		
6.25	1.5	0	0	0	0	0	0		
6.75	1.5	0	0	0	0	0	0		
7.25	1.5	0	0	0	0	0	0		
7.75	1.5	0	0	0	0	0	0		
8.25	1.5	0	0	0	0	0	0		
TOTAL		**945**	**1009**	**832**	**891**	**753**	**4430**	**5439**	**485044685.2**

NAME OF SCHEME: SEWER NETWORK DESIGN -Revised-Perandoor Block 3A

MANHOLE ABSTRACT

Lower Range	Upper Range	Av depth	Total	BW	RCC
1.1	1.5	1.3	301	0	301
1.5	2	1.75	213	0	213
2	2.5	2.25	138	0	138
2.5	3	2.75	88	0	88
3	3.5	3.25	36	0	36
3.5	4	3.75	16	0	16
4	4.5	4.25	17	0	17
4.5	5	4.75	17	0	17
5	5.5	5.25	6	0	6
5.5	6	5.75	0	0	0
6	6.5	6.25	0	0	0
6.5	7	6.75	0	0	0
7	7.5	7.25	0	0	0
7.5	8	7.75	0	0	0
8	8.5	8.25	0	0	0
	TOTAL		**832**	**0**	**832**

		301
301.00	>=1.1<1.75	213
514.00	>=1.5<2	138
652.00	>=2<=2.5	88
740.00	>2.5<=3	36
776.00	>3<=3.5	16
792.00	>3.5<=4	17
809.00	>4<=4.5	17
826.00	>4.5<=5	6
832.00	>5<=5.5	0
832.00	>5.5<=6	0
832.00	>6<=6.5	0
832.00		

RCC MANHOLE ABSTRACT

Lower Range	Upper Range	Av depth	No
1.1	1.5	1.3	301
1.5	2	1.75	213
2	2.5	2.25	138
2.5	3	2.75	88
3	3.5	3.25	36
3.5	4	3.75	16
4	4.5	4.25	17
4.5	5	4.75	17
5	5.5	5.25	6
5.5	6	5.75	0
6	6.5	6.25	0
6.5	7	6.75	0
7	7.5	7.25	0
7.5	8	7.75	0
8	8.5	8.25	0
	TOTAL		**832**

NAME OF SCHEME: **SEWER NETWORK DESIGN -Revised-Perandoor Block 3A**

MANHOLE ABSTRACT

Lower Range	Upper Range	Av depth	Total	BW	RCC
1.1	1.5	1.3	355	0	355
1.5	2	1.75	210	0	210
2	2.5	2.25	104	0	104
2.5	3	2.75	82	0	82
3	3.5	3.25	47	0	47
3.5	4	3.75	18	0	18
4	4.5	4.25	25	0	25
4.5	5	4.75	33	0	33
5	5.5	5.25	16	0	16
5.5	6	5.75	1	0	1
6	6.5	6.25	0	0	0
6.5	7	6.75	0	0	0
7	7.5	7.25	0	0	0
7.5	8	7.75	0	0	0
8	8.5	8.25	0	0	0
	TOTAL		**891**	**0**	**891**

		355
355.00	>=1.1<1.75	210
565.00	>=1.5<2	104
669.00	>=2<=2.5	82
751.00	>2.5<=3	47
798.00	>3<=3.5	18
816.00	>3.5<=4	25
841.00	>4<=4.5	33
874.00	>4.5<=5	16
890.00	>5<=5.5	1
891.00	>5.5<=6	0
891.00	>6<=6.5	0
891.00		

RCC MANHOLE ABSTRACT

Lower Range	Upper Range	Av depth	No
1.1	1.5	1.3	355
1.5	2	1.75	210
2	2.5	2.25	104
2.5	3	2.75	82
3	3.5	3.25	47
3.5	4	3.75	18
4	4.5	4.25	25
4.5	5	4.75	33
5	5.5	5.25	16
5.5	6	5.75	1
6	6.5	6.25	0
6.5	7	6.75	0
7	7.5	7.25	0
7.5	8	7.75	0
8	8.5	8.25	0
	TOTAL		**891**

NAME OF SCHEME: SEWER NETWORK DESIGN -Revised-Perandoor Block 3A

MANHOLE ABSTRACT

Lower Range	Upper Range	Av depth	Total	BW	RCC
1.1	1.5	1.3	347	0	347
1.5	2	1.75	107	0	107
2	2.5	2.25	89	0	89
2.5	3	2.75	62	0	62
3	3.5	3.25	46	0	46
3.5	4	3.75	38	0	38
4	4.5	4.25	36	0	36
4.5	5	4.75	19	0	19
5	5.5	5.25	7	0	7
5.5	6	5.75	2	0	2
6	6.5	6.25	0	0	0
6.5	7	6.75	0	0	0
7	7.5	7.25	0	0	0
7.5	8	7.75	0	0	0
8	8.5	8.25	0	0	0
	TOTAL		**753**	**0**	**753**

		347
347.00	>=1.1<1.75	107
454.00	>=1.5<2	89
543.00	>=2<=2.5	62
605.00	>2.5<=3	46
651.00	>3<=3.5	38
689.00	>3.5<=4	36
725.00	>4<=4.5	19
744.00	>4.5<=5	7
751.00	>5<=5.5	2
753.00	>5.5<=6	0
753.00	>6<=6.5	0
753.00		

RCC MANHOLE ABSTRACT

Lower Range	Upper Range	Av depth	No
1.1	1.5	1.3	347
1.5	2	1.75	107
2	2.5	2.25	89
2.5	3	2.75	62
3	3.5	3.25	46
3.5	4	3.75	38
4	4.5	4.25	36
4.5	5	4.75	19
5	5.5	5.25	7
5.5	6	5.75	2
6	6.5	6.25	0
6.5	7	6.75	0
7	7.5	7.25	0
7.5	8	7.75	0
8	8.5	8.25	0
	TOTAL		**753**

NAME OF SCHEME: SEWER NETWORK DESIGN -Revised-Perandoor Block

INPUT													
Size of MH			**1.3 m (Depth) x 1.2m(Dia)**	**1.75 m (Depth) x 1.2m(Dia)**	**2.25 m (Depth) x 1.2m(Dia)**	**2.75 m (Depth) x 1.5m(Dia)**	**3.25 m (Depth) x 1.5m(Dia)**	**3.75 m (Depth) x 1.5m(Dia)**	**4.25 m (Depth) x 1.5m(Dia)**	**4.75 m (Depth) x 1.5m(Dia)**	**5.25 m (Depth) x 1.5m(Dia)**	**5.75 m (Depth) x 1.5m(Dia)**	**6.25 m (Depth) x 1.5m(Dia)**
Man hole Depth		**m**	1.3	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25
Dia		**m**	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Cover slab Thk.		**m**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Side wall Thk.		**m**	0.2	0.2	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Base slab thk		**m**	0.2	0.2	0.25	0.25	0.25	0.25	0.3	0.3	0.3	0.3	0.3
Base slab Projection		**m**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Addl. Working Width		**m**	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sand Fillng		**m**	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
PCC for LC		**m**	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
at 0.55 m depth	Pipe dia	mm	200	200	200	200	200	200	200	200	200	200	200
MH cover	Dia.	m	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Side wall perimeter-centre of section		**m**	4.4	4.4	4.56	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Base slab Dia		**m**	2	2	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Projection above GL		**m**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Depth		m	1.8	2.25	2.8	3.3	3.8	4.3	4.85	5.35	5.85	6.35	6.85
Dia		m	2.6	2.6	2.7	3	3	3	3	3	3	3	3
EW	Volume	cum	9.557	11.946	16.032	23.326	26.861	30.395	34.283	37.817	41.351	44.886	48.42
SAND FILLING	Volume	cum	0.796	0.796	0.859	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
PCC for LC	Volume	cum	0.796	0.796	0.859	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
COVER SLAB	Dia.	m	1.6	1.6	1.7	2	2	2	2	2	2	2	2
COVER SLAB	Volume	cum	0.4	0.4	0.45	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Deduct for MH cover		cum	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
Net volume		cum	0.34	0.34	0.39	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

Side wall	Clear Ht.	m	1.1	1.55	2.05	2.55	3.05	3.55	4.05	4.55	5.05	5.55	6.05
	volume	cum	0.97	1.36	2.33	3.5	4.19	4.88	5.57	6.25	6.94	7.63	8.32
Base slab	volume	cum	0.63	0.63	0.87	1.13	1.13	1.13	1.36	1.36	1.36	1.36	1.36
Cover Slab	Bottom	sqm	1.13	1.13	1.13	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77
	Deduct for MH cover (Dia. 0.6 m)	sqm	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28
	Net	sqm	0.85	0.85	0.85	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Cover slab	Sides	sqm	1.01	1.01	1.07	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
Side wall	Inner & Outer	sqm	9.68	13.63	18.68	28.04	33.54	39.03	44.53	50.03	55.53	61.03	66.52
Base slab	Sides		1.26	1.26	1.65	1.88	1.88	1.88	2.26	2.26	2.26	2.26	2.26
Refilling	Base slab portion	cum	0.43	0.43	0.57	0.64	0.64	0.64	0.76	0.76	0.76	0.76	0.76
	Side wall portion	cum	3.63	5.11	7.08	10.01	11.98	13.94	15.9	17.87	19.83	21.79	23.76
BENCHING	Chord length	cum	0.59	0.59	0.59	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
	Area of segment	**sqm**	1.112	1.112	1.112	1.744	1.744	1.744	1.744	1.744	1.744	1.744	1.744
	Depth of Benching	**m**	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Volume	**cum**	0.22	0.22	0.22	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35

DETAILED ESTIMATE FOR RCC MH-							
MH depth of 1.3 m and Dia of 1.2 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	2.6	2.6	1.8	9.56	cum
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	2.6	2.6	0.15	0.8	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	2.6	2.6	0.15	0.8	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed byEngineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	1.6	1.6	0.2	0.4	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.4	0.2	1.1	0.97	cum.
iii	Base slab	1 x (p/4)	2	2	0.2	0.63	cum
						1.94	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					155.2	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.2	1.2		1.13	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						0.85	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	1.6		0.2	1.01	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.4		1.1	9.68	sqm
iii	Base slab sides	1 x p	2		0.2	1.26	sqm
					Total	**12.33**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.3	0.3	0.2	0.43	cum
ii	Side wall portion	1 x p	2.1	0.5	1.1	3.63	cum
						4.06	cum
8	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.22	cum
9	Extra for providing sulphate resistant cement for the structures above plinth level.					1.94	cum
10	Finishing with epoxy paint for steel	1 x 1	155.2		0.04	6.21	sqm
11	Anticorrosive bituminous paint-outside	1 x p	1.6		1.3	6.53	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No.
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 1	9.42			9.42	M
	S/G mix					0.8	cum
	Extra for M30					1.94	cum

DETAILED ESTIMATE FOR RCC MH							
MH depth of 1.75 m and Dia of 1.2 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5 m	1 x (p/4)	2.6	2.6	1.5	7.96	cum
	Second depth of 1.5m to 3 m	1 x (p/4)	3.2	3.2	0.75	6.03	cum
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete .						
		1 x (p/4)	2.6	2.6	0.15	0.8	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	2.6	2.6	0.15	0.8	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	1.6	1.6	0.2	0.4	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.4	0.2	1.55	1.36	cum.
iii	Base slab	1 x (p/4)	2	2	0.2	0.63	cum
						2.33	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					186.4	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by KWAOfficers.(Retrieved Materials should be taken back by the contractor.)						

Sl No	Description	Nos	L	B	D	Quantity	
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.2	1.2		1.13	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						0.85	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	1.6		0.2	1.01	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.4		1.55	13.63	sqm
iii	Base slab sides	1 x p	2		0.2	1.26	sqm
					Total	**16.28**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.3	0.3	0.2	0.43	cum
ii	Side wall portion	1 x p	2.1	0.5	1.55	5.11	cum
						5.54	cum
8	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.22	cum
9	Extra for providing sulphate resistant cement for the structures above plinth level.					2.33	cum
10	Finishing with epoxy paint for steel	1 x 1	186.4		0.04	7.46	sqm
11	Anticorrosive bituminous paint-outside	1 x p	1.6		1.75	8.8	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 1	9.42			9.42	M

DETAILED ESTIMATE FOR RCC MH							
MH depth of 2.25 m and Dia of 1.2 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5m	1 x (p/4)	2.7	2.7	1.5	8.59	cum
	Second depth 1.5m to 3m	1 x (p/4)	3.3	3.3	1.3	11.12	cum
						19.71	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	2.7	2.7	0.15	0.86	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	2.7	2.7	0.15	0.86	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	1.7	1.7	0.2	0.45	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.45	0.25	2.05	2.33	cum.
iii	Base slab	1 x (p/4)	2.1	2.1	0.25	0.87	cum
						3.59	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					287.2	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						

Sl No	Description	Nos	L	B	D	Quantity	
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.2	1.2		1.13	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						0.85	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	1.7		0.2	1.07	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.45		2.05	18.68	sqm
iii	Base slab sides	1 x p	2.1		0.25	1.65	sqm
					Total	**21.78**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.4	0.3	0.25	0.57	cum
ii	Side wall portion	1 x p	2.2	0.5	2.05	7.08	cum
						7.65	cum
8	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.22	cum
9	Extra for providing sulphate resistant cement for the structures above plinth level.					3.59	cum
10	Finishing with epoxy paint for steel	1 x 1	287.2		0.04	11.49	sqm
11	Anticorrosive bituminous paint-outside	1 x p	1.7		2.25	12.02	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	9.42			9.42	M
	Extra for Mix 30					3.59	

DETAILED ESTIMATE FOR RCC MH							
MH depth of 2.75 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth 0 to 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth of 1.5m to 3m	1 x (p/4)	3.6	3.6	1.8	18.32	cum
						28.92	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge.						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the KWA						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	2.55	3.5	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.25	1.13	cum
						5.2	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					416	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by TWAD Board Officers.(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						

Sl No	Description	Nos			L	B	D	Quantity	
	At 0.55 m height from base slab								
	Cover slab bottom	1	x	(p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1	x	(p/4)	0.6	0.6		-0.28	sqm
								1.49	sqm
B	**Curved surface**								
a	**From 0 m to 3.3 m**								
i	Cover slab sides	1	x	p	2		0.2	1.26	sqm
	Add for MH cover Sides	1	x	p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2	x	p	1.75		2.55	28.04	sqm
iii	Base slab sides	1	x	p	2.4		0.25	1.88	sqm
							Total	**31.56**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the TWAD Board Officers.								
i	Base slab portion	1	x	p	2.7	0.3	0.25	0.64	cum
ii	Side wall portion	1	x	p	2.5	0.5	2.55	10.01	cum
								10.65	cum
8	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the TWAD Board Officers.								
		1	x	1				0.35	cum
9	Extra for providing sulphate resistant cement for the structures above plinth level.							5.2	cum
10	Finishing with epoxy paint for steel	1	x	1	416		0.04	16.64	sqm
11	Anticorrosive bituminous paint-outside	1	x	p	2		2.75	17.28	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1	x	1				1	No.
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1	x	10.68				10.68	M

DETAILED ESTIMATE FOR RCC MH							
MH depth of 3.25 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth 1.5m to 3m		3	3	1.5	10.6	
	Third depth of 2 m 300m to 4.5m		3	3	0.8	5.65	
						26.85	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	3.05	4.19	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.25	1.13	cum
						5.89	cum
							cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-chargeEngineer -in-charge						
	@ 80 kg/cum of RCC volume					471.2	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						1.49	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	2		0.2	1.26	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.75		3.05	33.54	sqm
iii	Base slab sides	1 x p	2.4		0.25	1.88	sqm
					Total	**37.06**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.7	0.3	0.25	0.64	cum
ii	Side wall portion	1 x p	2.5	0.5	3.05	11.98	cum
						12.62	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 1.5 m	1 x p	3		1.5	14.14	sqm
	Above 1.5 m upto 3 m	1 x p	3		1.5	14.14	sqm
	Above 3 m upto 3.25 m	1 x p	3		0.25	2.36	sqm
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge.						
		1 x 1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.					5.89	cum
11	Finishing with epoxy paint for steel	1 x 1	471.2		0.04	18.85	sqm
12	Anticorrosive bituminous paint-outside	1 x p	2		3.25	20.42	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No.
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	M

1.06
5.89

DETAILED ESTIMATE FOR RCC MH							
MH depth of 3.75 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	3	3	1.5	10.6	cum
			3	3	1.5	10.6	
			3	3	1.3	9.19	
						30.39	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	3.55	4.88	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.25	1.13	cum
						6.58	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					526.4	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						1.49	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	2		0.2	1.26	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.75		3.55	39.03	sqm
iii	Base slab sides	1 x p	2.4		0.25	1.88	sqm
					Total	**42.55**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.7	0.3	0.25	0.64	cum
ii	Side wall portion	1 x p	2.5	0.5	3.55	13.94	cum
						14.58	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 1.5 m	1 x p	3		1.5	14.14	sqm
	Above 1.5 m upto 3 m	1 x p	3		1.5	14.14	
	Above 3 m upto 3.75 m	1 x p	3		0.75	7.07	
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.					6.58	cum
11	Finishing with epoxy paint for steel	1 x 1	526.4		0.04	21.06	sqm
12	Anticorrosive bituminous paint-outside	1 x p	2		3.75	23.56	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	M

DETAILED ESTIMATE FOR RCC MH							
MH depth of 4.25 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth 1.5m to 3m	1 x (p/4)	3	3	1.5	10.6	
	Third depth 3.0m to 4.5m	1 x (p/4)	3	3	1.5	10.6	
	forth depth 4.5m to 6m	1 x (p/4)	3	3	0.25	1.77	
						33.57	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	4.05	5.57	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.3	1.36	cum
						7.5	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					600	KG

Sl No	Description	Nos			L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)								
A	**Plane surface**								
a	**From 0m to 3.3 m**								
	At 0.55 m height from base slab								
	Cover slab bottom	1	x	(p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1	x	(p/4)	0.6	0.6		-0.28	sqm
								1.49	sqm
B	**Curved surface**								
a	**From 0 m to 3.3 m**								
i	Cover slab sides	1	x	p	2		0.2	1.26	sqm
	Add for MH cover Sides	1	x	p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2	x	p	1.75		4.05	44.53	sqm
iii	Base slab sides	1	x	p	2.4		0.3	2.26	sqm
							Total	**48.43**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge								
i	Base slab portion	1	x	p	2.7	0.3	0.3	0.76	cum
ii	Side wall portion	1	x	p	2.5	0.5	4.05	15.9	cum
								16.66	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.								
	0 m to 1.5 m	1	x	p	3		1.5	14.14	sqm
	Above 1.5 m upto 3 m	1	x	p	3		1.5	14.14	sqm
	Above 3 m upto 4.25 m	1	x	p	3		1.25	11.78	sqm
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge								
		1	x	1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.							7.5	cum
11	Finishing with epoxy paint for steel	1	x	1	600		0.04	24	sqm
12	Anticorrosive bituminous paint-outside	1	x	p	2		4.25	26.7	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No.
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	m

DETAILED ESTIMATE FOR RCC MH							
MH depth of 4.75 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth 1.5m to 3m		3	3	1.5	10.6	
	Third depth 3.0m to 4.5m		3	3	1.5	10.6	
	forth depth 4.5m to 6m		3	3	0.85	6.01	
						37.81	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	4.55	6.25	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.3	1.36	cum
						8.18	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					654.4	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						1.49	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	2		0.2	1.26	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.75		4.55	50.03	sqm
iii	Base slab sides	1 x p	2.4		0.3	2.26	sqm
					Total	**53.93**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.7	0.3	0.3	0.76	cum
ii	Side wall portion	1 x p	2.5	0.5	4.55	17.87	cum
						18.63	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 4.75m	1 x p	3		4.75	44.77	sqm
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.					8.18	cum
11	Finishing with epoxy paint for steel	1 x 1	654.4		0.04	26.18	sqm
12	Anticorrosive bituminous paint-outside	1 x p	2		4.75	29.85	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	M

DETAILED ESTIMATE FOR RCC MH							
MH depth of 5.25 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth 1.5m to 3m	1 x (p/4)	3	3	1.5	10.6	
	Third depth 3.0m to 4.5m	1 x (p/4)	3	3	1.5	10.6	
	forth depth 4.5m to 6m	1 x (p/4)	3	3	1.35	9.54	
						41.34	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	5.05	6.94	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.3	1.36	cum
						8.87	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					709.6	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						1.49	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	2		0.2	1.26	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.75		5.05	55.53	sqm
iii	Base slab sides	1 x p	2.4		0.3	2.26	sqm
					Total	**59.43**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.7	0.3	0.3	0.76	cum
ii	Side wall portion	1 x p	2.5	0.5	5.05	19.83	cum
						20.59	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m 5.25 m	1 x p	3		5.25	49.48	sqm
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.					8.87	cum
11	Finishing with epoxy paint for steel	1 x 1	709.6		0.04	28.38	sqm
12	Anticorrosive bituminous paint-outside	1 x p	2		5.25	32.99	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC MH							
MH depth of 5.75 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth 1.5m to 3m	1 x (p/4)	3	3	1.5	10.6	
	Third depth 3.0m to 4.5m	1 x (p/4)	3	3	1.5	10.6	
	forth depth 4.5m to 6m	1 x (p/4)	3	3	1.5	10.6	
	fifth depth 6.0m to 7.5m	1 x (p/4)	3	3	0.35	2.47	
						44.87	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	5.55	7.63	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.3	1.36	cum
						9.56	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					764.8	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						1.49	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	2		0.2	1.26	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.75		5.55	61.03	sqm
iii	Base slab sides	1 x p	2.4		0.3	2.26	sqm
					Total	**64.93**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.7	0.3	0.3	0.76	cum
ii	Side wall portion	1 x p	2.5	0.5	5.55	21.79	cum
						22.55	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 5.75 m	1 x p	3		5.75	54.19	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.					9.56	cum
11	Finishing with epoxy paint for steel	1 x 1	764.8		0.04	30.59	sqm
12	Anticorrosive bituminous paint-outside	1 x p	2		5.75	36.13	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	No
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	M

DETAILED ESTIMATE FOR RCC MH							
MH depth of 6.25 m and Dia of 1.5 m							
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 1.5m	1 x (p/4)	3	3	1.5	10.6	cum
	Second depth 1.5m to 3m	1 x (p/4)	3	3	1.5	10.6	
	Third depth 3.0m to 4.5m	1 x (p/4)	3	3	1.5	10.6	
	forth depth 4.5m to 6m	1 x (p/4)	3	3	1.5	10.6	
	fifth depth 6.0m to 7.5m	1 x (p/4)	3	3	0.85	6.01	
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	3	3	0.15	1.06	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	**Upto 1.5 m**						
i	Cover slab	1 x (p/4)	2	2	0.2	0.63	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.2	-0.06	cum
ii	Side wall	1 x p	1.75	0.25	6.05	8.32	cum.
iii	Base slab	1 x (p/4)	2.4	2.4	0.3	1.36	cum
						10.25	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					820	KG

Sl No	Description	Nos	L	B	D	Quantity	
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						
A	**Plane surface**						
a	**From 0m to 3.3 m**						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	1.5	1.5		1.77	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						1.49	sqm
B	**Curved surface**						
a	**From 0 m to 3.3 m**						
i	Cover slab sides	1 x p	2		0.2	1.26	sqm
	Add for MH cover Sides	1 x p	0.6		0.2	0.38	sqm
ii	Side wall inner & outer sides	2 x p	1.75		6.05	66.52	sqm
iii	Base slab sides	1 x p	2.4		0.3	2.26	sqm
					Total	**70.42**	sqm
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	2.7	0.3	0.3	0.76	cum
ii	Side wall portion	1 x p	2.5	0.5	6.05	23.76	cum
						24.52	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	3		6.25	58.9	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Benching :- P.C.C 1:1.5:3 using S.R. cement and 20 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x 1				0.35	cum
10	Extra for providing sulphate resistant cement for the structures above plinth level.					10.25	cum
11	Finishing with epoxy paint for steel	1 x 1	820		0.04	32.8	sqm
12	Anticorrosive bituminous paint-outside	1 x p	2		6.25	39.27	sqm

Sl No	Description	Nos	L	B	D	Quantity	
13	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
14	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

ABSTRACT OF LIFT MANHOLES, RISING MAINS & PUMPSET															
Block No.	Man Holes			Length in m	Ground Levels		Flow in MLD			Lift MH Size		Rising main Size	Pumpset		Cost of Lift MH
	From	To	Lift MH No.		Starting Manhole	Ending Manhole	Initial	Inter	Ultimate	Dia. (m)	Depth (m)		Disc (lpm) x Head (m)	Capacity	Rupees**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Block 02	DERDMH36	DERDMH37	LM-1	30.00	3.76	3.78	2.16	2.38	2.586	3.5	6.67	200 DI K9	1654.2 lpm x 8 m Head	5	**796393**
	DPRDMH9	DPRDMH10A	LM-2	30.00	3.56	3.62	0.90	1.00	1.082	2.5	5.77	150 DI K9	692.4 lpm x 7 m Head	5	**511895**
	DERDM71.2	DERDM71.1	LM-3	30.00	4.25	4.66	0.18	0.19	0.211	2.5	5.97	100 DI K9	134.7 lpm x 7 m Head	5	**524471**
Block 3A	SNRDMH34	SNRDMH8	LM-4	15.00	2.05	2.05	0.77	0.85	0.919	2.5	4.8	100 DI K9	588.2 lpm x 6 m Head	5	**405010**
Block 3B	EVRDM1	NJPWDRDM30	LM-5	30.00	2.98	3.08	0.25	0.28	0.301	2.5	4.7	100 DI K9	192.4 lpm x 6 m Head	5	**399433**
	PMRDM12	PMRDM13	LM-6	20.00	2.75	3.14	0.29	0.32	0.347	2.5	5.17	100 DI K9	222.2 lpm x 7 m Head	5	**473688**
	EKRDM5	EKRDM6	LM-7	20.00	3.38	3.46	0.15	0.17	0.184	2.5	5.05	100 DI K9	118.1 lpm x 6 m Head	5	**466177**
Block 3C	MASNRDM4	MASNRDM5	LM-8	26.00	4.77	4.89	2.57	2.84	3.079	4	6.56	200 DI K9	1970.1 lpm x 8 m Head	5	**906240**
	PORDM11	PO3CRRDM10	LM-9	30.00	4.94	4.98	0.76	0.84	0.913	2.5	6.49	150 DI K9	584 lpm x 8 m Head	5	**557626**
	CKRDM18	CKRDM19	LM-10	34.00	5.00	5.04	0.13	0.15	0.159	2.5	4.75	100 DI K9	101.4 lpm x 6 m Head	5	**402217**
	VIAPRDM2	ONHRDM5	LM-11	33.00	4.90	5.32	0.28	0.31	0.332	2.5	6.69	100 DI K9	212.5 lpm x 8 m Head	5	**570198**
	VIAPRDM2	ONHRDM5	LM-12	72.00	3.21	6.03	0.32	0.35	0.383	2.5	5.05	100 DI K9	245.1 lpm x 9 m Head	5	**551871**
Block 4	MNRDM10L	MNRDM9	LM-13	20.00	5.59	5.43	0.07	0.07	0.079	2.5	6.4	100 DI K9	50.7 lpm x 7 m Head	5	**551871**
	VPRDM21	VPRDM22	LM-14	30.00	6.37	6.67	0.80	0.89	0.963	2.5	5.1	200 DI K9	616 lpm x 6 m Head	5	**469321**
	VMRDM20.9	VMRDM20.8	LM-15	21.00	13.31	14.21	1.31	1.45	1.57	3	6.49	200 DI K9	1004.2 lpm x 8 m Head	5	**666850**
	VMRDM20.9	VMRDM20.8	LM-16	150.00	8.55	21.36	0.67	0.74	0.808	2.5	5.24	200 DI K9	516.7 lpm x 19 m Head	5	**478219**
	VMRDM20.9	VMRDM20.8	LM-17	350.00	10.90	22.20	0.13	0.14	0.156	2.5	2.62	100 DI K9	100 lpm x 15 m Head	5	**284845**
	VMRDM20.9	VMRDM20.8	LM-18	150.00	13.71	18.92	0.02	0.02	0.023	2.5	2.62	100 DI K9	14.6 lpm x 9 m Head	5	**284845**
	VMRDM20.9	VMRDM20.8	LM-19	60.00	8.44	9.76	0.18	0.20	0.219	2.5	5.24	100 DI K9	140.3 lpm x 8 m Head	5	**478219**
	VMRDM20.9	VMRDM20.8	LM-20	190.00	5.62	14.06	0.24	0.26	0.283	2.5	5.42	100 DI K9	181.3 lpm x 15 m Head	5	**489572**
														TOTAL	**10268977**

Note: ***** The unit rates given in the Estimates are to be updated as per current SOR of Kerala state***

NAME OF SCHEME: SEWER NETWORK DESIGN -MUTTAR SYSTEM

CONSTRUCTION OF LIFT MAN HOLES

INPUT			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
			Block 02			**Block 3A**	**Block 3B**			**Block 3C**					Block 4							
LIFT MH NAME			DERDMH36	DPRDMH9	DERDM71.2	SNRDMH34	EVRDM1	PMRDM12	EKRDM5	MASNRDM 4	PORDM11	CKRDM18	VIAPRDM2	NH17SRRSM 6	MNRDM10L	VPRDM21	VMRDM2 0.9	GNRDM9. 7	VPRDM9 1.19	VMRDM 20.21.4	VMRDM 22	VMRDM 12.19
Size of MH			**6.67 m (Depth) x 3.5m(Dia)**	**5.77 m (Depth) x 2.5m(Dia)**	**5.97 m (Depth) x 2.5m(Dia)**	**4.8 m (Depth) x 2.5m(Dia)**	**4.7 m (Depth) x 2.5m(Dia)**	**5.17 m (Depth) x 2.5m(Dia)**	**5.05 m (Depth) x 2.5m(Dia)**	**6.56 m (Depth) x 4m(Dia)**	**6.49 m (Depth) x 2.5m(Dia)**	**4.75 m (Depth) x 2.5m(Dia)**	**6.69 m (Depth) x 2.5m(Dia)**	**6.4 m (Depth) x 2.5m(Dia)**	**6.4 m (Depth) x 2.5m(Dia)**	**5.1 m (Depth) x 2.5m(Dia)**	**6.49 m (Depth) x 3m(Dia)**	**5.24 m (Depth) x 2.5m(Dia)**	**2.62 m (Depth) x 2.5m(Dia**	**2.62 m (Depth) x 2.5m(Dia**	**5.24 m (Depth) x 2.5m(Dia**	**5.42 m (Depth) x 2.5m(Dia**
Lift Man hole Depth		**m**	**6.67**	**5.77**	**5.97**	**4.80**	**4.70**	**5.17**	**5.05**	**6.56**	**6.49**	**4.75**	**6.69**	**6.40**	**6.40**	**5.10**	**6.49**	**5.24**	**2.62**	**2.62**	**5.24**	**5.42**
Dia		**m**	**3.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**4.00**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**3.00**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**
Cover slab Thk.		**m**	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Side wall Thk.		**m**	0.3	0.3	0.3	0.25	0.25	0.3	0.3	0.3	0.3	0.25	0.3	0.3	0.3	0.3	0.3	0.3	0.25	0.25	0.3	0.3
Base slab thk		**m**	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Base slab Projection		**m**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Addl. Working Width		**m**	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sand Fillng		**m**	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
PCC for LC		**m**	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Pipe dia	mm	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
MH cover	Dia.	m	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Side wall perimeter-centre of section		**m**	11.94	8.8	8.8	8.64	8.64	8.8	8.8	13.51	8.8	8.64	8.8	8.8	8.8	8.8	10.37	8.8	8.64	8.64	8.8	8.8
Base slab Dia		**m**	4.5	3.5	3.5	3.4	3.4	3.5	3.5	5	3.5	3.4	3.5	3.5	3.5	3.5	4	3.5	3.4	3.4	3.5	3.5
Projection above GL		**m**	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Depth		m	7.27	6.37	6.57	5.4	5.3	5.77	5.65	7.16	7.09	5.35	7.29	7	7	5.7	7.09	5.84	3.22	3.22	5.84	6.02
Dia		m	5.1	4.1	4.1	4	4	4.1	4.1	5.6	4.1	4	4.1	4.1	4.1	4.1	4.6	4.1	4	4	4.1	4.1
EW	Volume	cum	148.513	84.1	86.741	67.858	66.602	76.179	74.594	176.351	93.606	67.23	96.247	92.418	92.418	75.254	117.829	77.103	40.464	40.464	77.103	79.479
SAND FILLING	Volume	cum	3.064	1.98	1.98	1.885	1.885	1.98	1.98	3.695	1.98	1.885	1.98	1.98	1.98	1.98	2.493	1.98	1.885	1.885	1.98	1.98
PCC for LC	Volume	cum	3.064	1.98	1.98	1.885	1.885	1.98	1.98	3.695	1.98	1.885	1.98	1.98	1.98	1.98	2.493	1.98	1.885	1.885	1.98	1.98
COVER SLAB	Dia.	m	4.1	3.1	3.1	3	3	3.1	3.1	4.6	3.1	3	3.1	3.1	3.1	3.1	3.6	3.1	3	3	3.1	3.1
COVER SLAB	Volume	cum	3.3	1.89	1.89	1.77	1.77	1.89	1.89	4.15	1.89	1.77	1.89	1.89	1.89	1.89	2.54	1.89	1.77	1.77	1.89	1.89
Deduct for MH cover		cum	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
Net volume		cum	3.23	1.82	1.82	1.7	1.7	1.82	1.82	4.08	1.82	1.7	1.82	1.82	1.82	1.82	2.47	1.82	1.7	1.7	1.82	1.82
Side wall	Clear Ht.	m	6.42	5.52	5.72	4.55	4.45	4.92	4.8	6.31	6.24	4.5	6.44	6.15	6.15	4.85	6.24	4.99	2.37	2.37	4.99	5.17
	volume	cum	22.99	14.57	15.09	9.83	9.61	12.98	12.67	25.57	16.47	9.72	16.99	16.23	16.23	12.8	19.41	13.17	5.12	5.12	13.17	13.64
Base slab	volume	cum	4.77	2.89	2.89	2.72	2.72	2.89	2.89	5.89	2.89	2.72	2.89	2.89	2.89	2.89	3.77	2.89	2.72	2.72	2.89	2.89
Cover Slab	Bottom	sqm	9.62	4.91	4.91	4.91	4.91	4.91	4.91	12.57	4.91	4.91	4.91	4.91	4.91	4.91	7.07	4.91	4.91	4.91	4.91	4.91
	Deduct for MH cover (Dia. 0.6 m)	sqm	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28
	Net	sqm	9.34	4.63	4.63	4.63	4.63	4.63	4.63	12.29	4.63	4.63	4.63	4.63	4.63	4.63	6.79	4.63	4.63	4.63	4.63	4.63
Cover slab	Sides	sqm	3.22	2.43	2.43	2.36	2.36	2.43	2.43	3.61	2.43	2.36	2.43	2.43	2.43	2.43	2.83	2.43	2.36	2.36	2.43	2.43
Side wall	Inner & Outer	sqm	153.28	97.11	100.63	78.62	76.89	86.56	84.45	170.48	109.78	77.75	113.3	108.2	108.2	85.33	129.38	87.79	40.95	40.95	87.79	90.96
Base slab	Sides		4.24	3.3	3.3	3.2	3.2	3.3	3.3	4.71	3.3	3.2	3.3	3.3	3.3	3.3	3.77	3.3	3.2	3.2	3.3	3.3
Refilling	Base slab portion	cum	1.36	1.07	1.07	1.05	1.05	1.07	1.07	1.5	1.07	1.05	1.07	1.07	1.07	1.07	1.22	1.07	1.05	1.05	1.07	1.07
	Side wall portion	cum	46.39	31.21	32.35	25.01	24.47	27.82	27.14	50.55	35.29	24.74	36.42	34.78	34.78	27.43	40.19	28.22	13.03	13.03	28.22	29.24
BENCHING	Chord length	cum	1.75	1.25	1.25	1.25	1.25	1.25	1.25	2	1.25	1.25	1.25	1.25	1.25	1.25	1.5	1.25	1.25	1.25	1.25	1.25
	Area of segment	**sqm**	9.621	4.909	4.909	4.909	4.909	4.909	4.909	12.566	4.909	4.909	4.909	4.909	4.909	4.909	7.069	4.909	4.909	4.909	4.909	4.909
	Depth of Benching	**m**	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Volume	**cum**	1.92	0.98	0.98	0.98	0.98	0.98	0.98	2.51	0.98	0.98	0.98	0.98	0.98	0.98	1.41	0.98	0.98	0.98	0.98	0.98

DETAILED ESTIMATE FOR RCC LIFT MH at DERDMH36 of Block 02										
MH depth of 6.67 m and Dia of 3.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	5.1	5.1	7.27	148.51	cum	214.03	31785.6	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	5.1	5.1	0.15	3.06	cum	164.18	502.39	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	5.1	5.1	0.15	3.06	cum	4678.17	14315.2	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									

	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	4.1	4.1	0.25	3.3	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	3.80	0.3	6.42	22.99	cum.			
iii	Base slab	1 x (p/4)	4.5	4.5	0.3	4.77	cum			
						30.99	cum	5977.31	185236.84	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					2479.2	KG	98.3	243705.36	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	3.50	3.5		9.62	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						9.34	sqm	335.31	3131.8	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	4.1		0.25	3.22	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	3.80		6.42	153.28	sqm			
iii	Base slab sides	1 x p	4.5		0.3	4.24	sqm			
					Total	**161.21**	sqm	815.78	131511.89	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	4.8	0.3	0.3	1.36	cum			
ii	Side wall portion	1 x p	4.6	0.5	6.42	46.39	cum			
						47.75	cum	258.57	12346.72	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	5.1		6.25	100.14	sqm	776.89	77797.76	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					30.99	cum	2247.4	69646.93	MR
10	Finishing with epoxy paint for steel	1 x 1	2479.2		0.04	99.17	sqm	141.8	14062.31	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	4.1		6.67	85.91	sqm	124.47	10693.22	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**796393.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at DPRDMH9 of Block 02										
MH depth of 5.77 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	6.37	84.1	cum	214.03	17999.92	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	5.52	14.57	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						19.28	cum	5977.31	115242.54	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1542.4	KG	98.3	151617.92	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		5.52	97.11	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**103.31**	sqm	815.78	84278.23	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	5.52	31.21	cum			

						32.28	cum	258.57	8346.64	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					19.28	cum	2247.4	43329.87	MR
10	Finishing with epoxy paint for steel	1 x 1	1542.4		0.04	61.7	sqm	141.8	8749.06	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.77	56.19	sqm	124.47	6993.97	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**511895.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at DERDM71.2 of Block 02										
MH depth of 5.97 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	6.57	86.74	cum	214.03	18564.96	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	5.72	15.09	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						19.8	cum	5977.31	118350.74	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1584	KG	98.3	155707.2	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		5.72	100.63	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**106.83**	sqm	815.78	87149.78	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	5.72	32.35	cum			

						33.42	cum	258.57	8641.41	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					19.8	cum	2247.4	44498.52	MR
10	Finishing with epoxy paint for steel	1 x 1	1584		0.04	63.36	sqm	141.8	8984.45	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.97	58.14	sqm	124.47	7236.69	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**524471.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at SNRDMH34 of Block 3A										
MH depth of 4.8 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4	4	5.4	67.86	cum	214.03	14524.08	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	164.18	308.66	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	4678.17	8794.96	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3	3	0.25	1.77	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	2.75	0.25	4.55	9.83	cum.			
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum			
						14.25	cum	5977.31	85176.67	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1140	KG	98.3	112062	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3		0.25	2.36	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.75		4.55	78.62	sqm			
iii	Base slab sides	1 x p	3.4		0.3	3.2	sqm			
					Total	**84.65**	sqm	815.78	69055.78	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05	cum			
ii	Side wall portion	1 x p	3.5	0.5	4.55	25.01	cum			

						26.06	cum	258.57	6738.33	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4		6.25	78.54	sqm	776.89	61016.94	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					14.25	cum	2247.4	32025.45	MR
10	Finishing with epoxy paint for steel	1 x 1	1140		0.04	45.6	sqm	141.8	6466.08	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3		4.80	45.24	sqm	124.47	5631.02	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**405010.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at EVRDM1 of Block 3B										
MH depth of 4.7 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4	4	5.3	66.6	cum	214.03	14254.4	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	164.18	308.66	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	4678.17	8794.96	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3	3	0.25	1.77	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	2.75	0.25	4.45	9.61	cum.			
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum			
						14.03	cum	5977.31	83861.66	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1122.4	KG	98.3	110331.92	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3		0.25	2.36	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.75		4.45	76.89	sqm			
iii	Base slab sides	1 x p	3.4		0.3	3.2	sqm			
					Total	**82.92**	sqm	815.78	67644.48	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05	cum			
ii	Side wall portion	1 x p	3.5	0.5	4.45	24.47	cum			

						25.52	cum	258.57	6598.71	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4		6.25	78.54	sqm	776.89	61016.94	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					14.03	cum	2247.4	31531.02	MR
10	Finishing with epoxy paint for steel	1 x 1	1122.4		0.04	44.9	sqm	141.8	6366.82	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3		4.70	44.3	sqm	124.47	5514.02	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**399433.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at PMRDM12 of Block 3B										
MH depth of 5.17 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	5.8	76.18	cum	214.03	16304.81	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	4.9	12.98	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						17.69	cum	5977.31	105738.61	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1415.2	KG	98.3	139114.16	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		4.9	86.56	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**92.76**	sqm	815.78	75671.75	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	4.9	27.82	cum			

						28.89	cum	258.57	7470.09	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					17.69	cum	2247.4	39756.51	MR
10	Finishing with epoxy paint for steel	1 x 1	1415		0	56.61	sqm	141.8	8027.3	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.17	50.35	sqm	124.47	6267.06	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**473688.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at EKRDM5 of Block 3B										
MH depth of 5.05 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	5.7	74.59	cum	214.03	15964.5	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	4.8	12.67	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						17.38	cum	5977.31	103885.65	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1390.4	KG	98.3	136676.32	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		4.8	84.45	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**90.65**	sqm	815.78	73950.46	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	4.8	27.14	cum			

						28.21	cum	258.57	7294.26	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					17.38	cum	2247.4	39059.81	MR
10	Finishing with epoxy paint for steel	1 x 1	1390		0	55.62	sqm	141.8	7886.92	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.05	49.18	sqm	124.47	6121.43	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**466177.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at MASNRDM4 of Block 3C										
MH depth of 6.56 m and Dia of 4 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	5.6	5.6	7.2	176.35	cum	214.03	37744.19	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	5.6	5.6	0.2	3.69	cum	164.18	605.82	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	5.6	5.6	0.2	3.69	cum	4678.17	17262.45	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	4.6	4.6	0.3	4.15	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	4.30	0.3	6.3	25.57	cum.			
iii	Base slab	1 x (p/4)	5	5	0.3	5.89	cum			
						35.54	cum	5977.31	212433.6	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					2843.2	KG	98.3	279486.56	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	4.00	4		12.57	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						12.29	sqm	335.31	4120.96	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	4.6		0.3	3.61	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	4.30		6.3	170.48	sqm			
iii	Base slab sides	1 x p	5		0.3	4.71	sqm			
					Total	**179.27**	sqm	815.78	146244.88	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	5.3	0.3	0.3	1.5	cum			
ii	Side wall portion	1 x p	5.1	0.5	6.3	50.55	cum			

						52.05	cum	258.57	13458.57	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	5.6		6.3	109.96	sqm	776.89	85426.82	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					35.54	cum	2247.4	79872.6	MR
10	Finishing with epoxy paint for steel	1 x 1	2843		0	113.73	sqm	141.8	16126.91	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	4.6		6.56	94.8	sqm	124.47	11799.76	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**906240.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at PORDM11 of Block 3C										
MH depth of 6.49 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	7.1	93.61	cum	214.03	20035.35	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	6.2	16.47	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						21.18	cum	5977.31	126599.43	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1694.4	KG	98.3	166559.52	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		6.2	109.78	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**115.98**	sqm	815.78	94614.16	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	6.2	35.29	cum			

						36.36	cum	258.57	9401.61	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					21.18	cum	2247.4	47599.93	MR
10	Finishing with epoxy paint for steel	1 x 1	1694		0	67.78	sqm	141.8	9611.2	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		6.49	63.21	sqm	124.47	7867.75	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**557626.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at CKRDM18 of Block 3C										
MH depth of 4.75 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4	4	5.4	67.23	cum	214.03	14389.24	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4	4	0.2	1.88	cum	164.18	308.66	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4	4	0.2	1.88	cum	4678.17	8794.96	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3	3	0.3	1.77	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.75	0.3	4.5	9.72	cum.			
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum			
						14.14	cum	5977.31	84519.16	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1131.2	KG	98.3	111196.96	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3		0.3	2.36	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.75		4.5	77.75	sqm			
iii	Base slab sides	1 x p	3.4		0.3	3.2	sqm			
					Total	**83.78**	sqm	815.78	68346.05	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05	cum			
ii	Side wall portion	1 x p	3.5	0.5	4.5	24.74	cum			

						25.79	cum	258.57	6668.52	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4		6.3	78.54	sqm	776.89	61016.94	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					14.14	cum	2247.4	31778.24	MR
10	Finishing with epoxy paint for steel	1 x 1	1131		0	45.25	sqm	141.8	6416.45	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3		4.75	44.77	sqm	124.47	5572.52	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**402217.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VIAPRDM2 of Block 3C										
MH depth of 6.69 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	7.3	96.25	cum	214.03	20600.39	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	6.4	16.99	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						21.7	cum	5977.31	129707.63	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1736	KG	98.3	170648.8	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		6.4	113.3	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**119.5**	sqm	815.78	97485.71	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	6.4	36.42	cum			

						37.49	cum	258.57	9693.79	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					21.7	cum	2247.4	48768.58	MR
10	Finishing with epoxy paint for steel	1 x 1	1736		0	69.44	sqm	141.8	9846.59	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		6.69	65.15	sqm	124.47	8109.22	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**570198.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at NH17SRRSM6 of Block 3C										
MH depth of 6.4 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	7	92.42	cum	214.03	19780.65	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									

i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	6.15	16.23	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						20.94	cum	5977.31	125164.87	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1675.2	KG	98.3	164672.16	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		6.15	108.2	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**114.4**	sqm	815.78	93325.23	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	6.15	34.78	cum			
						35.85	cum	258.57	9269.73	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					20.94	cum	2247.4	47060.56	MR
10	Finishing with epoxy paint for steel	1 x 1	1675.2		0.04	67.01	sqm	141.8	9502.02	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		6.40	62.33	sqm	124.47	7758.22	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**551871.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at MNRDM10L of Block 4										
MH depth of 6.4 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	7	92.42	cum	214.03	19780.65	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	6.2	16.23	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						20.94	cum	5977.31	125164.87	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1675.2	KG	98.3	164672.16	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		6.2	108.2	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**114.4**	sqm	815.78	93325.23	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	6.2	34.78	cum			

						35.85	cum	258.57	9269.73	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					20.94	cum	2247.4	47060.56	MR
10	Finishing with epoxy paint for steel	1 x 1	1675		0	67.01	sqm	141.8	9502.02	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		6.40	62.33	sqm	124.47	7758.22	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**551871.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VPRDM21 of Block 4										
MH depth of 5.1 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	5.7	75.25	cum	214.03	16105.76	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.2	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	4.9	12.8	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						17.51	cum	5977.31	104662.7	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1400.8	KG	98.3	137698.64	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		4.9	85.33	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**91.53**	sqm	815.78	74668.34	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	4.9	27.43	cum			

						28.5	cum	258.57	7369.25	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					17.51	cum	2247.4	39351.97	MR
10	Finishing with epoxy paint for steel	1 x 1	1401		0	56.03	sqm	141.8	7945.05	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.10	49.67	sqm	124.47	6182.42	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**469321.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VMRDM20.9 of Block 4										
MH depth of 6.49 m and Dia of 3 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.6	4.6	7.1	117.83	cum	214.03	25219.15	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.6	4.6	0.2	2.49	cum	164.18	408.81	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.6	4.6	0.2	2.49	cum	4678.17	11648.64	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.6	3.6	0.3	2.54	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum			
ii	Side wall	1 x p	3.30	0.3	6.2	19.41	cum.			
iii	Base slab	1 x (p/4)	4	4	0.3	3.77	cum			
						25.65	cum	5977.31	153318	5.33.1

5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					2052	KG	98.3	201711.6	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	3.00	3		7.07	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						6.79	sqm	335.31	2276.75	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.6		0.3	2.83	sqm			
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	3.30		6.2	129.38	sqm			
iii	Base slab sides	1 x p	4		0.3	3.77	sqm			
					Total	**136.45**	sqm	815.78	111313.18	5.9.5
7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	4.3	0.3	0.3	1.22	cum			
ii	Side wall portion	1 x p	4.1	0.5	6.2	40.19	cum			

						41.41	cum	258.57	10707.38	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.6		6.3	90.32	sqm	776.89	70168.7	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					25.65	cum	2247.4	57645.81	MR
10	Finishing with epoxy paint for steel	1 x 1	2052		0	82.08	sqm	141.8	11638.94	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.6		6.49	73.4	sqm	124.47	9136.1	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68		28.01	299.15	
								TOTAL	**666850.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at GNRDM9.7 of Block 4										
MH depth of 5.24 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	Description	Nos	L	B	D	Quantity		RATE	Amount	SPEC.CODE
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	5.84	77.1	cum	214.03	16501.71	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			

ii	Side wall	1 x p	2.80	0.3	4.99	13.17	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						17.88	cum	5977.31	106874.3	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1430.4	KG	98.3	140608.32	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		4.99	87.79	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**93.99**	sqm	815.78	76675.16	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	4.99	28.22	cum			
						29.29	cum	258.57	7573.52	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					17.88	cum	2247.4	40183.51	MR
10	Finishing with epoxy paint for steel	1 x 1	1430.4		0.04	57.22	sqm	141.8	8113.8	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.24	51.03	sqm	124.47	6351.7	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**478219.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VPRDM91.19 of Block 4										
MH depth of 2.62 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4	4	3.22	40.46	cum	214.03	8659.65	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	164.18	308.66	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	4678.17	8794.96	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3	3	0.25	1.77	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			

ii	Side wall	1 x p	2.75	0.25	2.37	5.12	cum.			
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum			
						9.54	cum	5977.31	57023.54	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					763.2	KG	98.3	75022.56	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3		0.25	2.36	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.75		2.37	40.95	sqm			
iii	Base slab sides	1 x p	3.4		0.3	3.2	sqm			
					Total	**46.98**	sqm	815.78	38325.34	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05	cum			
ii	Side wall portion	1 x p	3.5	0.5	2.37	13.03	cum			
						14.08	cum	258.57	3640.67	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4		6.25	78.54	sqm	776.89	61016.94	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					9.54	cum	2247.4	21440.2	MR
10	Finishing with epoxy paint for steel	1 x 1	763.2		0.04	30.53	sqm	141.8	4329.15	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3		2.62	24.69	sqm	124.47	3073.16	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**284845.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VMRDM20.21.4 of Block 4										
MH depth of 2.62 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4	4	3.22	40.46	cum	214.03	8659.65	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	164.18	308.66	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4	4	0.15	1.88	cum	4678.17	8794.96	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3	3	0.25	1.77	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			

ii	Side wall	1 x p	2.75	0.25	2.37	5.12	cum.			
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum			
						9.54	cum	5977.31	57023.54	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					763.2	KG	98.3	75022.56	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3		0.25	2.36	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.75		2.37	40.95	sqm			
iii	Base slab sides	1 x p	3.4		0.3	3.2	sqm			
					Total	**46.98**	sqm	815.78	38325.34	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05	cum			
ii	Side wall portion	1 x p	3.5	0.5	2.37	13.03	cum			
						14.08	cum	258.57	3640.67	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4		6.25	78.54	sqm	776.89	61016.94	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					9.54	cum	2247.4	21440.2	MR
10	Finishing with epoxy paint for steel	1 x 1	763.2		0.04	30.53	sqm	141.8	4329.15	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3		2.62	24.69	sqm	124.47	3073.16	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**284845.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VMRDM22 of Block 4										
MH depth of 5.24 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	5.84	77.1	cum	214.03	16501.71	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum			
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			

ii	Side wall	1 x p	2.80	0.3	4.99	13.17	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						17.88	cum	5977.31	106874.3	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1430.4	KG	98.3	140608.32	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		4.99	87.79	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**93.99**	sqm	815.78	76675.16	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	4.99	28.22	cum			
						29.29	cum	258.57	7573.52	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					17.88	cum	2247.4	40183.51	MR
10	Finishing with epoxy paint for steel	1 x 1	1430.4		0.04	57.22	sqm	141.8	8113.8	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.24	51.03	sqm	124.47	6351.7	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**478219.00**	

DETAILED ESTIMATE FOR RCC LIFT MH at VMRDM12.19 of Block 4										
MH depth of 5.42 m and Dia of 2.5 m								ANTEA RATES/REFERENCE		
Sl No	**Description**	**Nos**	**L**	**B**	**D**	**Quantity**		**RATE**	**Amount**	**SPEC.CODE**
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL									
a	First depth of 2 m	1 x (p/4)	4.1	4.1	6.02	79.48	cum	214.03	17011.1	2.6.1
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	164.18	325.08	2.25
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge									
		1 x (p/4)	4.1	4.1	0.15	1.98	cum	4678.17	9262.78	4.1.5
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge									
	Below GL									
a	**Upto 1.5 m**									
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum			

	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum			
ii	Side wall	1 x p	2.80	0.3	5.17	13.64	cum.			
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum			
						18.35	cum	5977.31	109683.64	5.33.1
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge									
	@ 80 kg/cum of RCC volume					1468	KG	98.3	144304.4	5.22.6
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)									
A	**Plane surface**									
a	**From 0m to 3.3 m**									
	At 0.55 m height from base slab									
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm			
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm			
						4.63	sqm	335.31	1552.49	4.3.1
B	**Curved surface**									
a	**From 0 m to 3.3 m**									
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm			
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm			
ii	Side wall inner & outer sides	2 x p	2.80		5.17	90.96	sqm			
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm			
					Total	**97.16**	sqm	815.78	79261.18	5.9.5

7	Refilling the outside of the well with excavated earth (other then sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge									
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum			
ii	Side wall portion	1 x p	3.6	0.5	5.17	29.24	cum			
						30.31	cum	258.57	7837.26	2.25
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.									
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm	776.89	62539.65	2.17.2
	Above 2 m upto 4 m									
	Above 4 m upto 6 m									
9	Extra for providing sulphate resistant cement for the structures above plinth level.					18.35	cum	2247.4	41239.79	MR
10	Finishing with epoxy paint for steel	1 x 1	1468		0.04	58.72	sqm	141.8	8326.5	13.52.1
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.42	52.79	sqm	124.47	6570.77	MR
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1		1358.15	1358.15	MR
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68		28.01	299.15	
								TOTAL	**489572.00**	

	Man Holes		Manhole Type	Length in m	Ground Levels		FLOWS LPS		Proposed Size of Sewer in mm	Proposed Size of Sewer in mm	MOC	Invert Level in m			Depth of cutting in m				
	From	To			Starting Manhole	Ending Manhole	Total Flow	in MLD	OD	OD		From		To	Starting Manhole	Ending manhole	Ave.Depth		
	1	2	3	4	5	6	7		8	8	9	10	11	12	13	14			
Block 02	DERDMH36	DERDMH37	L	30.00	3.760	3.778	29.935	2.586	0.200	200	DWC	-1.36	-1.36	-1.41	4.95	5.17	5.058		
	DPRDMH9	DPRDMH10A	L	30.00	3.563	3.619	12.524	1.082	0.200	200	DWC	-0.65		-0.71	4.16	4.27	4.2155		
	DERDM71.2	DERDM71.1	L	30.00	4.251	4.656	2.443	0.211	0.200	200	DWC	-0.16		-0.22	4.01	4.47	4.2385		
Block 3A	SNRDMH34	SNRDMH8	L	15.00	2.054	2.054	10.635	0.919	0.200	200	DWC	-1.19		-1.25	3.24	3.30	3.273		
Block 3B	EVRDM1	NJPWDRDM30	L	30.00	2.981	3.081	3.484	0.301	0.200	200	DWC	-0.16		-0.22	2.84	3.20	3.0215		
	PMRDM12	PMRDM13	L	20.00	2.747	3.143	4.012	0.347	0.200	200	DWC	-0.90		-0.92	3.56	3.67	3.615		
	EKRDM5	EKRDM6	L	20.00	3.383	3.460	2.128	0.184	0.200	200	DWC	-0.13		-0.17	3.44	3.55	3.4965		
Block 3C	MASNRDM4	MASNRDM5	L	26.00	4.773	4.894	35.638	3.079	0.200	200	DWC	-0.25		-0.29	4.82	5.06	4.939		
	PORDM11	PO3CRRDM10	L	30.00	4.940	4.975	10.566	0.913	0.200	200	DWC	0.01		-0.05	5.01	4.99	5.001		
	CKRDM18	CKRDM19	L	34.00	5.000	5.040	1.839	0.159	0.200	200	DWC	1.84		1.75	1.90	3.25	2.575		
	VIAPRDM2	ONHRDM5	L	33.00	4.903	5.316	3.842	0.332	0.200	200	DWC	-0.23		-0.29	4.69	5.19	4.9395		
	NH17SRRSM6	AASNRDM19.2		72.00	3.210	6.032	4.436	0.383	0.200	200	DWC	-0.28		-0.34	3.82	3.55	3.685		
Block 4	MNRDM10L	MNRDM9	L	20.00	5.586	5.432	0.915	0.079	0.200	200	DWC	0.72	0.72	0.69	5.02	4.90	4.9585		
	VPRDM21	VPRDM22	L	30.00	6.370	6.670	11.144	0.963	0.200	200	DWC	2.82		2.77	3.43	3.60	3.5145		
	VMRDM20.9	VMRDM20.8	L	21.00	13.312	14.206	18.168	1.570	0.200	200	DWC	8.36		8.32	4.06	4.99	4.526		
LS1	GNRDM9.7	VPRDM66.30.1	1	150	8.545	21.359	9.355	0.808	0.200	200	DWC	4.86		4.81	3.641	3.735	3.688	0.6	0.5
LS2	VPRDM91.19	VPRDM66.29	1	350	10.901	22.2	1.811	0.156	0.200	200	DWC	10.78		9.78	1.103	1.121	1.112	1.18	0.1
LS3	VMRDM20.21.4	VMRDM20.20	1	150	13.706	18.919	0.267	0.023	0.200	200	DWC	13.88		12.59	1.108	1.116	1.112	0.89	0.07
LS4	VMRDM22	VMRDM19	1	60	8.442	9.755	2.537	0.219	0.200	200	DWC	4.75		4.7	2.835	3.742	3.2885	0.42	0.25
LS5	VMRDM12.19	VPRDM66.7	1	190	5.618	14.062	3.276	0.283	0.200	200	DWC	1.76		1.7	3.797	3.918	3.8575	0.45	0.29

	MUTTAR STP-From WW1 to WW2							
	Detailed Estimate -SCREEN/GRIT WELL (3m dia)							
Sr. No	**Description of item**	**No.**	**L (m)**	**B (m)**	**D (m)**	**Quantity**	**Total**	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	π/4	5.10	5.10	2.00	40.86	**41.00**	**cu.m**
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	1	π	3.90	6.80	83.32		
	Total					115.14	**116.00**	**sq.m**
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	PI()*3.45	0.45	6.80	33.17	**34.00**	**cu.m**
	From 1.5m to 4.5m below ground level							
	kerb	1	((0.525*0.45)+(0.15*0.6)+(			4.86	**5.00**	**cu.m**
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x3^2		0.45	3.18	**4.00**	**cu.m**
4	C.C 1:2:4 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	**2.00**	**cu.m**
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	**207.10**	**kg**
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressior, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	**2.00**	**m**

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
b	Second depth of 2m					2	**2.00**	**m**
c	Third depth of 2m					0.7	**0.70**	**m**
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45^2/4		0.30	2.12	**2.20**	**cu.m**
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	41.21	120	kg/cum	4,944.65		
	wastage at 2.5%					124.00		
						5,068.65	**5100.00**	**kg**
9	Plastering with C.M.1:3 Using Sulphate resistance cement for 20mm thick including curing etc complete.(well inner)							
	a)Well inner	1	3.14x3		6.80	64.09		
	b)Well floor	1	3.14x3^2/4			7.07		
						71.16	**72.00**	**sq.m**
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	**18.00**	**sq.m**
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9^2		2.00	14.14		
	Total					26.72	**27.00**	**cu.m**
12	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	π/4	3.90	3.90	4.10	48.98		
	Deduct for Refilling quantity					(26.72)		
	Total					63.12	**64.00**	**cu.m**
13	Supplying and fixing C.I.steps.	1				22.67	**23.00**	**nos**
14	Colour washing two coats over one coat of white washing					18.00	**18.00**	**sq.m**

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
15	Supply and erection of Cast Iron single faced manually operated rising type 450mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well.					1.00	**1.00**	**no**
16	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.8m			5.4	**sq.m**	
	total weight of flats					613.87	**614.00**	
	50 x 10mm SS for outer frame	1	9.60			37.63	**38.00**	
	50mmx10mm flats at 30 mm spacing	34	1			133.28		
	Area of horizontal portion		3m x 1.5m			4.5	**sq.m**	
	total weight of flats					599.76	**600.00**	
	50 x 10mm SS for outer frame	1	9.00			35.28	**36.00**	
						Total	**1288.00**	
						Total wt of frame	**1288.00**	**Kg**
17	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	**290.76**	kg
	25 x6 SS for outer frame	1				14.46	**14.46**	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	**30.58**	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	**8.43**	
	Misc. items for opening frame	1				5.00	**5.00**	
						Total	**349.23**	kg
						Say	**350.00**	kg

	MUTTAR STP-From WW1 to WW2							
	DETAILED ESTIMATE-SUCTION WELL (5.5 m dia)							
Sl.No	**Description of item**	**No.**	**L (m)**	**B (m)**	**D (m)**	**Quantity**	**Total**	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	π/4	8.00	8.00	2.00	100.53	**101.00**	**cu.m**
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	5.50	0.60	10.37		
b	well Kerb - outer	1	π	6.85	1.33	28.51		
c	well Kerb - slope	1	5.50	6.03	0.90	32.59		
d	Side wall	1	π	6.10	8.59	164.62		
	Total					236.08	**237.00**	**sq.m**
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.60	8.59	98.77		
						98.77	**99.00**	**m3**
	From 1.5m to 4.5m below ground level							
	kerb	1	((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4			4.21	**5.00**	**m3**
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x5.5^2		0.60	14.25	**15.00**	**m3**
4	C.C 1:2:4 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
i)	4.5m to 9m depth	1	5.50	5.50	0.25	5.94	**6.00**	**m3**
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	6.7	16.9	kg/m	355.72	**355.80**	**kg**
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressior, helmet etc., complete and including baling out water.							
	5.5m dia well							
a	First depth of 2m					2	**2.00**	**m**
b	Second depth of 2m					2	**2.00**	**m**
c	Third depth of 2m					2	**2.00**	**m**
d	Fourth depth of 2m					0.59	**0.59**	**m**
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x6.1^2/4		0.40	11.69	**11.70**	**m3**
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	117.2	120	kg/cum	14,067.65		
	wastage at 2.5%					352.00		
						14,419.65	**14,500.00**	**kg**
9	Plastering with C.M.1:3 Using Sulphate resistance cement for 20mm thick including curing etc complete.(well inner)							
a)	Well inner	1	3.14x5.5		8.59	148.42		
b)	Well floor	1	3.14x5.5^2/4			23.76		
						172.18	**173.00**	**m2**
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
a)	well outer	1	3.14	6.70	1.00	21.04		
b)	top of wall thickness	1	3.14	6.10	0.60	11.49		
						32.53	**33.00**	**m2**

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					100.53		
	Total volume of the well	1	3.14/4x6.7^2		2.00	47.52		
	Total					53.01	**54.00**	**m3**
12	Disposal of surplus earth							
	Earthwork quantity	1				100.53		
	For sinking well	π/4	6.70	6.70	6.59	232.34		
	Deduct for Refilling quantity					(53.01)		
	Total					279.86	**280.00**	**m3**
13	Supplying and fixing C.I.steps.	1				28.63	**29.00**	**nos**
14	Colour washing two coats over one coat of white washing					33.00	**33.00**	**m2**
15	Supply and erection of Cast Iron single faced manually operated rising type 450mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well.					1.00	**1.00**	**no**
15	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				35.239	36.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					872.28	**872.28**	kg
	25 x6 SS for outer frame	1				24.84	**24.84**	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.70			52.53	**52.53**	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.80			25.93	**25.93**	
	Misc. items for opening frame	1				10.00	**10.00**	
						Total	**985.58**	kg
						Say	**986.00**	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	**DESCRIPTION OF WORK**	**NO**	**L (m)**	**B (m)**	**D (m)**	**QTY**	**TOTAL**	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	**13.00**	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	**2.00**	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	**1.00**	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	**4.00**	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	**305.00**	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	**22.00**	sq.m
7	Plastering with cement mortar 1:3 (**SRC**) for 20mm thick including curing, etc., complete.							
	Inside	2	1.50		1.20	3.60		
		2	1.50		1.20	3.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	10.05	**11.00**	sq.m
8	Plastering with cement mortar 1:3 (**SRC**) for 12mm thick including curing, etc., complete.							
	Outside	2	2.00		1.20	4.80		
		2	2.00		1.20	4.80		
						9.60	**10.00**	sq.m
9	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	**5.54**	cu.m
10	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	**7.41**	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	DESCRIPTION OF WORK	NO. OR QTY	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m

DETAILED ESTIMATE VALVE CHAMBER - 2.3 m x 3.8 m x 1.9 m								
SL. NO	**DESCRIPTION OF WORK**	**NO**	**L (m)**	**B (m)**	**D (m)**	**QTY**	**TOTAL**	
1	Earth work excavation	1	3.70	5.20	2.35	45.21	**46.00**	cu.m
2	Sand filling	1	3.70	5.20	0.15	2.89	**3.00**	cu.m
3	PCC 1:3:6, 40mm B.G with	1	3.30	4.80	0.10	1.58	**2.00**	cu.m
4	resistant cement concrete of							
	Raft	1	3.10	4.60	0.20	2.85		
	Walls	2	2.70	0.20	1.90	2.05		
		2	3.80	0.20	1.90	2.89		
						7.79	**8.00**	cu.m
5	Steel for RCC work	1	7.792 x 100 kg / cu.m			779.20	**780.00**	kg
6	Precast slab in Cement	1	2.70	4.20	0.18	1.98	**2.00**	cu.m
7	Providing formwork							
	Raft	2	3.10		0.20	1.24		
		2		4.60	0.20	1.84		
	Walls outer	2	2.70		1.90	10.26		
		2		4.20	1.90	15.96		
	Walls inner	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44		
					Total	52.48	**53.00**	sq.m
8	Plastering with cement mortar							
	Inside	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44	**23.00**	sq.m
9	Plastering with cement mortar							
	Outside	2	2.70		2.08	11.21		
		2		4.20	2.08	17.43		
						28.64	**29.00**	sq.m
10	Refilling with excavated soil							
	Total Excavation	1				45.21		
	Deduction							
	PCC	1				1.58		
	Sand filling	1				2.89		
	RCC	1				7.79		
	Chamber Size	1	2.30	3.80	1.90	16.61		
						16.35	**16.35**	cu.m
11	Disposal of earth work							
	Excavation	1				45.21		
	Refilling	1				16.35		
						28.87	**28.87**	cu.m
12	S&F CI steps	1				6	**6**	**Nos.**

MUTTAR STP-From WW2 to Inlet Chamber								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
Sr. No	**Description of item**	**No.**	**L (m)**	**B (m)**	**D (m)**	**Quantity**	**Total**	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	π/4	5.10	5.10	2.00	40.86	**41.00**	**cu.m**
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	1	π	3.90	7.10	86.99		
	Total					118.81	**119.00**	**sq.m**
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	PI()*3.45	0.45	7.10	34.63	**35.00**	**cu.m**
	From 1.5m to 4.5m below ground level							
	kerb	1	((0.525*0.45)+(0.15*0.6)+(			4.86	**5.00**	**cu.m**
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x3^2		0.45	3.18	**4.00**	**cu.m**
4	C.C 1:2:4 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	**2.00**	**cu.m**
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	**207.10**	**kg**

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressior, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	**2.00**	**m**
b	Second depth of 2m					2	**2.00**	**m**
c	Third depth of 2m					1	**1.00**	**m**
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45^2/4		0.30	2.12	**2.20**	**cu.m**
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	42.67	120	kg/cum	5,120.23		
	wastage at 2.5%					129.00		
						5,249.23	**5300.00**	**kg**
9	Plastering with C.M.1:3 Using Sulphate resistance cement for 20mm thick including curing etc complete.(well inner)							
	a)Well inner	1	3.14x3		7.10	66.92		
	b)Well floor	1	3.14x3^2/4			7.07		
						73.98	**74.00**	**sq.m**
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	**18.00**	**sq.m**
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9^2		2.00	14.14		
	Total					26.72	**27.00**	**cu.m**
12	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	π/4	3.90	3.90	4.40	52.56		
	Deduct for Refilling quantity					(26.72)		
	Total					66.70	**67.00**	**cu.m**
13	Supplying and fixing C.I.steps.	1				23.67	**24.00**	**nos**
14	Colour washing two coats over one coat of white washing					18.00	**18.00**	**sq.m**

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
15	Supply and erection of Cast Iron single faced manually operated rising type 450mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well.					1.00	**1.00**	**no**
16	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.8m			5.4	**sq.m**	
	total weight of flats					613.87	**614.00**	
	50 x 10mm SS for outer frame	1	9.60			37.63	**38.00**	
	50mmx10mm flats at 30 mm spacing	34	1			133.28		
	Area of horizontal portion		3m x 1.5m			4.5	**sq.m**	
	total weight of flats					599.76	**600.00**	
	50 x 10mm SS for outer frame	1	9.00			35.28	**36.00**	
						Total	**1288.00**	
						Total wt of frame	**1288.00**	**Kg**
17	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	**290.76**	kg
	25 x6 SS for outer frame	1				14.46	**14.46**	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	**30.58**	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	**8.43**	
	Misc. items for opening frame	1				5.00	**5.00**	
						Total	**349.23**	kg
						Say	**350.00**	kg

MUTTAR STP-From WW2 to Inlet Chamber								
DETAILED ESTIMATE-SUCTION WELL (7 m dia)								
Sl.No	**Description of item**	**No.**	**L (m)**	**B (m)**	**D (m)**	**Quantity**	**Total**	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	π/4	10.00	10.00	2.00	157.08	**158.00**	**cu.m**
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	7.00	1.00	21.99		
b	well Kerb - outer	1	π	9.15	2.10	60.37		
c	well Kerb - slope	1	7.00	7.83	1.38	64.27		
d	Side wall	1	π	8.00	8.79	220.92		
	Total					367.55	**368.00**	**sq.m**
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	1.00	8.79	220.92		
						220.92	**221.00**	**m3**
	From 1.5m to 4.5m below ground level							
	kerb	1	((1.075*1)+(0.25*1.1)+(0.			12.86	**13.00**	**m3**
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x7^2		1.00	38.48	**39.00**	**m3**

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
4	C.C 1:2:4 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	7.00	7.00	0.25	9.62	**10.00**	**m3**
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	9	16.9	kg/m	477.84	**477.90**	**kg**
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressior, helmet etc., complete and including baling out water.							
	7m dia well							
a	First depth of 2m					2	**2.00**	**m**
b	Second depth of 2m					2	**2.00**	**m**
c	Third depth of 2m					2	**2.00**	**m**
d	Fourth depth of 2m					1.29	**1.29**	**m**
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x8^2/4		1.71	85.95	**86.00**	**m3**
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	272.3	120	kg/cum	32,671.46		
	wastage at 2.5%					817.00		
						33,488.46	**33,500.00**	**kg**
9	Plastering with C.M.1:3 Using Sulphate resistance cement for 20mm thick including curing etc complete.(well inner)							
a)	Well inner	1	3.14x7		8.79	193.30		
b)	Well floor	1	3.14x7^2/4			38.48		
						231.79	**232.00**	**m2**
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
a)	well outer	1	3.14	9.00	1.00	28.26		
b)	top of wall thickness	1	3.14	8.00	1.00	25.12		
						53.38	**54.00**	**m2**

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					157.08		
	Total volume of the well	1	3.14/4x9^2		2.00	76.97		
	Total					80.11	**81.00**	**m3**
12	Disposal of surplus earth							
	Earthwork quantity	1				157.08		
	For sinking well	π/4	9.00	9.00	7.29	463.77		
	Deduct for Refilling quantity					(80.11)		
	Total					540.74	**541.00**	**m3**
13	Supplying and fixing C.I.steps.	1				29.30	**30.00**	**nos**
14	Colour washing two coats over one coat of white washing					54.00	**54.00**	**m2**
15	Supply and erection of Cast Iron single faced manually operated rising type 450mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well.					1.00	**1.00**	**no**
15	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				63.585	64.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					1,550.72	**1550.72**	kg
	25 x6 SS for outer frame	1				33.36	**33.37**	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	9.00			70.56	**70.56**	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	7.60			33.97	**33.98**	
	Misc. items for opening frame	1				10.00	**10.00**	
						Total	**1698.63**	kg
						Say	**1699.00**	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	**DESCRIPTION OF WORK**	**NO**	**L (m)**	**B (m)**	**D (m)**	**QTY**	**TOTAL**	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	**13.00**	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	**2.00**	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	**1.00**	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	**4.00**	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	**305.00**	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	**22.00**	sq.m
7	Plastering with cement mortar 1:3 (**SRC**) for 20mm thick including curing, etc., complete.							
	Inside	2	1.50		1.20	3.60		
		2	1.50		1.20	3.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	10.05	**11.00**	sq.m
8	Plastering with cement mortar 1:3 (**SRC**) for 12mm thick including curing, etc., complete.							
	Outside	2	2.00		1.20	4.80		
		2	2.00		1.20	4.80		
						9.60	**10.00**	sq.m
9	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	**5.54**	cu.m
10	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	**7.41**	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	**DESCRIPTION OF WORK**	**NO. OR QTY**	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m

DETAILED ESTIMATE VALVE CHAMBER - 2.4 m x 3.9 m x 2.2 m								
SL. NO	**DESCRIPTION OF WORK**	**NO**	**L (m)**	**B (m)**	**D (m)**	**QTY**	**TOTAL**	
1	Earth work excavation	1	3.80	5.30	2.65	53.37	**54.00**	cu.m
2	Sand filling	1	3.80	5.30	0.15	3.02	**4.00**	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	3.40	4.90	0.10	1.67	**2.00**	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	Raft	1	3.20	4.70	0.20	3.01		
	Walls	2	2.80	0.20	2.20	2.46		
		2	3.90	0.20	2.20	3.43		
						8.90	**9.00**	cu.m
5	Steel for RCC work	1	8.904 x 100 kg / cu.m			890.40	**891.00**	kg
6	Precast slab in Cement Concrete 1:2:4 using 12-20mm BG jelly for reinforced cement concrete works including cost of steel, centering, shuttering and cost of steel reinforcement and including laying in position, compacting, curing, finishing, etc., complete.	1	2.80	4.30	0.18	2.11	**2.20**	cu.m
7	Providing formwork							
	Raft	2	3.20		0.20	1.28		
		2		4.70	0.20	1.88		
	Walls outer	2	2.80		2.20	12.32		
		2		4.30	2.20	18.92		
	Walls inner	2	2.40		2.20	10.56		
		2		3.90	2.20	17.16		
					Total	62.12	**63.00**	sq.m
8	Plastering with cement mortar 1:3 (**SRC**) for 20mm thick including curing, etc., complete.							
	Inside	2	2.40		2.20	10.56		
		2		3.90	2.20	17.16	**28.00**	sq.m
9	Plastering with cement mortar 1:3 (**SRC**) for 12mm thick including curing, etc., complete.							
	Outside	2	2.80		2.38	13.30		
		2		4.30	2.38	20.43		
						33.73	**34.00**	sq.m
10	Refilling with excavated soil							
	Total Excavation	1				53.37		
	Deduction							
	PCC	1				1.67		

SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
	Sand filling	1				3.02		
	RCC	1				8.90		
	Chamber Size	1	2.40	3.90	2.20	20.59		
						19.19	**19.19**	cu.m
11	Disposal of earth work							
	Excavation	1				53.37		
	Refilling	1				19.19		
						34.18	**34.19**	cu.m
12	S&F CI steps	1				7	**7**	**Nos.**

ANNEXURE 5

ESTIMATES -STP

16.5 MLD - MUTTAR GENERAL ABSTRACT

General Abstract - Construction and Commissioning of 16.5 MLD STP in Muttar including Raw Sewage Colection Wet well 1 with Pumping Units 1no with sewage pumping Station for Block 4 of Muttar Collection System in the STP site Est. Cost: Rs 7415 lakh		
S. No	**Description**	**Amount Rs in Lakh**
	CAPITAL COST	
1	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 3 with Screen and grit wells for Block 3C and Block 4 of Muttar Zone (Peak Flow:11.74 mld) for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room integrally with that required for adjoining STP Components and Pumping main of 350 mm DI K9 class pipes to the adjoining inlet chamber of the STP with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	92.00
2	Design, Supply & Delivery, Construction and commissioning of 16.5 MLD STP for the ultimate sewage load during 2055 (Intermediate 2040: 15 MLD) with 10 year Operation & maintenance(O&M includes Wet well Sewage Pumping Station in Item1) and on Design, Build, Operate and Transfer mode based on the latest Sequential Batch Reactor Technology with Turbo Blowers having non-contact Air Foil bearings for energy savings with compatible Diffuser Assembly with highest standard specifications with minimal land and energy footprint having inbuilt plant automation including all other allied items for the best functioning of the STP comprising the requisite hierarchy of treatment units with contingent items associated thereto including Buildings with with disaster resilient design, compound wall, approach roads, storm water drains, peripheral plantations, landscaping Treated water fountain etc including aesthetic lay-outing of the plant since entry point to outfall locale congenial to the comfortable commute for O& M and the spinal functional efficacy to preserve the environment by complying the stringent effluent standards prescribed by KPCB/ CPCB for the discharge of STP treated water- **Concept to Completion Cost of STP having innovative robust, engineered and energy-efficient Turbo Blowers with high quality membrane diffuser assembly to produce the desired effluent quality to achieve BOD < 5 ppm, COD < 100 ppm, TSS < 10 ppm, to get recyclable quality of water for industrial / agricultural purposes. (Plant is designed for N, P outlet parameters and also include TN < 10 ppm, Nh3N < 2 ppm and TP < 1 ppm)**	3000.0
2.1	Environmental Management Plan including Environmental clearance, Public consultation	25
2.2	Extending Dedicated Electrical Feeders and the connected deposits and payments payable to Kerala Electricity Board for supply of uninterupted 24*7 power supply	247
3	**Supply, delivery and installation of SCADA System for STP including collection system**	252.3
4	**Supply, delivery and installation of 200 KW capacity Solar Power Plant at Muttar**	103
	Sub Total Item [1+4]	**3719.33**
	Provision for GST Payment @ 18%	**669.48**
	Total -1	**4388.81**

S. No	Description	Amount Rs in Lakh
	ANNUAL MAINTENANCE FOR 10 YEARS [OPERATIONAL COST]	
5	**Annual maintenance for 10 years for SCADA System for STP**	82.35
6	**Annual maintenance for 10 years for Installation of 200 KW capacity Solar Power Plant at Muttar**	32.64
7	**Annual Maintenance Cost of STP For 10 Years-** Total: Rs 2446.66 lakh	
7.1	O& M Cost excluding Electrical Energy for 10 years	1401.29
7.2	Electrical Energy Cost for 10 years	1045.37
	Sub Total [Item 5 to 7]	**2,561.65**
	Provision for GST Payment @ 18%	**461.10**
	Add for sundries	3.32
	Total -2	**3026.07**
	Grand Total	**7415**

(Rupees Seventy four crore and fifteen Only)

SUMMARY OF PUMPING STATION-		
Sr. No.	**Components**	**Cost (Rs.)**
1	Grit/Screen Chamber	13,91,806.95
2	Suction Well	38,36,440.88
4	Silt Pit	91,764.61
5	Silt Raiser	40,132.64
6	Valve Chamber	3,12,644.31
	Sub Cost, Rs.	**56,72,789.39**
7	Pipe Connection,Pumpsets Pumping main & allieds components Etc.,	**34,98,898.84**
		28,312.00
	Total Cost, Rs	**92,00,000.23**

Refer to Maharashtra State Schedule of Rates Year 2021 - 2022			
Calculating Rates for 16.5 MLD STP based on SBR Technology with Automation System - MPJ Rates 2021-22			
Design, Supply & Delivery, Construction and commissioning of 16.5 MLD STP for the ultimate sewage load during 2055 (Intermediate 2040: 15 MLD) based on the latest Sequential Batch Reactor Technology embracing highest standards and practices			
Estimate Cost: Rs 30 crore			
S. No	**Description**		**Amount Rs in Lakh**
1.1	Interpolating MLD rate from MPJ rates 2021-22: (99.78-1.55= 98.30say Rs 98.3 lakh) Reduce incremental value= (99.78-94.63)/5*1.5= 1.55, STP rated per MLD reduces when capacity increases from 15 to 20 MLD	1 MLD	98.3
1.2	Adding 5% to account of extra construction work and larger process units because of increased peak factor from 2 to 2.25 including price contingencies for 2022-23 rates	1 MLD	4.9
1.3	Adding 10% extra for Nitrogen & Phosphorous removal	per MLD	9.8
	Sub Total for 19 MLD SBR Technology based STP		**113.0**
1.4	Add 5% for work in **CORPORATION Area** on per MLD rate in above total		5.7
1.5	Add 5% for disaster resilience structures M30 concrete, higher specifications in buildings Sulphate resistant Cement, corrosion resistant steel, **SS SG 316** hand rails to protect against corrosion for 1.2 m wide walkways around the component structures for unhindered access to each unit including price contingencies due to increase cost of labour and associated items in Kerala		5.7
	Total Cost per MLD		**124.4**
	Total Cost of 16.5 MLD Plant based on above calculated MLD rates	**1 lot**	**2052.6**
2.1	**Cost for Additional Items not covered in per MLD rate of GWSSB**	**-**	**420**
	HT Substation including all additional requirements to meet high end specifications and latest		
	DG room including DG set of reputed make with latest configurations as per the design requirements including CEIG and allied statutory approvals if any until commissioning		
	Cost of Compound walls, Roads and Drains etc including Peripheral plantations, compensatory afforestation, Advanced Odour systems, Treated water fountains etc complete		
	Additional cost SS 316 Coarse/ fine Screens, Grit and Decanters and pricet variation in adopting latest Screw Press for Sludge dewatering Technology for energy savings and ease of maintenance		

S. No	Description		Amount Rs in Lakh
2.2	Additional cost for Lab equipment		39
2.3	Add for Site levelling and Soil stabilisation to improve SBC, Special/Pile footings, Architectural lay outing of Buildings, landscaping, Fountains, Aesthetical design finishes, 3 D modelling of the Plant/ STP etc complete to defray the site contingencies		293
	Total for STP with Tri-Lobe Blowers and PU Disc membrane Diffuser Assembly		**2804.6**
2.4	Add for higher specifications with modern Air diffusion Technology having High speed Turbo Aerators/Blowers with with non-contact, noise-less Air foil bearings to produce energy savings in place of lobe blowers. It is the latest technology, low vibration, noiseless and suitable for STPs in residential areas including. Additional cost includes price contingencies for high quality Membrane Diffusers compatible to turbo aeration to bring in maximum energy savings, less noise and efficacy in functioning		**135**
2.5	Add for higher specifications for diffuser Piping with SS316 laterals to adopt better quality newer materials with lesser Maintenance cost in excess of the diffuser Assembly considered in the MJP SoR including variation in cost for adopting latest Screw Press for Sludge dewatering to ensure highest standards with lesser energy footprint and improved functional efficacy		**60.4**
	Total for STP with Turbo Blowers with SS316 Diffuser pipes & latest Dewatering Technology with Screw Press		**3000.0**

(Rupees thirty cores) **INR 30 crore**

SCADA COMPONENTS & ESTIMATES					
Sl.No.	**Description**	**Qty.**	**Unit**	**Unit Price**	**Total Price**
1	**RAW SEWAGE** - WATER QUALITY SENSOR AND DISPLAY UNIT				
1a	BOD_5	1	No.	19,80,000	19,80,000
1b	COD	1	No.		
1c	TSS	1	No.		
1d	TKN (as N)	1	No.		
1e	TP (as PO_4)	1	No.		
2	**TREATED SEWAGE** - WATER QUALITY SENSOR AND DISPLAY UNIT				
2a	BOD_5 @ 20° C	1	No.	19,80,000	19,80,000
2b	COD	1	No.		
2c	TSS	1	No.		
2d	TN (as N)	1	No.		
2e	TP (as PO_4)	1	No.		
3	Raw Sewage Receiving Chamber				
	Sewage Level Sensor	1	No.	78,000	78,000
4	COARSE SCREEN CHANNEL: MECHANICAL				
4a	**Head Loss across Screen - Sensor**	1	Set	78,000	78,000
5	**COARSE SCREEN CHANNEL: MANUAL**				
5a	**Head Loss across Screen**	1	Set	78,000	78,000
6	**Raw Sewage Pumping Station**				
6a	Mechanical Coarse Bar Screen - Starter (1.5kW)(1W)	1	No.	65,000	65,000
6b	Flat Belt Conveyor - Starter (1.5kW)(1W)	1	No.	65,000	65,000
6c	Raw Sewage Pump-1 - VFD Starter Panel (11kW) (1W+1SB)	2	Nos.	1,48,000	2,96,000
6d	Raw Sewage Pump-2 - VFD Starter Panel (7.5kW)(1W+1SB)	1	Nos.	1,25,000	1,25,000
6e	Level Sensor	3	Nos	45,000	1,35,000
6f	Pressure Sensor	3	Nos	18,900	56,700
6g	Sensor Hook up System	6	lot	23,500	1,41,000
7	**STP**				
7a	Mechanical Fine Bar Screen (1.5 kW) - VFD Starter Panel (1W)	1	No.	65,000	65,000
7b	Flat Belt Conveyor - (1.5kW) VFD Starter Panel (1W)	1	No.	65,000	65,000
8	**Grit Chamber**				
8a	a. Scrapper Mechanism - VFD Starter Panel (1.5 kW) (2W)	2	Nos	65,000	1,30,000
8b	b. Classifier Mechanism - VFD Starter Panel (2.2 kW) (2W)	2	Nos	69,000	1,38,000
8c	c. Organic Return Pumps - VFD Starter Panel (1.5 kW) (2W+2SB)	4	Nos	65,000	2,60,000
8d	SBR Air Blowers(Tri-Lobe Blowers)-VFD Starter Panel (160kW) (2W)	2	Nos	5,02,000	10,04,000
8e	RAS Pumps - VFD Starter Panel - 7.5kW (2W)	2	Nos	1,25,000	2,50,000
8f	Decanters - VFD Starter Panel - 0.55kW (2W)	2	Nos	55,000	1,10,000
8g	SAS Pumps - VFD Starter Panel - 11kW (2W)	2	Nos	1,48,000	2,96,000
8h	Auto Valves/Sluice Gates - Motorized Actuator (0.55) (8W)	8	Nos	55,000	4,40,000
8i	Level Sensor	1	No.	45,000	45,000
8j	Pressure Sensor	3	Nos.	18,900	56,700
8k	Sensor Hook up System	4	lot	23,000	92,000
9	**Chlorination System**				
9a	a. Water Booster Pumps - VFD Starter Panel - 2.2kW (1W+1SB)	2	Nos	69,000	1,38,000
9b	b. NaOH Recirculation Pump - VFD Starter Panel - 2.2kW (1W)	1	Nos	69,000	69,000
9c	c. Air Blower - VFD Starter Panel - 1.5kW (1W)	1	Nos	65,000	65,000
9d	Residual Chlorine sensor	1	No.	73,000	73,000
9e	Free Chlorine Sensor	1	No.	67,800	67,800
9f	Level Sensor	2	Nos	45,000	90,000
9g	Pressure Sensor	3	Nos.	18,900	56,700
9k	Sensor Hook up System	7	lot	23,800	1,66,600
10	**Sludge Transfer, Dewatering & Thickening**				
10a	Sludge Sump Mixers VFD Starter Panel - 3.7kW (2W)	2	Nos	98,000	1,96,000
10b	Centrifuge - VFD Starter Panel - 22kW (1W+1SB)	2	Nos	2,37,000	4,74,000

Sl.No.	Description	Qty.	Unit	Unit Price	Total Price
10c	Centrifuge Feed Pumps - VFD Starter Panel - 7.5kW(1W+1SB)	2	Nos	1,25,000	2,50,000
11	**Dewatering Polymer Dosing System**				
11a	a. Agitators for Dosing Tanks - VFD Starter Panel - 0.75kW (2W)	2	Nos	52,000	1,04,000
11b	b. Dosing Pumps - VFD Starter Panel- 0.75kW (1W+1SB)	2	Nos	52,000	1,04,000
11c	Service Water Pumps - VFD Starter Panel - 3.7kW (1W+1SB)	2	Nos	98,000	1,96,000
11d	Level Sensor	2	Nos	98,000	1,96,000
11e	Pressure Sensor	3	Nos.	18,900	56,700
11f	Sensor Hook up System	5	lot	23,900	1,19,500
12	**RTU/PLC Panel**				
12a	RTU/PLC Panel	1	No.	7,89,000	7,89,000
12b	Battery Power Back-up	1	set	2,45,000	2,45,000
12c	GSM-GPRS unit	1	No.	12,000	12,000
12d	Antenna	1	No.	8,900	8,900
12e	Earth Pit	3	No.	22,500	67,500
12f	Field Cable	1	Lot		-
12g	Monitoring and Control Unit	1	No.	5,67,800	5,67,800
12h	SCADA Software	1	No.	3,28,000	3,28,000
12i	solar Power back-up for the electronics unit	1	No.	3,45,000	3,45,000
13	**SEWAGE COLLECTION AND PUMPING SYSTEM**				
	LM-1 TO LM - 20				
13a	Sewage Pumping System from the collection sump - VFD Starter Panel - 4 kW	40	Nos.	1,20,000	48,00,000
13b	RTU/PLC PANEL Integeration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	20	No.	1,79,000	35,80,000
13c	Level Sensor	20	No.	45,000	9,00,000
13d	Pressure Sensor	20	No.	18,900	3,78,000
13e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	20	No.	23,000	4,60,000
13f	Maintenance Free Power & Signal Earth	20	Nos,	22,500	4,50,000
13g	Field Signal Cable (Power cables are not included)	20	Lot	19,000	3,80,000
14	**WW-1 to WW-2**				
14a	WW-1 to WW-2 - VFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
14b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
14c	RTU/PLC PANEL Integeration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
14d	Level Sensor	1	No.	45,000	45,000
14e	Pressure Sensor	1	No.	18,900	18,900
14f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
14g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
15	**WW-2 to STP**				
15a	WW-1 to WW-2 - VFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
15b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
15c	RTU/PLC PANEL Integeration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
15d	Level Sensor	1	No.	45,000	45,000
15e	Pressure Sensor	1	No.	18,900	18,900
15f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
15g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
16	**Electrical Hoist with Travelling Trolley**				
16a	a. 5 HP (4 Nos)				
17	**Utility**				
17a	Plant Area Lighting				
	Basic Total				2,52,32,700
	Installation and Commissioning charges @ 12%				30,27,924
	Transport Charges @ 5%				12,61,635
	Insurance @ 0.6%				1,51,396
	Financial Charges @ 2%				5,04,654
	Other @ 2%				5,04,654
	Sub Total				3,06,82,963
	GST 18%				55,22,933
	Total				3,62,05,897

SOLAR PLANT 200 KW CAPACITY & ESTIMATES

Solar Plant 200 KW Capacity in Muttar STP Site & Estimates					
S.No.	**Description**	**Qty.**	**Unit**	**Unit Price**	**Total Price Rs**
1.Solar Plant 200 KW Capacity in Muttar STP Site					
	Of Supply, Delivery and InstallationSolar Power unit of 200KW using an array of Solar panels of 535-650 W capacity or higher to conserve space				
1.1	Cost of Solar Plant	200 kw	1 KW	50,000	1,00,00,000
1.2	Statutory approvals including CEG, Safety Certification and Online NoC etc	1 lot	-		3,00,000
1.3	Total Base cost				**1,03,00,000.00**
2. Annual Maintenance Cost of 200 KW Solar plant in Muttar STP site					
2.1	Annual Maintenance @ 5% of the Base cost for 1 year	1.0 lakh		0.03	3,00,000
2.2	Annual Maintenance for 10 years				32,63,788
3.Cost Savings from Solar Energy produced					
3.1	Total Energy harvested per day	200 kw	1 KW	4 unit	800 Units
3.2	Energy savings @ Rs 6.1 charged for the EB grid per day	800 Units	1 unit	6	Rs 4880
3.3	Annual Energy Savings during the 1st year	30*12		4,880	17,56,800
3.4	Annual Energy Savings for 10 years				**2,20,96,841**

1.1 ESTABLISHMENT CHARGES

SL. No	Location	Description	Nos	Wage/Month	Cost per Month	Cost /Month-Annum
1	MUTTAR SEWERAGE TREATMENT PLANT : 16.5 MLD	Plant Engineer/Manger	1	30,000.00	30,000.00	
3		Chemist	1	25,000.00	25,000.00	
4		Lab Assistant			-	
5		Mechanic/Fitter	1	18,000.00	18,000.00	
6		Electrician / Plant Operators	3	18,000.00	54,000.00	
7		Helpers	5	15,000.00	75,000.00	
8		Gardener/Sweeper/Watchman	3	10,000.00	30,000.00	
		Total	**15 nos**		2,32,000.00	27,84,000.00
		Add contractor's profit 15% Total			**2,66,800.00**	**32,01,600.00**

Establishment Cost For Annual Maintenace = Rs 32.02 lakh

1.2. CHEMICAL

SL NO	CHEMICAL	FLOW in MLD	UNIT	DOSAGE	UNIT	QTY Kg/day	UNIT RATE Rs.	AMOUNT Rs.
1	Chlorine @ 5 mg/l	15.00	MLD	5.00	mg/l	75	18.00	1,350.00
2	Dewatering Polymer @ 2.0 Kg/Ton of Dry Solids	3.400	MT	1.50	Kg/MT	5	350.00	1,785.00
	TOTAL (Rs./day)							3,135.00
	TOTAL Rs/ Month							97,185.00
	TOTAL (Rs/year)							**11,66,220.00**
		Add contractor's profit 15% Total						**13,41,153.00**

Cost of Chemicals per Annum= Rs 13.41 lakh

1.3. RESIDUAL DISPOSAL of SCREENINGS, GRIT AND DEWATERED SLUDGE

SL NO	DESCRIPTIPON	FLOW in MLD	UNIT	QTY Cum/day	UNIT RATE Rs./Cum	AMOUNT Rs.
1	Dewatered Sludge **Qty (m3/day) = Sludge (Kg/day) / Consistency (20%) / 1000**	15.00	MLD	14.00	200.00	2,800
	Coarse Screenings @ 15 Litres/MLD **Qty (m3/day) = Flow (MLD) x 0.015**	15.00	MLD	0.225	200.00	45
2	Fine Screenings @ 45 Litres/MLD **Qty (m3/day) = Flow (MLD) x 0.045**	15.00	MLD	0.675	200.00	135
3	Grit @ 0.05-0.15 Cum/MLD **Qty (m3/day) =Flow (MLD) x 0.1**	15.00	MLD	1.500	200.00	300
	TOTAL (Rs./day)					**3,280.00**
	Total/Month					**98,400.00**
	TOTAL (Rs./year)					**11,80,800.00**
	Total/per year with CoP 15%					**13,57,920.00**

Cost of Residual Disposal = Rs 13.57 lakhs

1.4. MAINTENANCE (Capital Cost= 92+3000-293-200=2599 Civil: Rs 1230 lakh, EMI: 1369 lakh)

SL NO	DESCRIPTION	CAPTAL COST Rs.	RATE	ANNUAL MAINTENANCE COST Rs.
1	Civil Works @ 0.5 **%** of Capital Cost	12,30,00,000.00	0.50%	6,15,000
2	Mechanical, Electrical & Instrumentation Works @ 2% of Capital Cost	13,69,00,000.00	2.00%	27,38,000
	TOTAL (Rs./year)			33,53,000

Cost of Maintenance = Rs 33.53 lakh

ENERGY DEMAND & CONSUMPTION COST FOR Muttar 16.5 MLD STP				
S.No	**Description**	**Value**	**Unit**	**Remarks**
1	**Transformer Capacity Design**			
1.1	Transformer connected load	550	KW	
1.2	Calculation of transformer capacity with 0.9 PF and 10% Margin	775	KVA	
1.3	Capacity of Transformer proposed: 800 KVA	800	KVA	
2	**Calculation of Electrical Energy demand and energy Consumption**			
2.1	Electrical Energy Demand			
a	Working Load	550	KW	
b	Average working hours of plant/ day	5.87	hours	
c	Total energy consumption per day	3,230	KWH	
d	Monthly consumption	3230x30	KWH	
e	Energy Cost	96,900.00	KWH	
3	**Electrical Energy cost**			
5.1	KVA demand charge (310 Rs/KVA)	800*310	Rs	
		Rs 2,48,000		
5.2	Energy charges (RS 6.10/KWH)	96,900x6.10	Rs	
		Rs 591000	Rs	
	Total charges payable (A+B) per Month	**₹ 8,39,000**	Rs	
	Energy charges payable /annum	**₹ 1,00,68,000**	Rs	

Muttar STP Annual Maintenance Estimate & Electricity Charges										
S.No	**Item description**	**Establishment (A)**	**Chemicals (B)**	**Residues (B)**	**Maintenance (C)**	**Electrical Energy Charges (D)**	**SCADA AME**	**Solar Power savings**	**Solar AME**	**Genset AME**
1	AM for 1st Year Estimate	32,01,600.00	13,41,153.00	13,57,920.00	Nil	1,00,68,000	Nil	17,56,800	Nil	23,40,000
2	AM for 2nd Year	33,61,680.00	14,08,210.65	14,25,816.00	Nil	1,05,71,400.00	Nil	18,44,640	Nil	24,57,000.00
3	Annual Mace for 3rd Year (5 % increase)	35,29,764.00	14,78,621.18	14,97,106.80	33,53,000.00	1,10,99,970.00	7,56,981.00	19,36,872	3,00,000.00	25,79,850.00
4	Annual Mace for 4th Year (5 % increase)	37,06,252.20	15,52,552.24	15,71,962.14	35,20,650.00	1,16,54,968.50	7,94,830.05	20,33,716	3,15,000.00	27,08,842.50
5	Annual Mace for 5th Year (5 % increase)	38,91,564.81	16,30,179.85	16,50,560.25	36,96,682.50	1,22,37,716.93	8,34,571.55	21,35,401	3,30,750.00	28,44,284.63
6	Annual Mace for 6th Year (10 % increase only for Maintenance, Others 5%)	40,86,143.05	17,11,688.85	17,33,088.26	40,66,350.75	1,28,49,602.77	9,18,028.71	22,42,171	3,63,825.00	29,86,498.86
7	Annual Mace for 7th Year (10 % increase)	42,90,450.20	17,97,273.29	18,19,742.67	44,72,985.83	1,34,92,082.91	10,09,831.58	23,54,280	4,00,207.50	31,35,823.80
8	Annual Mace for 8th Year (10 % increase)	45,04,972.71	18,87,136.95	19,10,729.81	49,20,284.41	1,41,66,687.06	11,10,814.74	24,71,994	4,40,228.25	32,92,614.99
9	Annual Mace for 9th Year (15 % increase)	47,30,221.35	19,81,493.80	20,06,266.30	56,58,327.07	1,48,75,021.41	12,77,436.95	25,95,594	5,06,262.49	34,57,245.74
10	Annual Mace for 10th Year (20 % increase)	49,66,732.42	20,80,568.49	21,06,579.61	67,89,992.48	1,56,18,772.48	15,32,924.34	27,25,373	6,07,514.99	36,30,108.03
	Total AMC for 10 Years	**4,02,69,380.74**	**1,68,68,878.31**	**1,70,79,771.83**	**3,64,78,273.03**	**12,66,34,222.05**	**82,35,418.91**	**2,20,96,841.61**	**32,63,788.22**	**2,94,32,269**
		402.69	**168.69**	**170.80**	**364.78**	**1,266.34**	**82.35**	**220.97**	**32.64**	**294.32**

NB: i) Annual increase is 5% uniform for Establishment, Chemicals and Electricity
ii) The annual cost for Maintenance progressively increases by 5% upto 5th year
10% for 6th to 8th, and 15% for 8th and 20% for 10th year
1.Chargeable to Contract:= A+B+C = Rs 1107 Lakh
2. Payable to Electricity Board)+ (2) alone = Rs 1266 Lakh

Annual Maintenance Estimate Cost for O& M [Rs in Lakh]			
S.No	Item	AME for 1st year	AME for 10 years
1.1	Manpower	32.02	402.69
1.2	Chemicals	13.41	168.69
1.3	Residue Disposal	13.58	170.80
1.4	Maintenance	33.53	364.78
1.5	Genset Fuel	23.40	294.32
	Total O&M excluding Solar and SCADA	**115.94**	**1,401.29**
1.6	SCADA	7.57	82.35
1.7	Solar	3.00	32.64
1.8	Total O&M excluding Electrical charges	**126.51**	**1,516.28**
a	Electrical Energy	100.68	1266.34
b	Solar Savings	-	220.97
1.9	**Net Electrical energy Cost for AME(a-b)**	**100.68**	**1,045.37**

MUTTAR STP-From WW@STP site to Inlet Chamber								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
Sr. No	**Description of item**	**No.**	**L (m)**	**B (m)**	**D (m)**	**Quantity**	**Total**	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	π/4	5.10	5.10	2.00	40.86	**41.00**	**cu.m**
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	1	π	3.90	6.50	79.64		
	Total					111.46	**112.00**	**sq.m**
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	PI()*3.45	0.45	6.50	31.70	**32.00**	**cu.m**
	From 1.5m to 4.5m below ground level							
	kerb	1	((0.525*0.45)+(0.15*0.6)+(0.5*(0.525-0.15)*0.6))*11.1			4.86	**5.00**	**cu.m**
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x3^2		0.45	3.18	**4.00**	**cu.m**
4	C.C 1:2:4 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	**2.00**	**cu.m**
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	**207.10**	**kg**
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressior, helmet etc., complete and including baling out water							

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
	3m dia well							
a	First depth of 2m					2	**2.00**	**m**
b	Second depth of 2m					2	**2.00**	**m**
c	Third depth of 2m					0.4	**0.40**	**m**
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45^2/4		0.30	2.12	**2.20**	**cu.m**
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	39.74	120	kg/cum	4,769.07		
	wastage at 2.5%					120.00		
						4,889.07	**4900.00**	**kg**
9	Plastering with C.M.1:3 Using Sulphate resistance cement for 20mm thick including curing etc complete.(well inner)							
	a)Well inner	1	3.14x3		6.50	61.26		
	b)Well floor	1	3.14x3^2/4			7.07		
						68.33	**69.00**	**sq.m**
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	**18.00**	**sq.m**
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9^2		2.00	14.14		
	Total					26.72	**27.00**	**cu.m**
12	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	π/4	3.90	3.90	3.80	45.39		
	Deduct for Refilling quantity					(26.72)		
	Total					59.53	**60.00**	**cu.m**
13	Supplying and fixing C.I.steps.	1				21.67	**22.00**	**nos**
14	Colour washing two coats over one coat of white washing					18.00	**18.00**	**sq.m**

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
15	Supply and erection of Cast Iron single faced manually operated rising type 450mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear					1.00	**1.00**	**no**
16	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.8m			5.4	**sq.m**	
	total weight of flats					613.87	**614.00**	
	50 x 10mm SS for outer frame	1	9.60			37.63	**38.00**	
	50mmx10mm flats at 30 mm spacing	34	1			133.28		
	Area of horizontal portion		3m x 1.5m			4.5	**sq.m**	
	total weight of flats					599.76	**600.00**	
	50 x 10mm SS for outer frame	1	9.00			35.28	**36.00**	
						Total	**1288.00**	
						Total wt of frame	**1288.00**	**Kg**
17	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	**290.76**	kg
	25 x6 SS for outer frame	1				14.46	**14.46**	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	**30.58**	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	**8.43**	
	Misc. items for opening frame	1				5.00	**5.00**	
						Total	**349.23**	kg
						Say	**350.00**	kg

	MUTTAR STP-From WW@STP site to Inlet Chamber							
	DETAILED ESTIMATE-SUCTION WELL (5.5 m dia)							
Sl.No	**Description of item**	**No.**	**L (m)**	**B (m)**	**D (m)**	**Quantity**	**Total**	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	π/4	8.00	8.00	2.00	100.53	**101.00**	**cu.m**
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	5.50	0.60	10.37		
b	well Kerb - outer	1	π	6.85	1.33	28.51		
c	well Kerb - slope	1	5.50	6.03	0.90	32.59		
d	Side wall	1	π	6.10	8.22	157.53		
	Total					228.99	**229.00**	**sq.m**
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.60	8.22	94.52		
						94.52	**95.00**	**m3**
	From 1.5m to 4.5m below ground level							
	kerb	1	((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*19.4			4.21	**5.00**	**m3**
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x5.5^2		0.60	14.25	**15.00**	**m3**
4	C.C 1:2:4 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
	Benching							
i)	4.5m to 9m depth	1	5.50	5.50	0.25	5.94	**6.00**	**m3**
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	6.7	16.9	kg/m	355.72	**355.80**	**kg**
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressior, helmet etc., complete and including baling out water.							
	5.5m dia well							
a	First depth of 2m					2	**2.00**	**m**
b	Second depth of 2m					2	**2.00**	**m**
c	Third depth of 2m					2	**2.00**	**m**
d	Fourth depth of 2m					0.22	**0.22**	**m**
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x6.1^2/4		0.40	11.69	**11.70**	**m3**
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	113.0	120	kg/cum	13,557.13		
	wastage at 2.5%					339.00		
						13,896.13	**13,900.00**	**kg**
9	Plastering with C.M.1:3 Using Sulphate resistance cement for 20mm thick including curing etc complete.(well inner)							
a)	Well inner	1	3.14x5.5		8.22	142.03		
b)	Well floor	1	3.14x5.5^2/4			23.76		
						165.79	**166.00**	**m2**
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
a)	well outer	1	3.14	6.70	1.00	21.04		
b)	top of wall thickness	1	3.14	6.10	0.60	11.49		
						32.53	**33.00**	**m2**

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					100.53		
	Total volume of the well	1	3.14/4x6.7^2		2.00	47.52		
	Total					53.01	**54.00**	**m3**
12	Disposal of surplus earth							
	Earthwork quantity	1				100.53		
	For sinking well	π/4	6.70	6.70	6.22	219.30		
	Deduct for Refilling quantity					(53.01)		
	Total					266.81	**267.00**	**m3**
13	Supplying and fixing C.I.steps.	1				27.40	**28.00**	**nos**
14	Colour washing two coats over one coat of white washing					33.00	**33.00**	**m2**
15	Supply and erection of Cast Iron single faced manually operated rising type 450mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well.					1.00	**1.00**	**no**
15	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc.complete							
	Area of pumping station	1				35.239	36.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					872.28	**872.28**	kg
	25 x6 SS for outer frame	1				24.84	**24.84**	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.70			52.53	**52.53**	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.80			25.93	**25.93**	
	Misc. items for opening frame	1				10.00	**10.00**	
						Total	**985.58**	kg
						Say	**986.00**	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	**DESCRIPTION OF WORK**	**NO**	**L (m)**	**B (m)**	**D (m)**	**QTY**	**TOTAL**	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	**13.00**	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	**2.00**	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	**1.00**	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	**4.00**	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	**305.00**	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	**22.00**	sq.m
7	Plastering with cement mortar 1:3 (**SRC**) for 20mm thick including curing, etc., complete.							
	Inside	2	1.50		1.20	3.60		
		2	1.50		1.20	3.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	10.05	**11.00**	sq.m
8	Plastering with cement mortar 1:3 (**SRC**) for 12mm thick including curing, etc., complete.							
	Outside	2	2.00		1.20	4.80		
		2	2.00		1.20	4.80		
						9.60	**10.00**	sq.m
9	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	**5.54**	cu.m
10	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	**7.41**	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	**DESCRIPTION OF WORK**	**NO. OR QTY**	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m

DETAILED ESTIMATE VALVE CHAMBER - 2.3 m x 3.8 m x 1.9 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	3.70	5.20	2.35	45.21	**46.00**	cu.m
2	Sand filling	1	3.70	5.20	0.15	2.89	**3.00**	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	3.30	4.80	0.10	1.58	**2.00**	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	Raft	1	3.10	4.60	0.20	2.85		
	Walls	2	2.70	0.20	1.90	2.05		
		2	3.80	0.20	1.90	2.89		
						7.79	**8.00**	cu.m
5	Steel for RCC work	1	7.792 x 100 kg / cu.m			779.20	**780.00**	kg
6	Precast slab in Cement Concrete 1:2:4 using 12-20mm BG jelly for reinforced cement concrete works including cost of steel, centering, shuttering and cost of steel reinforcement and including laying in position, compacting, curing, finishing, etc., complete.	1	2.70	4.20	0.18	1.98	**2.00**	cu.m
7	Providing formwork							
	Raft	2	3.10		0.20	1.24		
		2		4.60	0.20	1.84		
	Walls outer	2	2.70		1.90	10.26		
		2		4.20	1.90	15.96		
	Walls inner	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44		
					Total	52.48	**53.00**	sq.m
8	Plastering with cement mortar 1:3 (**SRC**) for 20mm thick including curing, etc., complete.							
	Inside	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44	**23.00**	sq.m
9	Plastering with cement mortar 1:3 (**SRC**) for 12mm thick including curing, etc., complete.							
	Outside	2	2.70		2.08	11.21		
		2		4.20	2.08	17.43		
						28.64	**29.00**	sq.m
10	Refilling with excavated soil							
	Total Excavation	1				45.21		
	Deduction							
	PCC	1				1.58		
	Sand filling	1				2.89		
	RCC	1				7.79		
	Chamber Size	1	2.30	3.80	1.90	16.61		
						16.35	**16.35**	cu.m
11	Disposal of earth work							
	Excavation	1				45.21		
	Refilling	1				16.35		
						28.87	**28.87**	cu.m
12	S&F CI steps	1				6	**6**	**Nos.**

ANNEXURE 6

DESIGN AND DRAWINGS

ANNEXURE 6

DESIGN: SEWER NETWORK

SEWER NETWORK DESIGN - Zone 5&Zone2 (TP&Chilavanoor N/Catchment)				
Sl. No.	**Description**	**Year**	**Quantity BLOCK5**	**Unit**
1	Projected population	2055	37030	Persons
2	Domestic Demand @150LPCD		5.555	MLD
3	Floating population		20367	Persons
4	Floating Demand @ 70 LPCD		1.426	MLD
5	Nondomestic demand		0.858	MLD
6	Waste water generated		85%	%
7	Quantity of waste water generated		6.663	MLD
8			6662583.558	LPD
9	GWI @4500liters per kilometer sewer length	30.22	135990	Liters
			6798573.558	
			0.13599	MLD
			6.799	MLD
			6.799	MLD

SEWER NETWORK DESIGN -Block 2 Muttar STP

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	ASKRDM37	ASKRDM36	0	1	H		17		17.00	4.140	4.134	2.60	2.60	2.25	0.068	0.000	0.068	10	200	200	DWC	2833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	3.04		2.95	1.10	1.18
2	ASKRDM36	ASKRDM35	1	1	C		23		40.00	4.134	4.028	3.52	6.13	2.25	0.160	0.000	0.160	15	200	200	DWC	217	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.95		2.82	1.18	1.21
3	ASKRDM35	ASKRDM34	1	1	C		23		63.00	4.028	3.923	3.52	9.65	2.25	0.251	0.000	0.251	18	200	200	DWC	219	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.82		2.69	1.21	1.23
4	ASKRDM34	ASKRDM33	1	1	C		27		90.00	3.923	3.707	4.14	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	125	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	2.69		2.54	1.23	1.17
5	ASKRDM33	ASKRDM32	1	1	C		25		115.00	3.707	3.561	3.83	17.62	2.25	0.459	0.000	0.459	25	200	200	DWC	171	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.54		2.40	1.17	1.16
6	ASKRDM32	ASKRDM31	1	1	C		25		140.00	3.561	3.420	3.83	21.45	2.25	0.558	0.000	0.558	27	200	200	DWC	177	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.40		2.32	1.16	1.10
7	ASKRDM30.5	ASKRDM30.4	0	1	H		15		15.00	3.644	3.743	2.30	2.30	2.25	0.060	0.000	0.060	9	200	200	DWC	-152	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.54		2.46	1.10	1.28
8	ASKRDM30.4	ASKRDM30.3	1	1	C		26		41.00	3.743	2.937	3.98	6.28	2.25	0.164	0.000	0.164	15	200	200	DWC	32	41	0.010	2.12	66.72	0.00	0.30	0.07	OK	0.64	OK	0.63	0.00	2.46		1.83	1.28	1.11
9	ASKRDM30.3	ASKRDM30.2	1	1	C		27		68.00	2.937	3.034	4.14	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	-278	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	1.83		1.68	1.11	1.35
10	ASKRDM30.2.2	ASKRDM30.2.1	0	1	H		20		20.00	3.292	3.164	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	156	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.13	0.00	2.19		2.06	1.10	1.10
11	ASKRDM30.2.1	ASKRDM30.2	1	1	C		17		37.00	3.164	3.034	2.60	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	131	131	0.010	1.19	37.33	0.00	0.30	0.07	OK	0.36	OK	0.13	0.00	2.06		1.93	1.10	1.10
12	ASKRDM30.2	ASKRDM30.1	2	1	J		21		126.00	3.034	3.179	3.22	19.30	2.25	0.503	0.000	0.503	26	200	200	DWC	-145	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	1.68	1.68	1.61	1.35	1.57
13	ASKRDM30.1	ASKRDM30	1	1	C		23		149.00	3.179	3.324	3.52	22.82	2.25	0.594	0.000	0.594	28	200	200	DWC	-159	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	1.61		1.56	1.57	1.76
14	ASKRDM30	ASKRDM31	1	1	C		19		168.00	3.324	3.416	2.91	25.73	2.25	0.670	0.000	0.670	30	200	200	DWC	-207	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	1.56		1.52	1.76	1.90
15	ASKRDM31	FRRDMH14	2	1	J		16		324.00	3.416	3.618	2.45	49.63	2.25	1.292	0.000	1.292	41	200	200	DWC	-79	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	1.52	1.52	1.49	1.90	2.13
16	FRRDMH14	FRRDMH13	1	1	C		17		341.00	3.618	3.820	2.60	52.24	2.25	1.360	0.000	1.360	42	200	200	DWC	-84	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	1.49		1.46	2.13	2.36
17	FRRDMH13	FRRDMH12	1	1	C		32		373.00	3.820	3.601	4.90	57.14	2.25	1.488	0.000	1.488	44	200	200	DWC	146	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.46		1.40	2.36	2.20
18	FRRDMH12	FRRDMH11	1	1	C		10		383.00	3.601	3.608	1.53	58.67	2.25	1.528	0.000	1.528	45	200	200	DWC	-1429	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.02	0.00	1.40		1.38	2.20	2.23
19	FRRDMH11	FRRDMH10	1	1	C		20		403.00	3.608	3.582	3.06	61.73	2.25	1.608	0.000	1.608	46	200	200	DWC	769	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	1.38		1.34	2.23	2.24
20	FRRDMH10	FRRDMH9	1	1	C		20		423.00	3.582	3.557	3.06	64.80	2.25	1.687	0.000	1.687	47	200	200	DWC	800	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	1.34		1.30	2.24	2.26
21	FRRDMH9	FRRDMH8	1	1	C		23		446.00	3.557	3.576	3.52	68.32	2.25	1.779	0.000	1.779	48	200	200	DWC	-1211	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	1.30		1.26	2.26	2.32
22	FRRDMH8	FRRDMH7	1	1	C		30		476.00	3.576	3.471	4.60	72.92	2.25	1.899	0.000	1.899	50	200	200	DWC	286	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	1.26		1.20	2.32	2.27
23	FRRDMH7	FRKLLRDMH6	1	1	C		8		484.00	3.471	3.443	1.23	74.14	2.25	1.931	0.000	1.931	50	200	200	DWC	286	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.02	0.00	1.20		1.18	2.27	2.26
24	ASKRDM38	ASKRDM39	0	1	H		26		26.00	4.140	3.290	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	31	31	0.010	2.46	77.36	0.00	0.30	0.07	OK	0.74	OK	0.85	0.00	3.04		2.19	1.10	1.10
25	ASKRDM39	ASKRDM40	1	1	C		23		49.00	3.290	3.822	3.52	7.51	2.25	0.195	0.000	0.195	16	200	200	DWC	-43	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.19		2.06	1.10	1.76
26	ACSRDMH3.1	ACSRDMH3.2	0	1	H		28		28.00	3.494	3.500	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	-4667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	2.39		2.23	1.10	1.27
27	ACSRDMH3.2	ACSRDMH3.3	1	1	C		20		48.00	3.500	3.393	3.06	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	187	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.23		2.12	1.27	1.27
28	ACSRDMH3.3	ACSRDMH3.4	1	1	C		20		68.00	3.393	3.286	3.06	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	187	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.12		2.01	1.27	1.28
29	ACSRDMH3.4	ACSRDMH3.5	1	1	C		24		92.00	3.286	3.345	3.68	14.09	2.25	0.367	0.000	0.367	22	200	200	DWC	-407	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.01		1.88	1.28	1.47
30	ACSRDMH3.5	ACSRDMH3.6	1	1	C		27		119.00	3.340	3.583	4.14	18.23	2.25	0.475	0.000	0.475	25	200	200	DWC	-111	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	1.88		1.80	1.46	1.78
31	ACSRDMH3.6	ASKRDM40	1	1	C		25		144.00	3.583	3.822	3.83	22.06	2.25	0.574	0.000	0.574	28	200	200	DWC	-105	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	1.80		1.74	1.78	2.08
32	ASKRDM40	ASKRDM41	2	1	J		28		221.00	3.822	3.293	4.29	33.85	2.25	0.882	0.000	0.882	34	200	200	DWC	53	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	1.74	1.74	1.69	2.08	1.60
33	ASKRDM41	ASKRDM42	1	1	C		29		250.00	3.293	3.787	4.44	38.30	2.25	0.997	0.000	0.997	36	200	200	DWC	-59	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.69		1.63	1.60	2.16
34	ASKRDM42.1	ASKRDM42	0	1	H		25		25.00	3.600	3.787	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	-134	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.50		2.36	1.10	1.43
35	ASKRDM42	ASKRDM43	2	1	J		19		294.00	3.780	3.917	2.91	45.04	2.25	1.173	0.000	1.173	39	200	200	DWC	-139	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.63	1.63	1.59	2.15	2.33
36	ASKRDM43	ASKRDM44	1	1	C		13		307.00	3.917	3.842	1.99	47.03	2.25	1.225	0.000	1.225	40	200	200	DWC	173	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	1.59		1.56	2.33	2.28
37	ASKRDM49.3	ASKRDM49.2	0	1	H		22		22.00	3.994	3.982	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	1833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.89		2.77	1.10	1.21
38	ASKRDM49.2	ASKRDM49.1	1	1	C		31		53.00	3.982	3.962	4.75	8.12	2.25	0.211	0.000	0.211	17	200	200	DWC	1550	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.77		2.60	1.21	1.36
39	ASKRDM49.1	ASKRDM49	1	1	C		34		87.00	3.962	3.813	5.21	13.33	2.25	0.347	0.000	0.347	22	200	200	DWC	228	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	2.60		2.41	1.36	1.40
40	ASKRDM50	ASKRDM49	0	1	H		30		30.00	3.813	3.943	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-231	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.71		2.54	1.10	1.40
41	ASKRDM49	ASKRDM48	2	1	J		30		147.00	3.943	3.989	4.60	22.52	2.25	0.586	0.000	0.586	28	200	200	DWC	-652	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.41	2.41	2.34	1.53	1.65
42	ASKRDM48	ASKRDM47	1	1	C		30		177.00	3.989	3.896	4.60	27.11	2.25	0.706	0.000	0.706	30	200	200	DWC	323	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.34		2.28	1.65	1.62
43	ASKRDM47	ASKRDM46	1	1	C		30		207.00	3.896	3.804	4.60	31.71	2.25	0.826	0.000	0.826	33	200	200	DWC	326	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.28		2.22	1.62	1.58
44	ASKRDM46	ASKRDM45	1	1	C		26		233.00	3.804	3.925	3.98	35.69	2.25	0.929	0.000	0.929	35	200	200	DWC	-215	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.22		2.17	1.58	1.76
45	ASKRDM45	ASKRDM44	1	1	C		30		263.00	3.925	3.840	4.60	40.29	2.25	1.049	0.000	1.049	37	200	200	DWC	353	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.17		2.11	1.76	1.73
46	ASKRDM44	KLRDMH17	2	1	J		30		600.00	3.840	3.830	4.60	91.91	2.25	2.394	0.000	2.394	56	200	200	DWC	3000	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	1.56	1.56	1.50	2.28	2.33
47	KLRDMH17	KLRDMH16	1	1	C		10		610.00	3.830	3.954	1.53	93.44	2.25	2.433	0.000	2.433	56	200	200	DWC	-81	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.02	0.00	1.50		1.48	2.33	2.47
48	KLRDMH16	KLRDMH15	1	1	C		19		629.00	3.954	3.729	2.91	96.35	2.25	2.509	0.000	2.509	57	200	200	DWC	84	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	1.48		1.44	2.47	2.29
49	KLRDMH15	KLRDMH14	1	1	C		14		643.00	3.729	3.614	2.14	98.50	2.25	2.565	0.000	2.565	58	200	200	DWC	122	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	1.44		1.41	2.29	2.20
50	KLRDMH14	KLRDMH13	1	1	C		23		666.00	3.614	3.609	3.52	102.02	2.25	2.657	0.000	2.657	59	200	200	DWC	4600	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.04	0.00	1.41		1.37	2.20	2.24
51	KLRDMH13	KLRDMH12	1	1	C		22		688.00	3.609	3.532	3.37	105.39	2.25	2.745	0.000	2.745	60	200	200	DWC	286	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	1.37		1.33	2.24	2.20
52	KLRDMH12.1	KLRDMH12	0	1	H		30		30.00	3.822	3.532	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	103	105	0.010	1.32	41.69	0.00	0.30	0.07	OK	0.40	OK	0.29	0.00	2.72		2.43	1.10	1.10
53	KLRDMH12	KLRDMH11	2	1	J		19		737.00	3.532	3.425	2.91	112.90	2.25	2.940	0.000	2.940	62	200	200	DWC	178	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	1.33	1.33	1.29	2.20	2.14
54	KLRDMH11	KLRDMH10	1	1	C		21		758.00	3.425	3.467	3.22	116.11	2.25	3.024	0.000	3.024	63	200	200	DWC	-500	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	1.29		1.25	2.14	2.22
55	KLRDMH10	KLRDMH9	1	1	C		25		783.00	3.467	3.368	3.83	119.94	2.25	3.124	0.000	3.124	64	200	200	DWC	253	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.05	0.00	1.25		1.20	2.22	2.17
56	KLRDMH9	KLRDMH8	1	1	C		25		808.00	3.368	3.270	3.83	123.77	2.25	3.223	0.000	3.223	65	200	200	DWC	255	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.05	0.00	1.20		1.15	2.17	2.12
57	KLRDMH8	KLRDMH7	1	1	C		22		830.00	3.270	3.312	3.37	127.14	2.25	3.311	0.000	3.311	65	200	200	DWC	-524	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	1.15		1.11	2.12	2.20
58	KLRDMH7	KLLRDMH1	1	1	C		27		857.00	3.312	3.148	4.14	131.28	2.25	3.419	0.000	3.419	66	200	200	DWC	165	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.05	0.00	1.11		1.06	2.20	2.09
59	KLLRDMH1	KLLRDMH2	1	1	C		20		877.00	3.148	3.105	3.06	134.34	2.25	3.499	0.000	3.499	67	200	200	DWC	465	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	1.06		1.02	2.09	2.09
60	KLLRDMH2	KLLRDMH3	1	1	C		19		896.00	3.105	3.244	2.91	137.25	2.25	3.574	0.000	3.574	68	200	200	DWC	-137	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	1.02		0.98	2.09	2.26
61	BBORDMH1	BBORDMH2	0	1	H		33		33.00	3.942	3.670	5.06	5.06	2.25	0.132	0.000	0.132	13	200	200	DWC	121	124	0.010	1.22	38.37	0.00	0.30	0.07	OK	0.37	OK	0.27	0.00	2.84		2.57	1.10	1.10
62	BBORDMH2	BBORDMH3	1	1	C		29		62.00	3.670	3.570	4.44	9.50	2.25	0.247	0.000	0.247	18	200	200	DWC	290	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	2.57		2.41	1.10	1.16
63	BBORDMH3	BBORDMH4	1	1	C		23		85.00	3.570	3.616	3.52	13.02	2.25	0.339	0.000	0.339	21	200	200	DWC	-500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.41		2.28	1.16	1.34
64	BBORDMH4	BBORDMH5	1	1	C		20		105.00	3.616	3.501	3.06	16.08	2.25	0.419	0.000	0.419	24	200	200	DWC	174	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	2.28		2.22	1.34	1.28
65	BBORDMH5	BBORDMH6	1	1	C		20		125.00	3.501	3.387	3.06	19.15	2.25	0.499	0.000	0.499	26	200	200	DWC	175	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	2.22		2.16	1.28	1.23
66	BBORDMH6	KLLRDMH3	1	1	C		25		150.00	3.387	3.244	3.83	22.98	2.25	0.598	0.000	0.598	28	200	200	DWC	175	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	2.16		2.10	1.23	1.14
67	KLLRDMH3	KLLRDMH4	2	1	J		37		1083.00	3.244	3.184	5.67	165.90	2.25	4.320	0.000	4.320	75	200	200	DWC	617	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.07	0.00	0.98	0.98	0.91	2.26	2.27
68	KLLRDMH4	KLLRDMH5	1	1	C		30		1113.00	3.184	3.144	4.60	170.49	2.25	4.440	0.000	4.440	76	200	200	DWC	750	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	0.91		0.85	2.27	2.29
69	KLLRDMH5	FRKLLRDMH6	1	1	C		30		1143.00	3.144	3.443	4.60	175.09	2.25	4.560	0.000	4.560	77	200	200	DWC	-100	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	0.85		0.79	2.29	2.65
70	FRKLLRDMH6	FRRDMH5	2	1	J		9		1636.00	3.443	3.451	1.38	250.61	2.25	6.526	0.000	6.526	92	200	200	DWC	-1125	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.02	0.00	0.79	0.79	0.77	2.65	2.68
71	FRRDMH5	FRRDMH4	1	1	C		28		1664.00	3.451	3.526	4.29	254.90	2.25	6.638	0.000	6.638	92	200	200	DWC	-373	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.05	0.00	0.77		0.72	2.68	2.81
72	FRRDMH4	FRRDMH3	1	1	C		30		1694.00	3.526	3.487	4.60	259.49	2.25	6.758	0.000	6.758	93	200	200	DWC	769	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	0.72		0.66	2.81	2.83

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
73	FRRDMH3	FRRDMH2	1	1	C		30		1724.00	3.480	3.440	4.60	264.09	2.25	6.877	0.000	6.877	94	200	200	DWC	750	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.06	0.00	0.66		0.60	2.82	2.84
74	FRRDMH2	FRRDMH1	1	1	C		30		1754.00	3.443	3.495	4.60	268.69	2.25	6.997	0.000	6.997	95	200	200	DWC	-577	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.06	0.00	0.60		0.54	2.84	2.96
75	FRRDMH1	DEFRDMH12	1	1	C		30		1784.00	3.495	3.551	4.60	273.28	2.25	7.117	0.000	7.117	96	200	200	DWC	-536	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	0.54		0.48	2.96	3.07
76	MCBRDMH1	MCBRDMH2	0	1	H		23		23.00	2.620	2.590	3.52	3.52	2.25	0.092	0.000	0.092	11	200	200	DWC	767	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.52		1.39	1.10	1.20
77	MCBRDMH2	MCBRDMH3	1	1	C		30		53.00	2.590	2.556	4.60	8.12	2.25	0.211	0.000	0.211	17	200	200	DWC	882	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.39		1.22	1.20	1.34
78	MCBRDMH3	MCBRDMH4	1	1	C		30		83.00	2.556	2.522	4.60	12.71	2.25	0.331	0.000	0.331	21	200	200	DWC	882	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.22		1.05	1.34	1.47
79	MCBRDMH4	MCBKPRDMH5	1	1	C		21		104.00	2.522	2.400	3.22	15.93	2.25	0.415	0.000	0.415	23	200	200	DWC	172	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	1.05		0.93	1.47	1.47
80	MCBRDMH7	MCBRDMH6	0	1	H		12		12.00	2.453	2.416	1.84	1.84	2.25	0.048	0.000	0.048	8	200	200	DWC	324	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.35		1.28	1.10	1.14
81	MCBRDMH6	MCBKPRDMH5	1	1	C		17		29.00	2.416	2.400	2.60	4.44	2.25	0.116	0.000	0.116	13	200	200	DWC	1063	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.28		1.19	1.14	1.21
82	KPRDMH9	KPRDMH8	0	1	H		19		19.00	2.230	2.280	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	-380	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.13		1.02	1.10	1.26
83	KPRDMH8	MCBKPRDMH5	1	1	C		15		34.00	2.280	2.400	2.30	5.21	2.25	0.136	0.000	0.136	14	200	200	DWC	-125	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.02		0.94	1.26	1.46
84	MCBKPRDMH5	KPRDMH7	3	1	J		25		192.00	2.400	2.664	3.83	29.41	2.25	0.766	0.000	0.766	32	200	200	DWC	-95	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	0.93	0.93	0.88	1.47	1.78
85	KPRDMH7	KPRDMH6	1	1	C		25		217.00	2.664	2.929	3.83	33.24	2.25	0.866	0.000	0.866	34	200	200	DWC	-94	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.88		0.83	1.78	2.10
86	KPRDMH6	KPRDMH5	1	1	C		22		239.00	2.929	2.997	3.37	36.61	2.25	0.953	0.000	0.953	35	200	200	DWC	-324	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.83		0.79	2.10	2.21
87	KPRDMH5	KPRDMH4	1	1	C		22		261.00	2.997	3.065	3.37	39.98	2.25	1.041	0.000	1.041	37	200	200	DWC	-324	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.79		0.75	2.21	2.32
88	KPRDMH4.1	KPRDMH4.2	0	1	H		24		24.00	3.260	3.315	3.68	3.68	2.25	0.096	0.000	0.096	12	200	200	DWC	-436	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.16		2.03	1.10	1.29
89	KPRDMH4.2	KPRDMH4.3	1	1	C		24		48.00	3.315	3.370	3.68	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	-436	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.03		1.90	1.29	1.47
90	KPRDMH4.3	KPRDMH4.4	1	1	C		30		78.00	3.370	3.200	4.60	11.95	2.25	0.311	0.000	0.311	20	200	200	DWC	176	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.90		1.73	1.47	1.47
91	KPRDMH4.4	KPRDMH4.5	1	1	C		21		99.00	3.200	3.132	3.22	15.17	2.25	0.395	0.000	0.395	23	200	200	DWC	309	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	1.73		1.61	1.47	1.52
92	KPRDMH4.5	KPRDMH4	1	1	C		21		120.00	3.132	3.065	3.22	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	313	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	1.61		1.54	1.52	1.53
93	KPRDMH4	KPRDMH3	2	1	J		30		411.00	3.065	3.176	4.60	62.96	2.25	1.640	0.000	1.640	46	200	200	DWC	-270	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.75	0.75	0.69	2.32	2.49
94	KPRDMH3	KPRDMH2	1	1	C		30		441.00	3.176	3.222	4.60	67.55	2.25	1.759	0.000	1.759	48	200	200	DWC	-652	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.69		0.63	2.49	2.59
95	KPRDMH2	KPRDMH1	1	1	C		30		471.00	3.222	3.342	4.60	72.15	2.25	1.879	0.000	1.879	49	200	200	DWC	-250	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.63		0.57	2.59	2.77
96	KPRDMH1	DEKPRDMH7	1	1	C		31		502.00	3.342	3.403	4.75	76.90	2.25	2.003	0.000	2.003	51	200	200	DWC	-508	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.57		0.51	2.77	2.89
97	DERDMH1	DERDMH2	0	1	H		30		30.00	3.860	3.737	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	244	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.76		2.59	1.10	1.15
98	DERDMH2	DERDMH3	1	1	C		30		60.00	3.737	3.645	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	326	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.59		2.42	1.15	1.23
99	DERDMH3	DERDMH4	1	1	C		30		90.00	3.645	3.595	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.42		2.25	1.23	1.35
100	DERDMH4	DERDMH5	1	1	C		30		120.00	3.590	3.546	4.60	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	682	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.25		2.16	1.34	1.39
101	DERDMH5	DERDMH6	1	1	C		30		150.00	3.546	3.572	4.60	22.98	2.25	0.598	0.000	0.598	28	200	200	DWC	-1154	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.16		2.09	1.39	1.48
102	DERDMH6	DEKPRDMH7	1	1	C		30		180.00	3.572	3.403	4.60	27.57	2.25	0.718	0.000	0.718	31	200	200	DWC	178	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.09		2.03	1.48	1.37
103	KLRDMH6	KLRDMH5	0	1	H		19		19.00	3.570	3.489	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	235	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.47		2.36	1.10	1.13
104	KLRDMH5	KLRDMH4	1	1	C		19		38.00	3.489	3.408	2.91	5.82	2.25	0.152	0.000	0.152	14	200	200	DWC	235	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.36		2.25	1.13	1.16
105	KLRDMH4	KLRDMH3	1	1	C		21		59.00	3.408	3.310	3.22	9.04	2.25	0.235	0.000	0.235	18	200	200	DWC	214	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.25		2.13	1.16	1.18
106	KLRDMH3	KLRDMH2	1	1	C		21		80.00	3.310	3.213	3.22	12.25	2.25	0.319	0.000	0.319	21	200	200	DWC	216	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.13		2.01	1.18	1.20
107	KLRDMH2	KLRDMH1	1	1	C		17		97.00	3.213	3.145	2.60	14.86	2.25	0.387	0.000	0.387	23	200	200	DWC	250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.01		1.92	1.20	1.23
108	KLRDMH1	DEKPRDMH7	1	1	C		31		128.00	3.140	3.403	4.75	19.61	2.25	0.511	0.000	0.511	26	200	200	DWC	-118	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.10	0.00	1.92		1.82	1.22	1.58
109	DEKPRDMH7	DERDMH8	3	1	J		31		841.00	3.403	3.354	4.75	128.83	2.25	3.355	0.000	3.355	66	200	200	DWC	633	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.51	0.51	0.45	2.89	2.90
110	DERDMH8	DERDMH9	1	1	C		30		871.00	3.354	3.482	4.60	133.42	2.25	3.475	0.000	3.475	67	200	200	DWC	-234	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.45		0.39	2.90	3.09
111	DERDMH9	DERDMH10	1	1	C		9		880.00	3.482	3.510	1.38	134.80	2.25	3.510	0.000	3.510	67	200	200	DWC	-321	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.02	0.00	0.39		0.37	3.09	3.14
112	DERDMH10.3	DERDMH10.2	0	1	H		10		10.00	3.472	3.497	1.53	1.53	2.25	0.040	0.000	0.040	8	200	200	DWC	-400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.37		2.31	1.10	1.19
113	DERDMH10.2	DERDMH10.1	1	1	C		30		40.00	3.497	3.633	4.60	6.13	2.25	0.160	0.000	0.160	15	200	200	DWC	-221	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.31		2.14	1.19	1.49
114	DERDMH10.1	DERDMH10	1	1	C		30		70.00	3.633	3.510	4.60	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	244	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.14		1.97	1.49	1.54
115	DERDMH10	DERDMH11	2	1	J		15		965.00	3.510	3.546	2.30	147.82	2.25	3.850	0.000	3.850	71	200	200	DWC	-417	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.03	0.00	0.37	0.37	0.34	3.14	3.21
116	DERDMH11	DEFRDMH12	1	1	C		29		994.00	3.546	3.551	4.44	152.27	2.25	3.965	0.000	3.965	72	200	200	DWC	-5800	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.06	0.00	0.34		0.28	3.21	3.27
117	DEFRDMH12	DETSRDMH13	2	1	J		30		2808.00	3.551	3.572	4.60	430.14	2.25	11.202	0.000	11.202	120	200	200	DWC	-1429	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.06	0.00	0.28	0.28	0.22	3.27	3.35
118	TSRDMH6	TSRDMH5	0	1	H		30		30.00	3.170	3.459	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-104	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.07		1.90	1.10	1.56
119	TSRDMH5	TSRDMH4	1	1	C		30		60.00	3.459	3.797	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-89	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.90		1.73	1.56	2.07
120	TSRDMH4	TSRDMH3	1	1	C		30		90.00	3.790	4.061	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	-111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.73		1.56	2.06	2.50
121	TSRDMH3	TSRDMH2	1	1	C		30		120.00	4.061	3.954	4.60	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	280	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.56		1.47	2.50	2.48
122	TSRDMH2	TSRDMH1	1	1	C		27		147.00	3.954	3.845	4.14	22.52	2.25	0.586	0.000	0.586	28	200	200	DWC	248	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	1.47		1.41	2.48	2.44
123	TSRDMH1	DETSRDMH13	1	1	C		14		161.00	3.845	3.572	2.14	24.66	2.25	0.642	0.000	0.642	29	200	200	DWC	51	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	1.41		1.38	2.44	2.19
124	DETSRDMH13	DERDMH14	2	1	J		30		2999.00	3.572	3.714	4.60	459.40	2.25	11.964	0.000	11.964	124	200	200	DWC	-211	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.06	0.00	0.22	0.22	0.16	3.35	3.55
125	DERDMH14	DERDMH15	1	1	C		30		3029.00	3.714	3.780	4.60	464.00	2.25	12.083	0.000	12.083	125	200	200	DWC	-455	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.06	0.00	0.16		0.10	3.55	3.68
126	DERDMH15	DEGERDMH16	1	1	C		16		3045.00	3.780	3.962	2.45	466.45	2.25	12.147	0.000	12.147	125	200	200	DWC	-88	520	0.010	0.60	18.73	0.65	1.06	0.59	OK	0.63	OK	0.03	0.00	0.10		0.07	3.68	3.89
127	GERDMH6.1	GERDMH6	0	1	H		15		15.00	1.750	1.888	2.30	2.30	2.25	0.060	0.000	0.060	9	200	200	DWC	-109	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.65		0.57	1.10	1.32
128	GERDMH6	GERDMH7	1	1	C		30		45.00	1.888	1.843	4.60	6.89	2.25	0.180	0.000	0.180	16	200	200	DWC	667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.57		0.40	1.32	1.44
129	GERDMH7	GERDMH8	1	1	C		30		75.00	1.843	1.821	4.60	11.49	2.25	0.299	0.000	0.299	20	200	200	DWC	1364	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.40		0.23	1.44	1.59
130	GERDMH8	GERDMH9	1	1	C		30		105.00	1.821	2.041	4.60	16.08	2.25	0.419	0.000	0.419	24	200	200	DWC	-136	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.23		0.14	1.59	1.90
131	GERDMH9	GERDMH10	1	1	C		8		113.00	2.040	1.779	1.23	17.31	2.25	0.451	0.000	0.451	24	200	200	DWC	31	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	0.14		0.11	1.90	1.67
132	GERDMH10	GERDMH11	1	1	C		20		133.00	1.779	1.835	3.06	20.37	2.25	0.531	0.000	0.531	26	200	200	DWC	-357	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.11		0.05	1.67	1.79
133	GERDMH11	GERDBRDMH12	1	1	C		29		162.00	1.835	2.059	4.44	24.82	2.25	0.646	0.000	0.646	29	200	200	DWC	-129	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.05		-0.02	1.79	2.08
134	GERDMH5	GERDMH4	0	1	H		30		30.00	1.940	2.002	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-484	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.84		0.67	1.10	1.33
135	GERDMH4	GERDMH3	1	1	C		8		38.00	2.002	1.912	1.23	5.82	2.25	0.152	0.000	0.152	14	200	200	DWC	89	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	0.67		0.63	1.33	1.28
136	GERDMH3	GERDMH2	1	1	C		30		68.00	1.912	2.017	4.60	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	-286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.63		0.46	1.28	1.56
137	GERDMH2	GERDMH1	1	1	C		30		98.00	2.017	2.020	4.60	15.01	2.25	0.391	0.000	0.391	23	200	200	DWC	-10000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.46		0.29	1.56	1.73
138	GERDMH1	GERDBRDMH12	1	1	C		30		128.00	2.020	2.059	4.60	19.61	2.25	0.511	0.000	0.511	26	200	200	DWC	-769	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.29		0.20	1.73	1.86
139	GERDBRDMH12	GERDMH13	2	1	J		8		298.00	2.059	2.099	1.23	45.65	2.25	1.189	0.000	1.189	39	200	200	DWC	-200	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	-0.02	-0.02	-0.04	2.08	2.14
140	GERDMH13	GERDMH14	1	1	C		30		328.00	2.099	2.226	4.60	50.24	2.25	1.308	0.000	1.308	41	200	200	DWC	-236	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-0.04		-0.10	2.14	2.33
141	GERDMH14	GERDMH15	1	1	C		17		345.00	2.226	2.229	2.60	52.85	2.25	1.376	0.000	1.376	42	200	200	DWC	-5667	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	-0.10		-0.13	2.33	2.36
142	GERDMH15	GERDMH16	1	1	C		14		359.00	2.229	2.615	2.14	54.99	2.25	1.432	0.000	1.432	43	200	200	DWC	-36	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	-0.13		-0.16	2.36	2.78
143	GERDMH16	GERDMH17	1	1	C		30		389.00	2.610	3.002	4.60	59.59	2.25	1.552	0.000	1.552	45	200	200	DWC	-77	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.16		-0.22	2.77	3.22
144	GERDMH17	GERDMH18	1	1	C		30		419.00	3.002	3.596	4.60	64.18	2.25	1.671	0.000	1.671	47	200	200	DWC	-51	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.22		-0.28	3.22	3.88
145	GERDMH18	GERDMH19	1	1	C		30		449.00	3.590	3.710	4.60	68.78	2.25	1.791	0.000	1.791	48	200	200	DWC	-250	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.28		-0.34	3.87	4.05
146	GERDMH19	GERDMH20	1	1	C		30		479.00	3.710	3.836	4.60	73.38	2.25	1.911	0.000	1.911	50	200	200	DWC	-238	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.34		-0.40	4.05	4.24

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
147	GERDMH20	GERDMH21	1	1	C		30		509.00	3.836	3.986	4.60	77.97	2.25	2.030	0.000	2.030	51	200	200	DWC	-200	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.40		-0.46	4.24	4.45
148	GERDMH21	DEGERDMH16	1	1	C		24		533.00	3.986	3.962	3.68	81.65	2.25	2.126	0.000	2.126	53	200	200	DWC	1000	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.05	0.00	-0.46		-0.51	4.45	4.47
149	DEGERDMH16	DEFRRDMH17	2	1	J		29		3607.00	3.962	3.970	4.44	552.54	2.25	14.389	0.000	14.389	136	200	200	DWC	-3625	520	0.010	0.60	18.73	0.77	1.10	0.66	OK	0.65	OK	0.06	0.00	-0.51	-0.51	-0.57	4.47	4.54
150	FRMRDMH5	FRMRDMH4	0	1	H		20		20.00	3.890	3.882	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	2500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.79		2.68	1.10	1.20
151	FRMRDMH4A	FRMRDMH4	0	1	H		30		30.00	3.733	3.882	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-201	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.63		2.46	1.10	1.42
152	FRMRDMH4B	FRMRDMH4	0	1	H		30		30.00	3.684	3.882	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-152	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.58		2.41	1.10	1.47
153	FRMRDMH4	FRMRDMH3	3	1	J		10		90.00	3.882	3.869	1.53	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	769	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	2.41	2.41	2.35	1.47	1.52
154	FRMRDMH3	FRMRDMH2	1	1	C		30		120.00	3.869	3.843	4.60	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	1154	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.35		2.26	1.52	1.58
155	FRMRDMH2	FRMRDMH1	1	1	C		30		150.00	3.843	3.858	4.60	22.98	2.25	0.598	0.000	0.598	28	200	200	DWC	-2000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.26		2.19	1.58	1.67
156	FRMRDMH1	DEFRRDMH17	1	1	C		30		180.00	3.860	3.970	4.60	27.57	2.25	0.718	0.000	0.718	31	200	200	DWC	-273	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.19		2.13	1.67	1.84
157	DEFRRDMH17	DERDMH18	2	1	J		30		3817.00	3.970	4.075	4.60	584.70	2.25	15.227	0.000	15.227	140	200	200	DWC	-286	520	0.010	0.60	18.73	0.81	1.11	0.68	OK	0.66	OK	0.06	0.00	-0.57	-0.57	-0.63	4.54	4.71
158	DERDMH18	DERDMH18A	1	1	C		17		3834.00	4.075	4.114	2.60	587.31	2.25	15.295	0.000	15.295	140	200	200	DWC	-436	520	0.010	0.60	18.73	0.82	1.11	0.69	OK	0.66	OK	0.03	0.00	-0.63		-0.66	4.71	4.77
159	DERDMH18A.1	DERDMH18A.2	0	1	H		30		30.00	3.870	3.672	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	152	152	0.010	1.10	34.65	0.00	0.30	0.07	OK	0.33	OK	0.20	0.00	2.77		2.57	1.10	1.10
160	DERDMH18A.2	DERDMH18A.3	1	1	C		21		51.00	3.672	3.459	3.22	7.81	2.25	0.203	0.000	0.203	17	200	200	DWC	99	97	0.010	1.38	43.38	0.00	0.30	0.07	OK	0.41	OK	0.22	0.00	2.57		2.35	1.10	1.11
161	DERDMH18A.3	DERDMH18A.4	1	1	C		25		76.00	3.459	2.818	3.83	11.64	2.25	0.303	0.000	0.303	20	200	200	DWC	39	39	0.010	2.17	68.41	0.00	0.30	0.07	OK	0.65	OK	0.64	0.00	2.35		1.71	1.11	1.11
162	DERDMH18A.4	DERDMH18A.5	1	1	C		15		91.00	2.818	2.726	2.30	13.94	2.25	0.363	0.000	0.363	22	200	200	DWC	163	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	1.71		1.62	1.11	1.11
163	DERDMH18A.5	DERDMH18A.6	1	1	C		20		111.00	2.726	2.634	3.06	17.00	2.25	0.443	0.000	0.443	24	200	200	DWC	217	215	0.010	0.93	29.14	0.02	0.40	0.10	OK	0.37	OK	0.09	0.00	1.62		1.53	1.11	1.10
164	DERDMH18A.6	DERDMH18A.7	1	1	C		24		135.00	2.634	3.322	3.68	20.68	2.25	0.539	0.000	0.539	27	200	200	DWC	-35	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	1.53		1.47	1.10	1.85
165	DERDMH18A.7	DERDMH18A.8	1	1	C		30		165.00	3.322	3.781	4.60	25.28	2.25	0.658	0.000	0.658	29	200	200	DWC	-65	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.47		1.40	1.85	2.38
166	DERDMH18A.8	DERDMH18A.9	1	1	C		30		195.00	3.781	3.864	4.60	29.87	2.25	0.778	0.000	0.778	32	200	200	DWC	-361	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.40		1.34	2.38	2.52
167	DERDMH18A.9	DERDMH18A.10	1	1	C		30		225.00	3.864	3.989	4.60	34.47	2.25	0.898	0.000	0.898	34	200	200	DWC	-240	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.34		1.28	2.52	2.71
168	DERDMH18A.10	DERDMH18A	1	1	C		30		255.00	3.989	4.114	4.60	39.06	2.25	1.017	0.000	1.017	36	200	200	DWC	-240	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.28		1.22	2.71	2.89
169	DERDMH18A	DERDMH19	2	1	J		13		4102.00	4.114	4.125	1.99	628.36	2.25	16.364	0.000	16.364	145	200	200	DWC	-1182	520	0.010	0.60	18.73	0.87	1.12	0.72	OK	0.67	OK	0.03	0.00	-0.66	-0.66	-0.69	4.77	4.82
170	DERDMH19	DERDMH20	1	1	C		30		4132.00	4.130	4.160	4.60	632.96	2.25	16.483	0.000	16.483	145	200	200	DWC	-1000	520	0.010	0.60	18.73	0.88	1.13	0.73	OK	0.67	OK	0.06	0.00	-0.69		-0.75	4.82	4.91
171	DERDMH20	DERDMH21	1	1	C		35		4167.00	4.160	4.094	5.36	638.32	2.25	16.623	0.000	16.623	146	200	200	DWC	530	520	0.010	0.60	18.73	0.89	1.13	0.74	OK	0.67	OK	0.07	0.00	-0.75		-0.82	4.91	4.91
172	SRRDMH11	SRRDMH10	0	1	H		23		23.00	3.555	3.622	3.52	3.52	2.25	0.092	0.000	0.092	11	200	200	DWC	-343	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.46		2.33	1.10	1.29
173	SRRDMH10	SRRDMH9	1	1	C		16		39.00	3.622	3.689	2.45	5.97	2.25	0.156	0.000	0.156	15	200	200	DWC	-239	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.33		2.24	1.29	1.45
174	SRRDMH9	SRRDMH8	1	1	C		19		58.00	3.689	3.766	2.91	8.88	2.25	0.231	0.000	0.231	18	200	200	DWC	-247	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.24		2.13	1.45	1.64
175	SRRDMH8.2	SRRDMH8.3	0	1	H		18		18.00	3.874	3.837	2.76	2.76	2.25	0.072	0.000	0.072	10	200	200	DWC	486	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.77		2.67	1.10	1.17
176	SRRDMH8.3	SRRDMH8.4	1	1	C		30		48.00	3.837	3.777	4.60	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.67		2.50	1.17	1.28
177	SRRDMH8.4	SRRDMH8	1	1	C		30		78.00	3.777	3.766	4.60	11.95	2.25	0.311	0.000	0.311	20	200	200	DWC	2727	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.50		2.33	1.28	1.44
178	SRRDMH8	SRRDMH7	2	1	J		30		166.00	3.766	4.068	4.60	25.43	2.25	0.662	0.000	0.662	30	200	200	DWC	-99	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.13	2.13	2.06	1.64	2.01
179	SRRDMH7	SRRDMH6	1	1	C		28		194.00	4.068	4.030	4.29	29.72	2.25	0.774	0.000	0.774	32	200	200	DWC	737	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.06		2.01	2.01	2.02
180	SRRDMH6	SRRDMH5	1	1	C		17		211.00	4.035	4.002	2.60	32.32	2.25	0.842	0.000	0.842	33	200	200	DWC	515	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	2.01		1.98	2.03	2.02
181	SRRDMH5.3	SRRDMH5.2	0	1	H		25		25.00	3.684	3.848	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	-152	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.58		2.44	1.10	1.41
182	SRRDMH5.2	SRRDMH5.1	1	1	C		25		50.00	3.848	4.007	3.83	7.66	2.25	0.199	0.000	0.199	16	200	200	DWC	-157	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.44		2.30	1.41	1.71
183	SRRDMH5.1	SRRDMH5	1	1	C		29		79.00	4.007	4.002	4.44	12.10	2.25	0.315	0.000	0.315	21	200	200	DWC	5800	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	2.30		2.14	1.71	1.86
184	SRRDMH5	SRRDMH4	2	1	J		11		301.00	4.002	3.974	1.69	46.11	2.25	1.201	0.000	1.201	40	200	200	DWC	393	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	1.98	1.98	1.96	2.02	2.01
185	SRRDMH4	SRRDMH3	1	1	C		25		326.00	3.974	3.934	3.83	49.94	2.25	1.300	0.000	1.300	41	200	200	DWC	625	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.05	0.00	1.96		1.91	2.01	2.02
186	SRRDMH3	SRRDMH2	1	1	C		36		362.00	3.934	4.063	5.51	55.45	2.25	1.444	0.000	1.444	43	200	200	DWC	-279	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.07	0.00	1.91		1.84	2.02	2.22
187	SRRDMH2	SRRDMH1	1	1	C		30		392.00	4.063	4.192	4.60	60.05	2.25	1.564	0.000	1.564	45	200	200	DWC	-233	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.84		1.78	2.22	2.41
188	SRRDMH1	DERDMH21	1	1	C		30		422.00	4.192	4.094	4.60	64.64	2.25	1.683	0.000	1.683	47	200	200	DWC	306	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.78		1.72	2.41	2.37
189	DERDMH21	DERDMH22	2	1	J		22		4611.00	4.094	4.029	3.37	706.33	2.25	18.394	0.000	18.394	154	200	200	DWC	338	520	0.010	0.60	18.73	0.98	1.14	0.80	OK	0.68	OK	0.04	0.00	-0.82	-0.82	-0.86	4.91	4.89
190	DERDMH22.4.1	DERDMH22.4.2	0	1	H		30		30.00	1.801	2.243	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-68	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	0.70		0.53	1.10	1.71
191	DERDMH22.4.2	DERDMH22.4.3	1	1	C		30		60.00	2.243	2.153	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	333	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	0.53		0.36	1.71	1.79
192	DERDMH22.4.3	DERDMH22.4.4	1	1	C		30		90.00	2.153	2.095	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	517	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	0.36		0.19	1.79	1.91
193	DERDMH22.4.4	DERDMH22.4	1	1	C		30		120.00	2.090	3.091	4.60	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	-30	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.19		0.10	1.90	2.99
194	DERDMH22.4	DERDMH22.3	1	1	C		30		150.00	3.091	3.688	4.60	22.98	2.25	0.598	0.000	0.598	28	200	200	DWC	-50	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.10		0.03	2.99	3.66
195	DERDMH22.3	DERDMH22.2	1	1	C		30		180.00	3.688	3.829	4.60	27.57	2.25	0.718	0.000	0.718	31	200	200	DWC	-213	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.03		-0.03	3.66	3.86
196	DERDMH22.2	DERDMH22.1	1	1	C		30		210.00	3.829	3.783	4.60	32.17	2.25	0.838	0.000	0.838	33	200	200	DWC	652	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.03		-0.09	3.86	3.87
197	DERDMH22.1	DERDMH22	1	1	C		30		240.00	3.783	4.029	4.60	36.76	2.25	0.957	0.000	0.957	35	200	200	DWC	-122	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.09		-0.15	3.87	4.18
198	DERDMH22	DERDMH23	2	1	J		35		4886.00	4.029	3.965	5.36	748.46	2.25	19.491	0.000	19.491	158	250	250	DWC	630	520	0.010	0.69	33.97	0.57	1.03	0.54	OK	0.71	OK	0.07	0.00	-0.86	-0.86	-0.93	4.89	4.90
199	DERDMH23.1	DERDMH23.2	0	1	H		17		17.00	4.000	4.077	2.60	2.60	2.25	0.068	0.000	0.068	10	200	200	DWC	-221	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.90		2.81	1.10	1.27
200	DERDMH23.2	DERDMH23.3	1	1	C		30		47.00	4.077	4.042	4.60	7.20	2.25	0.187	0.000	0.187	16	200	200	DWC	857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.81		2.64	1.27	1.40
201	DERDMH23.3	DERDMH23.4	1	1	C		24		71.00	4.042	4.031	3.68	10.88	2.25	0.283	0.000	0.283	19	200	200	DWC	2182	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.64		2.51	1.40	1.52
202	DERDMH23.4	DERDMH23	1	1	C		24		95.00	4.031	4.021	3.68	14.55	2.25	0.379	0.000	0.379	22	200	200	DWC	2400	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.51		2.43	1.52	1.59
203	DERDMH23	DERDMH24	2	1	J		25		5006.00	3.965	3.869	3.83	766.84	2.25	19.970	0.000	19.970	160	250	250	DWC	260	700	0.010	0.60	29.28	0.68	1.07	0.61	OK	0.64	OK	0.04	0.00	-0.93	-0.93	-0.97	4.90	4.84
204	DERDMH24	DERDMH24A	1	1	C		10		5016.00	3.869	3.823	1.53	768.37	2.25	20.010	0.000	20.010	160	250	250	DWC	217	700	0.010	0.60	29.28	0.68	1.07	0.61	OK	0.64	OK	0.01	0.00	-0.97		-0.98	4.84	4.80
205	ELRDMH9	ELRDMH8	0	1	H		30		30.00	3.367	3.589	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-135	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.27		2.10	1.10	1.49
206	ELRDMH8	ELRDMH7	1	1	C		30		60.00	3.589	3.724	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-222	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.10		1.93	1.49	1.79
207	ELRDMH7	ELRDMH6	1	1	C		30		90.00	3.724	3.859	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	-222	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.93		1.76	1.79	2.10
208	ELRDMH6	ELRDMH5	1	1	C		30		120.00	3.859	4.071	4.60	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	-142	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.76		1.67	2.10	2.40
209	ELRDMH5	ELRDMH4	1	1	C		30		150.00	4.071	4.070	4.60	22.98	2.25	0.598	0.000	0.598	28	200	200	DWC	30000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.67		1.60	2.40	2.47
210	ELRDMH4	ELRDMH3	1	1	C		30		180.00	4.078	4.085	4.60	27.57	2.25	0.718	0.000	0.718	31	200	200	DWC	-4286	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.60		1.54	2.48	2.55
211	ELRDMH3	ELRDMH2	1	1	C		30		210.00	4.085	4.092	4.60	32.17	2.25	0.838	0.000	0.838	33	200	200	DWC	-4286	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.54		1.48	2.55	2.61
212	ELRDMH2	ELRDMH1	1	1	C		22		232.00	4.092	4.100	3.37	35.54	2.25	0.925	0.000	0.925	35	200	200	DWC	-2750	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	1.48		1.44	2.61	2.66
213	ELRDMH1	DERDMH24A	1	1	C		20		252.00	4.100	3.823	3.06	38.60	2.25	1.005	0.000	1.005	36	200	200	DWC	72	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	1.44		1.40	2.66	2.42
214	DERDMH24A	DERDMH25	2	1	J		17		5285.00	3.823	3.705	2.60	809.58	2.25	21.083	0.000	21.083	164	250	250	DWC	144	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.02	0.00	-0.98	-0.98	-1.00	4.80	4.71
215	DERDMH25.1	DERDMH25.2	0	1	H		30		30.00	3.890	3.891	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-30000	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.79		2.62	1.10	1.27
216	DERDMH25.2	DERDMH25.3	1	1	C		30		60.00	3.891	3.634	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	117	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.62		2.45	1.27	1.18
217	DERDMH25.3	DERDMH25	1	1	C		30		90.00	3.634	3.705	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	-423	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.45		2.28	1.18	1.43
218	DERDMH25	DERDMH25A	2	1	J		22		5397.00	3.705	3.530	3.37	826.74	2.25	21.530	0.000	21.530	166	250	250	DWC	126	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.03	0.00	-1.00	-1.00	-1.03	4.71	4.56
219	DERDMH25A.1	DERDMH25A.2	0	1	H		30		30.00	3.530	3.983	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-66	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.43		2.26	1.10	1.72
220	DERDMH25A.2	DERDMH25A.3	1	1	C		30		60.00	3.983	3.756	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	132	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.26		2.09	1.72	1.67

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
221	DERDMH25A.3	DERDMH25A	1	1	C		30		90.00	3.756	3.530	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	133	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.09		1.92	1.67	1.61
222	DERDMH25A	DERDMH26	2	1	J		12		5499.00	3.530	3.490	1.84	842.36	2.25	21.936	0.000	21.936	168	250	250	DWC	300	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.02	0.00	-1.03	-1.03	-1.05	4.56	4.54
223	DERDMH26	DERDMH27	1	1	C		25		5524.00	3.490	3.378	3.83	846.19	2.25	22.036	0.000	22.036	168	250	250	DWC	223	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.04	0.00	-1.05		-1.09	4.54	4.47
224	DERDMH27.1	DERDMH27.2	0	1	H		21		21.00	3.013	2.891	3.22	3.22	2.25	0.084	0.000	0.084	11	200	200	DWC	172	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.91		1.79	1.10	1.10
225	DERDMH27.2	DERDMH27.3	1	1	C		33		54.00	2.891	3.768	5.06	8.27	2.25	0.215	0.000	0.215	17	200	200	DWC	-38	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.79		1.61	1.10	2.16
226	DERDMH27.3	DERDMH27.4	1	1	C		29		83.00	3.768	3.655	4.44	12.71	2.25	0.331	0.000	0.331	21	200	200	DWC	257	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	1.61		1.45	2.16	2.21
227	DERDMH27.4	DERDMH27	1	1	C		29		112.00	3.650	3.378	4.44	17.16	2.25	0.447	0.000	0.447	24	200	200	DWC	107	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.45		1.36	2.20	2.02
228	DERDMH27	DERDMH28	2	1	J		35		5671.00	3.378	3.266	5.36	868.71	2.25	22.623	0.000	22.623	170	250	250	DWC	313	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.05	0.00	-1.09	-1.09	-1.14	4.47	4.41
229	DERDMH28	DEMATASLNRDN	1	1	C		11		5682.00	3.266	3.263	1.69	870.39	2.25	22.666	0.000	22.666	170	250	250	DWC	3667	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.02	0.00	-1.14		-1.16	4.41	4.42
230	TASLNRDMH10	TASLNRDMH9	0	1	H		14		14.00	2.122	2.159	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	-378	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.02		0.94	1.10	1.22
231	TASLNRDMH9	TASLNRDMH8	1	1	C		30		44.00	2.159	2.382	4.60	6.74	2.25	0.176	0.000	0.176	15	200	200	DWC	-135	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.94		0.77	1.22	1.61
232	TASLNRDMH8	TASLNRDMH7	1	1	C		7		51.00	2.382	2.420	1.07	7.81	2.25	0.203	0.000	0.203	17	200	200	DWC	-184	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	0.77		0.73	1.61	1.69
233	TASLNRDMH7	TASLNRDMH6	1	1	C		30		81.00	2.420	2.632	4.60	12.41	2.25	0.323	0.000	0.323	21	200	200	DWC	-142	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.73		0.56	1.69	2.07
234	TASLNRDMH6	TASLNRDMH5	1	1	C		20		101.00	2.632	2.872	3.06	15.47	2.25	0.403	0.000	0.403	23	200	200	DWC	-83	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.56		0.45	2.07	2.42
235	TASLNRDMH5	TASLNRDMH4	1	1	C		30		131.00	2.872	3.003	4.60	20.07	2.25	0.523	0.000	0.523	26	200	200	DWC	-229	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.45		0.36	2.42	2.64
236	TASLNRDMH4	TASLNRDMH3	1	1	C		30		161.00	3.003	3.270	4.60	24.66	2.25	0.642	0.000	0.642	29	200	200	DWC	-112	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.36		0.29	2.64	2.98
237	TASLNRDMH3	TASLNRDMH2	1	1	C		30		191.00	3.270	3.312	4.60	29.26	2.25	0.762	0.000	0.762	32	200	200	DWC	-714	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.29		0.23	2.98	3.08
238	TASLNRDMH2	TASLNRDMH1	1	1	C		30		221.00	3.312	3.337	4.60	33.85	2.25	0.882	0.000	0.882	34	200	200	DWC	-1200	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.23		0.17	3.08	3.17
239	TASLNRDMH1	DEMATASLNRDN	1	1	C		10		231.00	3.337	3.263	1.53	35.39	2.25	0.921	0.000	0.921	35	200	200	DWC	135	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	0.17		0.15	3.17	3.11
240	MARDMH9	MARDMH8	0	1	H		27		27.00	3.870	3.591	4.14	4.14	2.25	0.108	0.000	0.108	12	200	200	DWC	97	98	0.010	1.37	43.16	0.00	0.30	0.07	OK	0.41	OK	0.28	0.00	2.77		2.49	1.10	1.10
241	MARDMH8	MARDMH7	1	1	C		30		57.00	3.591	3.646	4.60	8.73	2.25	0.227	0.000	0.227	18	200	200	DWC	-545	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.49		2.32	1.10	1.33
242	MARDMH7.1	MARDMH7.2	0	1	H		34		34.00	3.724	3.704	5.21	5.21	2.25	0.136	0.000	0.136	14	200	200	DWC	1700	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	2.62		2.43	1.10	1.27
243	MARDMH7.2	MARDMH7.3	1	1	C		29		63.00	3.704	3.685	4.44	9.65	2.25	0.251	0.000	0.251	18	200	200	DWC	1526	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	2.43		2.27	1.27	1.42
244	MARDMH7.3	MARDMH7.4	1	1	C		26		89.00	3.685	3.665	3.98	13.63	2.25	0.355	0.000	0.355	22	200	200	DWC	1300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.27		2.13	1.42	1.54
245	MARDMH7.4	MARDMH7	1	1	C		30		119.00	3.660	3.646	4.60	18.23	2.25	0.475	0.000	0.475	25	200	200	DWC	2143	420	0.010	0.66	20.85	0.02	0.40	0.10	OK	0.26	Check	0.07	0.00	2.13		2.06	1.53	1.59
246	MARDMH7	MARDMH6	2	1	J		24		200.00	3.646	3.604	3.68	30.64	2.25	0.798	0.000	0.798	32	200	200	DWC	571	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.06	2.06	2.01	1.59	1.59
247	MARDMH6	MARDMH5A	1	1	C		15		215.00	3.604	3.583	2.30	32.93	2.25	0.858	0.000	0.858	34	200	200	DWC	714	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	2.01		1.98	1.59	1.60
248	MARDMH5A.1	MARDMH5A.2	0	1	H		28		28.00	3.832	3.630	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	139	140	0.010	1.15	36.11	0.00	0.30	0.07	OK	0.34	OK	0.20	0.00	2.73		2.53	1.10	1.10
249	MARDMH5A.2	MARDMH5A	1	1	C		30		58.00	3.630	3.563	4.60	8.88	2.25	0.231	0.000	0.231	18	200	200	DWC	448	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.53		2.36	1.10	1.20
250	MARDMH5A	MARDMH5	2	1	J		15		288.00	3.563	3.563	2.30	44.12	2.25	1.149	0.000	1.149	39	200	200	DWC	0	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	1.98	1.98	1.95	1.58	1.61
251	MARDMH5	MARDMH4	1	1	C		30		318.00	3.563	3.304	4.60	48.71	2.25	1.269	0.000	1.269	41	200	200	DWC	116	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.95		1.89	1.61	1.41
252	MARDMH4.1	MARDMH4	0	1	H		30		30.00	3.350	3.304	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	652	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.25		2.08	1.10	1.22
253	MLNRDMH3A	MLNRDMH3	0	1	H		10		10.00	3.883	3.897	1.53	1.53	2.25	0.040	0.000	0.040	8	200	200	DWC	-714	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.78		2.72	1.10	1.18
254	MLNRDMH3	MLNRDMH2	1	1	C		30		40.00	3.897	3.797	4.60	6.13	2.25	0.160	0.000	0.160	15	200	200	DWC	300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.72		2.55	1.18	1.25
255	MLNRDMH2	MLNRDMH1	1	1	C		30		70.00	3.797	3.597	4.60	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	150	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.55		2.38	1.25	1.22
256	MLNRDMH1	MARDMH4	1	1	C		30		100.00	3.597	3.304	4.60	15.32	2.25	0.399	0.000	0.399	23	200	200	DWC	102	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.38		2.21	1.22	1.09
257	MARDMH4	MARDMH3	3	1	J		29		477.00	3.304	3.310	4.44	73.07	2.25	1.903	0.000	1.903	50	200	200	DWC	-4833	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	1.89	1.89	1.83	1.41	1.48
258	MARDMH3	MARDMH2	1	1	C		30		507.00	3.310	3.329	4.60	77.66	2.25	2.023	0.000	2.023	51	200	200	DWC	-1579	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	1.83		1.77	1.48	1.56
259	MARDMH2	MARDMH1	1	1	C		30		537.00	3.329	3.340	4.60	82.26	2.25	2.142	0.000	2.142	53	200	200	DWC	-2727	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	1.77		1.71	1.56	1.63
260	MARDMH1	DEMATASLNRDN	1	1	C		30		567.00	3.340	3.263	4.60	86.86	2.25	2.262	0.000	2.262	54	200	200	DWC	390	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	1.71		1.65	1.63	1.61
261	DEMATASLNRDN	DERDMH30	3	1	J		15		6495.00	3.263	3.227	2.30	994.93	2.25	25.910	0.000	25.910	182	250	250	DWC	417	700	0.010	0.60	29.28	0.88	1.13	0.73	OK	0.67	OK	0.02	0.00	-1.16	-1.16	-1.18	4.42	4.41
262	DERDMH30	DERDMH31	1	1	C		19		6514.00	3.230	3.630	2.91	997.84	2.25	25.985	0.000	25.985	182	250	250	DWC	-48	700	0.010	0.60	29.28	0.89	1.13	0.74	OK	0.67	OK	0.03	0.00	-1.18		-1.21	4.41	4.84
263	DERDMH31.3	DERDMH31.2	0	1	H		19		19.00	3.770	3.747	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	826	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.67		2.56	1.10	1.19
264	DERDMH31.2	DERDMH31.1	1	1	C		30		49.00	3.747	3.719	4.60	7.51	2.25	0.195	0.000	0.195	16	200	200	DWC	1071	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.56		2.39	1.19	1.33
265	DERDMH31.1	DERDMH31	1	1	C		30		79.00	3.719	3.630	4.60	12.10	2.25	0.315	0.000	0.315	21	200	200	DWC	337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.39		2.22	1.33	1.41
266	DERDMH31.7	DERDMH31.6	0	1	H		25		25.00	3.030	3.225	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	-128	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.93		1.79	1.10	1.44
267	DERDMH31.6	DERDMH31.5	1	1	C		25		50.00	3.225	3.423	3.83	7.66	2.25	0.199	0.000	0.199	16	200	200	DWC	-126	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.79		1.65	1.44	1.77
268	DERDMH31.5	DERDMH31.4	1	1	C		27		77.00	3.423	3.541	4.14	11.80	2.25	0.307	0.000	0.307	20	200	200	DWC	-229	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	1.65		1.50	1.77	2.04
269	DERDMH31.4	DERDMH31	1	1	C		30		107.00	3.541	3.630	4.60	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	-337	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.50		1.41	2.04	2.22
270	DERDMH31	DERDMH32	3	1	J		30		6730.00	3.630	2.690	4.60	1030.93	2.25	26.847	0.000	26.847	185	250	250	DWC	32	700	0.010	0.60	29.28	0.92	1.14	0.76	OK	0.68	OK	0.04	0.00	-1.21	-1.21	-1.25	4.84	3.94
271	DERDMH32	DENPRDMH33	1	1	C		30		6760.00	2.690	3.346	4.60	1035.53	2.25	26.967	0.000	26.967	186	250	250	DWC	-46	700	0.010	0.60	29.28	0.92	1.14	0.76	OK	0.68	OK	0.04	0.00	-1.25		-1.29	3.94	4.64
272	DENPRDMH33.1	DENPRDMH33.2	0	1	H		19		19.00	4.070	3.905	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	115	115	0.010	1.27	39.84	0.00	0.30	0.07	OK	0.38	OK	0.17	0.00	2.97		2.80	1.10	1.11
273	DENPRDMH33.2	DENPRDMH33.3	1	1	C		20		39.00	3.905	3.741	3.06	5.97	2.25	0.156	0.000	0.156	15	200	200	DWC	122	122	0.010	1.23	38.76	0.00	0.30	0.07	OK	0.37	OK	0.16	0.00	2.80		2.64	1.11	1.10
274	DENPRDMH33.3	DENPRDMH33.4	1	1	C		20		59.00	3.741	3.577	3.06	9.04	2.25	0.235	0.000	0.235	18	200	200	DWC	122	121	0.010	1.23	38.84	0.01	0.30	0.07	OK	0.37	OK	0.17	0.00	2.64		2.47	1.10	1.11
275	DENPRDMH33.4	DENPRDMH33	1	1	C		20		79.00	3.577	3.346	3.06	12.10	2.25	0.315	0.000	0.315	21	200	200	DWC	87	87	0.010	1.46	45.80	0.01	0.30	0.07	OK	0.44	OK	0.23	0.00	2.47		2.24	1.11	1.11
276	NPRDMH1	NPRDMH2	0	1	H		20		20.00	1.820	1.639	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	110	108	0.010	1.31	41.11	0.00	0.30	0.07	OK	0.39	OK	0.19	0.00	0.72		0.53	1.10	1.11
277	NPRDMH2	NPRDMH3	1	1	C		26		46.00	1.639	1.773	3.98	7.05	2.25	0.184	0.000	0.184	16	200	200	DWC	-194	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.53		0.39	1.11	1.38
278	NPRDMH3	NPRDMH4	1	1	C		30		76.00	1.773	1.962	4.60	11.64	2.25	0.303	0.000	0.303	20	200	200	DWC	-159	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.39		0.22	1.38	1.74
279	NPRDMH4	NPRDMH5	1	1	C		32		108.00	1.962	2.236	4.90	16.54	2.25	0.431	0.000	0.431	24	200	200	DWC	-117	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.10	0.00	0.22		0.12	1.74	2.12
280	NPRDMH5.1	NPRDMH5.2	0	1	H		15		15.00	2.830	2.632	2.30	2.30	2.25	0.060	0.000	0.060	9	200	200	DWC	76	76	0.010	1.56	49.01	0.00	0.30	0.07	OK	0.47	OK	0.20	0.00	1.73		1.53	1.10	1.10
281	NPRDMH5.2	NPRDMH5	1	1	C		33		48.00	2.632	2.236	5.06	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	83	83	0.010	1.49	46.89	0.00	0.30	0.07	OK	0.45	OK	0.40	0.00	1.53		1.13	1.10	1.11
282	NPRDMH5	NPRDMH6	2	1	J		28		184.00	2.236	2.532	4.29	28.19	2.25	0.734	0.000	0.734	31	200	200	DWC	-95	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	0.12	0.12	0.07	2.12	2.46
283	NPRDMH6	NPRDMH7	1	1	C		30		214.00	2.532	2.698	4.60	32.78	2.25	0.854	0.000	0.854	33	200	200	DWC	-181	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.07		0.01	2.46	2.69
284	NPRDMH7	NPRDMH8	1	1	C		30		244.00	2.698	2.890	4.60	37.38	2.25	0.973	0.000	0.973	36	200	200	DWC	-156	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.01		-0.05	2.69	2.94
285	NPRDMH8	DENPRDMH33	1	1	C		30		274.00	2.890	3.346	4.60	41.97	2.25	1.093	0.000	1.093	38	200	200	DWC	-66	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.05		-0.11	2.94	3.46
286	DENPRDMH33	DERDMH33A	3	1	J		19		7132.00	3.346	3.335	2.91	1092.51	2.25	28.451	0.000	28.451	191	250	250	DWC	1727	700	0.010	0.60	29.28	0.97	1.14	0.80	OK	0.68	OK	0.03	0.00	-1.29	-1.29	-1.32	4.64	4.66
287	DERDMH33A.1	DERDMH33A.2	0	1	H		25		25.00	3.724	3.602	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	205	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.62		2.48	1.10	1.12
288	DERDMH33A.2	DERDMH33A	1	1	C		30		55.00	3.602	3.335	4.60	8.43	2.25	0.219	0.000	0.219	17	200	200	DWC	112	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.25	0.00	2.48		2.23	1.12	1.11
289	DERDMH33A	DERDMH34	2	1	J		17		7204.00	3.335	3.289	2.60	1103.54	2.25	28.738	0.000	28.738	192	250	250	DWC	370	700	0.010	0.60	29.28	0.98	1.14	0.80	OK	0.68	OK	0.02	0.00	-1.32	-1.32	-1.34	4.66	4.63
290	DERDMH34.1	DERDMH34.2	0	1	H		16		16.00	3.810	3.794	2.45	2.45	2.25	0.064	0.000	0.064	10	200	200	DWC	1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.71		2.62	1.10	1.17
291	DERDMH34.2	DERDMH34.3	1	1	C		13		29.00	3.794	3.779	1.99	4.44	2.25	0.116	0.000	0.116	13	200	200	DWC	867	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.62		2.55	1.17	1.23
292	DERDMH34.3	DERDMH34.4	1	1	C		30		59.00	3.779	3.544	4.60	9.04	2.25	0.235	0.000	0.235	18	200	200	DWC	128	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.55		2.38	1.23	1.16
293	DERDMH34.4	DERDMH34.5	1	1	C		12		71.00	3.544	3.453	1.84	10.88	2.25	0.283	0.000	0.283	19	200	200	DWC	132	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.38		2.31	1.16	1.14
294	DERDMH34.5	DERDMH34.6	1	1	C		11		82.00	3.453	3.332	1.69	12.56	2.25	0.327	0.000	0.327	21	200	200	DWC	91	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.09	0.00	2.31		2.22	1.14	1.11

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
295	DERDMH34.6	DERDMH34	1	1	C		23		105.00	3.332	3.289	3.52	16.08	2.25	0.419	0.000	0.419	24	200	200	DWC	535	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.22		2.15	1.11	1.14
296	DERDMH34	DEKARDMH35	2	1	J		16		7325.00	3.289	3.597	2.45	1122.08	2.25	29.221	0.000	29.221	193	250	250	DWC	-52	680	0.010	0.60	29.70	0.98	1.14	0.80	OK	0.69	OK	0.02	0.00	-1.34	-1.34	-1.36	4.63	4.96
297	KARDMH1	KARDMH2	0	1	H		29		29.00	3.150	3.095	4.44	4.44	2.25	0.116	0.000	0.116	13	200	200	DWC	527	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	2.05		1.89	1.10	1.21
298	KARDMH2	KARDMH3	1	1	C		30		59.00	3.095	3.111	4.60	9.04	2.25	0.235	0.000	0.235	18	200	200	DWC	-1875	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.89		1.72	1.21	1.39
299	KARDMH3	KARDMH4	1	1	C		30		89.00	3.111	3.142	4.60	13.63	2.25	0.355	0.000	0.355	22	200	200	DWC	-968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.72		1.55	1.39	1.59
300	KARDMH4	DEKARDMH35	1	1	C		30		119.00	3.142	3.597	4.60	18.23	2.25	0.475	0.000	0.475	25	200	200	DWC	-66	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.55		1.46	1.59	2.14
301	**DEKARDMH35**	**DERDMH36**	2	0	J	L	**30**		7474.00	**3.590**	**3.756**	4.60	1144.90	2.25	29.815	0.000	29.815	195	250	250	DWC	-181	650	0.010	0.62	30.38	0.98	1.14	0.80	OK	0.70	OK	0.05	0.00	-1.36	-1.36	-1.41	4.95	5.17
302	DERDMH36L	DERDMH37	0	1	H		30	7474.00	7504.00	3.760	3.778	4.60	1149.50	2.25	29.935	0.000	29.935	196	250	250	DWC	-1667	640	0.010	0.62	30.62	0.98	1.14	0.80	OK	0.71	OK	0.05	0.00	2.61		2.56	1.15	1.22
303	DERDMH37	DEPMRDMH38	1	1	C		13		7517.00	3.778	3.858	1.99	1151.49	2.25	29.987	0.000	29.987	196	250	250	DWC	-163	640	0.010	0.62	30.62	0.98	1.14	0.80	OK	0.71	OK	0.02	0.00	2.56		2.54	1.22	1.32
304	PMRDMH50A	PMRDMH50	0	1	H		30		30.00	3.911	3.775	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	221	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.81		2.64	1.10	1.14
305	PMRDMH50	PMRDMH50.1	1	1	C		26		56.00	3.775	3.947	3.98	8.58	2.25	0.223	0.000	0.223	17	200	200	DWC	-151	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.64		2.50	1.14	1.45
306	PMRDMH50.3	PMRDMH50.2	0	1	H		20		20.00	3.850	3.901	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	-392	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.75		2.64	1.10	1.26
307	PMRDMH50.2	PMRDMH50.1	1	1	C		20		40.00	3.901	3.947	3.06	6.13	2.25	0.160	0.000	0.160	15	200	200	DWC	-435	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.64		2.53	1.26	1.42
308	PMRDMH50.1	PMRDMH49	2	1	J		13		109.00	3.947	4.119	1.99	16.70	2.25	0.435	0.000	0.435	24	200	200	DWC	-76	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	2.50	2.50	2.46	1.45	1.66
309	PMRDMH49	PMRDMH48	1	1	C		22		131.00	4.119	4.190	3.37	20.07	2.25	0.523	0.000	0.523	26	200	200	DWC	-310	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.46		2.39	1.66	1.80
310	PMRDMH48.1	PMRDMH48.2	0	1	H		26		26.00	4.170	4.185	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	-1733	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	3.07		2.92	1.10	1.27
311	PMRDMH48.2	PMRDMH48	1	1	C		13		39.00	4.185	4.190	1.99	5.97	2.25	0.156	0.000	0.156	15	200	200	DWC	-2600	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.92		2.85	1.27	1.34
312	PMRDMH48	PMRDMH47	2	1	J		30		200.00	4.190	4.228	4.60	30.64	2.25	0.798	0.000	0.798	32	200	200	DWC	-789	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.39	2.39	2.33	1.80	1.90
313	PMRDMH47.1	PMRDMH47.2	0	1	H		30		30.00	3.880	4.057	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-169	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.78		2.61	1.10	1.45
314	PMRDMH47.2	PMRDMH47	1	1	C		30		60.00	4.057	4.228	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-175	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.61		2.44	1.45	1.79
315	PMRDMH47	PMRDMH46	2	1	J		29		289.00	4.228	4.127	4.44	44.27	2.25	1.153	0.000	1.153	39	200	200	DWC	287	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.33	2.33	2.27	1.90	1.86
316	MLNRDMH4	MLNRDMH5	0	1	H		27		27.00	3.824	3.750	4.14	4.14	2.25	0.108	0.000	0.108	12	200	200	DWC	365	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.72		2.57	1.10	1.18
317	MLNRDMH5	MLNRDMH6	1	1	C		27		54.00	3.750	3.674	4.14	8.27	2.25	0.215	0.000	0.215	17	200	200	DWC	355	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	2.57		2.42	1.18	1.25
318	MLNRDMH6	MLNRDMH7	1	1	C		28		82.00	3.674	3.900	4.29	12.56	2.25	0.327	0.000	0.327	21	200	200	DWC	-124	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	2.42		2.26	1.25	1.64
319	MLNRDMH7	PMRDMH46	1	1	C		28		110.00	3.900	4.130	4.29	16.85	2.25	0.439	0.000	0.439	24	200	200	DWC	-122	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.26		2.17	1.64	1.96
320	PMRDMH46	PMRDMH45	2	1	J		20		419.00	4.130	3.734	3.06	64.18	2.25	1.671	0.000	1.671	47	200	200	DWC	51	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	2.17	2.17	2.13	1.96	1.60
321	PMRDMH45.1	PMRDMH45.2	0	1	H		30		30.00	3.734	3.950	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-139	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.63		2.46	1.10	1.49
322	PMRDMH45.2	PMRDMH45	1	1	C		30		60.00	3.950	4.167	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-138	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.46		2.29	1.49	1.88
323	PMRDMH45	PMRDMH44	2	1	J		34		513.00	4.170	4.195	5.21	78.58	2.25	2.046	0.000	2.046	52	200	200	DWC	-1360	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.07	0.00	2.29	2.29	2.22	1.88	1.98
324	PMRDMH44	PMRDMH43	1	1	C		30		543.00	4.195	3.977	4.60	83.18	2.25	2.166	0.000	2.166	53	200	200	DWC	138	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	2.22		2.16	1.98	1.82
325	PMRDMH43	DEPMRDMH38	1	1	C		30		573.00	3.977	3.858	4.60	87.77	2.25	2.286	0.000	2.286	54	200	200	DWC	252	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	2.16		2.10	1.82	1.76
326	PMRDMH35	PMRDMH36	0	1	H		26		26.00	1.844	1.799	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	578	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.74		0.60	1.10	1.20
327	PMRDMH36.2	PMRDMH36.1	0	1	H		37		37.00	2.100	1.965	5.67	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	274	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.21	0.00	1.00		0.79	1.10	1.18
328	PMRDMH36.1	PMRDMH36	1	1	C		30		67.00	1.965	1.799	4.60	10.26	2.25	0.267	0.000	0.267	19	200	200	DWC	181	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.79		0.62	1.18	1.18
329	PMRDMH36A	PMRDMH36	0	1	H		30		30.00	1.820	1.799	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	1429	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.10	1.25
330	PMRDMH36	PMRDMH37	3	1	J		16		139.00	1.799	2.459	2.45	21.29	2.25	0.554	0.000	0.554	27	200	200	DWC	-24	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.55	0.55	0.51	1.25	1.95
331	PMRDMH37	PMRDMH38	1	1	C		26		165.00	2.460	2.459	3.98	25.28	2.25	0.658	0.000	0.658	29	200	200	DWC	26000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	0.51		0.45	1.95	2.01
332	PMRDMH38.1	PMRDMH38	0	1	H		28		28.00	2.234	2.459	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	-124	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.13		0.97	1.10	1.49
333	PMRDMH38	PMRDMH39	2	1	J		30		223.00	2.459	2.824	4.60	34.16	2.25	0.890	0.000	0.890	34	200	200	DWC	-82	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.45	0.45	0.39	2.01	2.43
334	PMRDMH39.1	PMRDMH39	0	1	H		30		30.00	2.730	2.824	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-319	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.63		1.46	1.10	1.36
335	PMRDMH39	PMRDMH40	2	1	J		20		273.00	2.824	3.189	3.06	41.82	2.25	1.089	0.000	1.089	38	200	200	DWC	-55	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.39	0.39	0.35	2.43	2.84
336	PMRDMH40	PMRDMH41	1	1	C		30		303.00	3.189	3.703	4.60	46.41	2.25	1.209	0.000	1.209	40	200	200	DWC	-58	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.35		0.29	2.84	3.41
337	PMRDMH41	PMRDMH42	1	1	C		30		333.00	3.703	3.878	4.60	51.01	2.25	1.328	0.000	1.328	42	200	200	DWC	-171	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.29		0.23	3.41	3.65
338	PMRDMH42	DEPMRDMH38	1	1	C		22		355.00	3.878	3.858	3.37	54.38	2.25	1.416	0.000	1.416	43	200	200	DWC	1100	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	0.23		0.19	3.65	3.67
339	DEPMRDMH38	DERDMH39	3	1	J		30		8475.00	3.858	3.888	4.60	1298.24	2.25	33.808	0.000	33.808	208	300	300	DWC	-1000	870	0.010	0.60	42.70	0.79	1.10	0.67	OK	0.66	OK	0.03	0.00	0.19	0.19	0.16	3.67	3.73
340	DERDMH39	DERDMH39A	1	1	C		13		8488.00	3.888	3.892	1.99	1300.23	2.25	33.860	0.000	33.860	208	300	300	DWC	-3250	870	0.010	0.60	42.70	0.79	1.10	0.67	OK	0.66	OK	0.01	0.00	0.16		0.15	3.73	3.74
341	DERDMH39A.1	DERDMH39A.2	0	1	H		30		30.00	3.570	3.730	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.47		2.30	1.10	1.43
342	DERDMH39A.2	DERDMH39A	1	1	C		30		60.00	3.730	3.892	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-185	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.30		2.13	1.43	1.76
343	DERDMH39A	DERDMH40	2	1	J		17		8565.00	3.892	3.897	2.60	1312.02	2.25	34.167	0.000	34.167	209	300	300	DWC	-3400	870	0.010	0.60	42.70	0.80	1.11	0.68	OK	0.67	OK	0.02	0.00	0.15	0.15	0.13	3.74	3.77
344	DERDMH40	DERDMH41	1	1	C		35		8600.00	3.897	3.905	5.36	1317.39	2.25	34.307	0.000	34.307	210	300	300	DWC	-4375	870	0.010	0.60	42.70	0.80	1.11	0.68	OK	0.67	OK	0.04	0.00	0.13		0.09	3.77	3.82
345	DERDMH41.1	DERDMH41.2	0	1	H		30		30.00	2.400	2.592	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-156	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.30		1.13	1.10	1.46
346	DERDMH41.2	DERDMH41.3	1	1	C		30		60.00	2.592	2.873	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-107	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.13		0.96	1.46	1.91
347	DERDMH41.3	DERDMH41.4	1	1	C		23		83.00	2.873	3.155	3.52	12.71	2.25	0.331	0.000	0.331	21	200	200	DWC	-82	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	0.96		0.83	1.91	2.33
348	DERDMH41.4	DERDMH41.5	1	1	C		23		106.00	3.155	3.436	3.52	16.24	2.25	0.423	0.000	0.423	24	200	200	DWC	-82	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	0.83		0.76	2.33	2.68
349	DERDMH41.5	DERDMH41.6	1	1	C		30		136.00	3.436	3.717	4.60	20.83	2.25	0.543	0.000	0.543	27	200	200	DWC	-107	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.76		0.69	2.68	3.03
350	DERDMH41.6	DERDMH41	1	1	C		30		166.00	3.710	3.905	4.60	25.43	2.25	0.662	0.000	0.662	30	200	200	DWC	-154	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.69		0.62	3.02	3.29
351	DERDMH41	DERDMH42	2	1	J		15		8781.00	3.905	3.934	2.30	1345.11	2.25	35.029	0.000	35.029	212	300	300	DWC	-517	870	0.010	0.60	42.70	0.82	1.11	0.69	OK	0.67	OK	0.02	0.00	0.09	0.09	0.07	3.82	3.86
352	DERDMH42	DETHRDMH43	1	1	C		25		8806.00	3.934	4.183	3.83	1348.94	2.25	35.129	0.000	35.129	212	300	300	DWC	-100	870	0.010	0.60	42.70	0.82	1.11	0.69	OK	0.67	OK	0.03	0.00	0.07		0.04	3.86	4.14
353	THRDMH1	THRDMH2	0	1	H		17		17.00	3.711	3.685	2.60	2.60	2.25	0.068	0.000	0.068	10	200	200	DWC	654	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.61		2.52	1.10	1.17
354	THRDMH2	THRDMH3	1	1	C		17		34.00	3.685	3.659	2.60	5.21	2.25	0.136	0.000	0.136	14	200	200	DWC	654	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.52		2.43	1.17	1.23
355	THRDMH3	THRDMH4	1	1	C		21		55.00	3.660	3.635	3.22	8.43	2.25	0.219	0.000	0.219	17	200	200	DWC	840	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.43		2.31	1.23	1.33
356	THRDMH4	THRDMH5	1	1	C		16		71.00	3.635	3.611	2.45	10.88	2.25	0.283	0.000	0.283	19	200	200	DWC	667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.31		2.22	1.33	1.39
357	THRDMH5	THRDMH6	1	1	C		12		83.00	3.611	3.643	1.84	12.71	2.25	0.331	0.000	0.331	21	200	200	DWC	-375	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.22		2.15	1.39	1.49
358	THRDMH6	THRDMH7	1	1	C		22		105.00	3.643	3.884	3.37	16.08	2.25	0.419	0.000	0.419	24	200	200	DWC	-91	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.15		2.08	1.49	1.80
359	THRDMH7	THRDMH8	1	1	C		21		126.00	3.884	4.002	3.22	19.30	2.25	0.503	0.000	0.503	26	200	200	DWC	-178	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.08		2.01	1.80	1.99
360	THRDMH8	THRDMH9	1	1	C		15		141.00	4.002	4.121	2.30	21.60	2.25	0.562	0.000	0.562	27	200	200	DWC	-126	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	2.01		1.96	1.99	2.16
361	THRDMH9.3	THRDMH9.2	0	1	H		23		23.00	4.060	4.094	3.52	3.52	2.25	0.092	0.000	0.092	11	200	200	DWC	-676	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.96		2.83	1.10	1.26
362	THRDMH9.2	THRDMH9	1	1	C		22		45.00	4.094	4.121	3.37	6.89	2.25	0.180	0.000	0.180	16	200	200	DWC	-815	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.83		2.71	1.26	1.41
363	THRDMH9.1	THRDMH9	0	1	H		30		30.00	4.153	4.121	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	938	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.05		2.88	1.10	1.24
364	THRDMH9	THRDMH10	3	1	J		31		247.00	4.121	3.996	4.75	37.84	2.25	0.985	0.000	0.985	36	200	200	DWC	248	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.96	1.96	1.90	2.16	2.10
365	THRDMH10.1	THRDMH10	0	1	H		30		30.00	4.142	3.996	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	205	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.04		2.87	1.10	1.13
366	THRDMH10	THRDMH11	2	1	J		22		299.40	3.996	4.067	3.43	45.86	2.25	1.194	0.000	1.194	40	200	200	DWC	-315	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.90	1.90	1.86	2.10	2.21
367	THRDMH11	THRDMH12	1	1	C		15		314.14	4.067	4.125	2.26	48.12	2.25	1.253	0.000	1.253	40	200	200	DWC	-254	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	1.86		1.83	2.21	2.30
368	THRDMH12.1	THRDMH12.2	0	1	H		26		26.00	4.140	4.132	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	3250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.04		2.90	1.10	1.23

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
369	THRDMH12.2	THRDMH12	1	1	C		30		56.00	4.132	4.125	4.60	8.58	2.25	0.223	0.000	0.223	17	200	200	DWC	4286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.90		2.73	1.23	1.40
370	THRDMH12	THRDMH13	2	1	J		15		385.40	4.125	4.185	2.34	59.04	2.25	1.537	0.000	1.537	45	200	200	DWC	-254	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	1.83	1.83	1.80	2.30	2.39
371	THRDMH13	DETHRDMH43	1	1	C		30		415.40	4.185	4.183	4.60	63.63	2.25	1.657	0.000	1.657	46	200	200	DWC	15000	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.80		1.74	2.39	2.44
372	DETHRDMH43	DERDMH44	2	1	J		33		9254.44	4.183	4.111	5.06	1417.64	2.25	36.918	0.000	36.918	217	300	300	DWC	459	870	0.010	0.60	42.70	0.86	1.12	0.72	OK	0.68	OK	0.04	0.00	0.04	0.04	0.00	4.14	4.11
373	DERDMH44.1	DERDMH44	0	1	H		30		30.00	4.050	4.111	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-492	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.95		2.78	1.10	1.33
374	DERDMH44	DERDMH45	2	1	J		32		9316.62	4.111	4.171	4.93	1427.16	2.25	37.166	0.000	37.166	218	300	300	DWC	-536	870	0.010	0.60	42.70	0.87	1.12	0.72	OK	0.68	OK	0.04	0.00	0.00	0.00	-0.04	4.11	4.21
375	DERDMH45.1	DERDMH45.2	0	1	H		20		20.00	4.150	4.160	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	-2000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.05		2.94	1.10	1.22
376	DERDMH45.2	DERDMH45	1	1	C		21		41.00	4.160	4.171	3.22	6.28	2.25	0.164	0.000	0.164	15	200	200	DWC	-1909	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.94		2.82	1.22	1.35
377	DERDMH45	DERDMH46A	2	1	J		30		9387.62	4.171	4.183	4.60	1438.04	2.25	37.449	0.000	37.449	219	300	300	DWC	-2500	870	0.010	0.60	42.70	0.88	1.13	0.73	OK	0.68	OK	0.03	0.00	-0.04	-0.04	-0.07	4.21	4.25
378	DERDMH46A.1	DERDMH46A	0	1	H		30		30.00	4.200	4.183	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	1765	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.10		2.93	1.10	1.25
379	DERDMH46A	DERDMH46	2	1	J		10		9427.27	4.183	4.190	1.48	1444.11	2.25	37.607	0.000	37.607	219	300	300	DWC	-1379	870	0.010	0.60	42.70	0.88	1.13	0.73	OK	0.68	OK	0.01	0.00	-0.07	-0.07	-0.08	4.25	4.27
380	DERDMH46	DERDMH47	1	1	C		30		9457.27	4.190	4.210	4.60	1448.71	2.25	37.727	0.000	37.727	220	300	300	DWC	-1500	870	0.010	0.60	42.70	0.88	1.13	0.73	OK	0.68	OK	0.03	0.00	-0.08		-0.11	4.27	4.32
381	DERDMH47	DERDMH48	1	1	C		30		9487.27	4.210	4.100	4.60	1453.30	2.25	37.846	0.000	37.846	220	300	300	DWC	273	870	0.010	0.60	42.70	0.89	1.13	0.74	OK	0.68	OK	0.03	0.00	-0.11		-0.14	4.32	4.24
382	DERDMH48.1	DERDMH48.2	0	1	H		28		27.84	2.050	2.314	4.26	4.26	2.25	0.111	0.000	0.111	12	200	200	DWC	-105	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	0.95		0.80	1.10	1.51
383	DERDMH48.2	DERDMH48.3	1	1	C		26		53.84	2.314	2.698	3.98	8.25	2.25	0.215	0.000	0.215	17	200	200	DWC	-68	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.80		0.66	1.51	2.04
384	DERDMH48.3	DERDMH48.4	1	1	C		30		83.84	2.690	3.083	4.60	12.84	2.25	0.334	0.000	0.334	21	200	200	DWC	-76	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.66		0.49	2.03	2.59
385	DERDMH48.4	DERDMH48.5	1	1	C		27		110.93	3.083	3.467	4.15	16.99	2.25	0.443	0.000	0.443	24	200	200	DWC	-71	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.49		0.41	2.59	3.06
386	DERDMH48.5	DERDMH48.6	1	1	C		30		140.93	3.460	3.852	4.60	21.59	2.25	0.562	0.000	0.562	27	200	200	DWC	-77	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.41		0.34	3.05	3.51
387	DERDMH48.6	DERDMH48	1	1	C		30		170.93	3.852	4.109	4.60	26.18	2.25	0.682	0.000	0.682	30	200	200	DWC	-117	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.34		0.27	3.51	3.84
388	DERDMH48	DERDMH49	2	1	J		30		9688.20	4.109	3.934	4.60	1484.08	2.25	38.648	0.000	38.648	222	300	300	DWC	171	870	0.010	0.60	42.70	0.91	1.13	0.75	OK	0.68	OK	0.03	0.00	-0.14	-0.14	-0.17	4.25	4.10
389	DERDMH49.1	DERDMH49	0	1	H		30		30.00	3.950	3.934	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	1875	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.85		2.68	1.10	1.25
390	DERDMH49	DERDMH50	2	1	J		30		9748.20	3.934	4.297	4.60	1493.27	2.25	38.887	0.000	38.887	223	300	300	DWC	-83	870	0.010	0.60	42.70	0.91	1.13	0.75	OK	0.68	OK	0.03	0.00	-0.17	-0.17	-0.20	4.10	4.50
391	DERDMH50.1	DERDMH50.2	0	1	H		29		29.00	4.944	4.120	4.44	4.44	2.25	0.116	0.000	0.116	13	200	200	DWC	35	35	0.010	2.29	72.21	0.00	0.30	0.07	OK	0.69	OK	0.83	0.00	3.84		3.01	1.10	1.11
392	DERDMH50.2	DERDMH50	1	1	C		30		59.00	4.120	4.297	4.60	9.04	2.25	0.235	0.000	0.235	18	200	200	DWC	-169	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.01		2.84	1.11	1.46
393	DERDMH50	DERDM51	2	1	J		30		9837.20	4.297	4.174	4.60	1506.91	2.25	39.242	0.000	39.242	224	300	300	DWC	244	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.03	0.00	-0.20	-0.20	-0.23	4.50	4.40
394	DERDM51	DEVPLNRDM52	1	1	C		13		9850.20	4.174	4.124	1.99	1508.90	2.25	39.294	0.000	39.294	224	300	300	DWC	260	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.01	0.00	-0.23		-0.24	4.40	4.36
395	VPLNRDM15.2	VPLNRDM15.1	0	1	H		23		23.00	1.613	1.556	3.52	3.52	2.25	0.092	0.000	0.092	11	200	200	DWC	404	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.51		0.38	1.10	1.18
396	VPLNRDM15.1	VPLNRDM15	1	1	C		32		55.00	1.556	1.655	4.90	8.43	2.25	0.219	0.000	0.219	17	200	200	DWC	-323	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.38		0.20	1.18	1.46
397	VPLNRDM15	VPLNRDM14	1	1	C		30		85.00	1.655	1.534	4.60	13.02	2.25	0.339	0.000	0.339	21	200	200	DWC	248	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.20		0.03	1.46	1.50
398	VPLNRDM14.2	VPLNRDM14.1	0	1	H		25		25.00	1.594	1.519	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.49		0.35	1.10	1.17
399	VPLNRDM14.1	VPLNRDM14	1	1	C		25		50.00	1.519	1.534	3.83	7.66	2.25	0.199	0.000	0.199	16	200	200	DWC	-1667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.35		0.21	1.17	1.32
400	VPLNRDM14	VPLNRDM13	2	1	J		24		159.00	1.534	1.509	3.68	24.36	2.25	0.634	0.000	0.634	29	200	200	DWC	960	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	0.03	0.03	-0.03	1.50	1.54
401	VPLNRDM13	VPLNRDM12	1	1	C		26		185.00	1.509	1.850	3.98	28.34	2.25	0.738	0.000	0.738	31	200	200	DWC	-76	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.03		-0.08	1.54	1.93
402	VPLNRDM12	VPLNRDM11	1	1	C		25		210.00	1.850	1.600	3.83	32.17	2.25	0.838	0.000	0.838	33	200	200	DWC	100	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.08		-0.13	1.93	1.73
403	VPLNRDM11	VPLNRDM10	1	1	C		30		240.00	1.600	1.722	4.60	36.76	2.25	0.957	0.000	0.957	35	200	200	DWC	-246	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.13		-0.19	1.73	1.91
404	VPLNRDM10	VPLNRDM9	1	1	C		26		266.00	1.722	1.925	3.98	40.75	2.25	1.061	0.000	1.061	37	200	200	DWC	-128	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	-0.19		-0.24	1.91	2.17
405	NVPLNRDM1	NVPLNRDM2	0	1	H		30		30.00	4.042	3.985	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	526	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.94		2.77	1.10	1.22
406	NVPLNRDM2	NVPLNRDM3	1	1	C		30		60.00	3.985	3.802	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	164	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.77		2.60	1.22	1.20
407	NVPLNRDM3	NVPLNRDM4	1	1	C		30		90.00	3.802	3.560	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	124	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.60		2.43	1.20	1.13
408	NVPLNRDM4	NVPLNRDM5	1	1	C		16		106.00	3.560	3.253	2.45	16.24	2.25	0.423	0.000	0.423	24	200	200	DWC	52	57	0.010	1.80	56.59	0.01	0.30	0.07	OK	0.54	OK	0.28	0.00	2.43		2.15	1.13	1.10
409	NVPLNRDM5	NVPLNRDM6	1	1	C		25		131.00	3.253	2.943	3.83	20.07	2.25	0.523	0.000	0.523	26	200	200	DWC	81	81	0.010	1.51	47.47	0.01	0.30	0.07	OK	0.45	OK	0.31	0.00	2.15		1.84	1.10	1.10
410	NVPLNRDM6	NVPLNRDM7	1	1	C		24		155.00	2.943	2.360	3.68	23.74	2.25	0.618	0.000	0.618	29	200	200	DWC	41	41	0.010	2.12	66.72	0.01	0.30	0.07	OK	0.64	OK	0.59	0.00	1.84		1.25	1.10	1.11
411	NVPLNRDM7.2	NVPLNRDM7.1	0	1	H		30		30.00	1.913	2.571	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-46	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.81		0.64	1.10	1.93
412	NVPLNRDM7.1	NVPLNRDM7	1	1	C		18		48.00	2.571	2.360	2.76	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	85	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.64		0.54	1.93	1.82
413	NVPLNRDM7	NVPLNRDM8	2	1	J		18		221.00	2.360	2.090	2.76	33.85	2.25	0.882	0.000	0.882	34	200	200	DWC	67	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	0.54	0.54	0.51	1.82	1.58
414	NVPLNRDM8	NVPLNRDM9	1	1	C		25		246.00	2.090	2.045	3.83	37.68	2.25	0.981	0.000	0.981	36	200	200	DWC	556	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.51		0.46	1.58	1.59
415	NVPLNRDM9.2	NVPLNRDM9.1	0	1	H		11		11.00	1.543	1.427	1.69	1.69	2.25	0.044	0.000	0.044	8	200	200	DWC	95	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.12	0.00	0.44		0.32	1.10	1.11
416	NVPLNRDM9.1	NVPLNRDM9	1	1	C		16		27.00	1.427	2.045	2.45	4.14	2.25	0.108	0.000	0.108	12	200	200	DWC	-26	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.32		0.23	1.11	1.82
417	NVPLNRDM9	VPLNRDM9	2	1	J		25		298.00	2.045	1.925	3.83	45.65	2.25	1.189	0.000	1.189	39	200	200	DWC	208	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	0.23	0.23	0.18	1.82	1.75
418	VPLNRDM9	VPLNRDM8	2	1	J		22		586.00	1.925	2.190	3.37	89.77	2.25	2.338	0.000	2.338	55	200	200	DWC	-83	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.04	0.00	0.18	0.18	0.14	1.75	2.05
419	VPLNRDM8	VPLNRDM7	1	1	C		10		596.00	2.190	2.455	1.53	91.30	2.25	2.378	0.000	2.378	56	200	200	DWC	-38	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.02	0.00	0.14		0.12	2.05	2.34
420	VPLNRDM7	VPLNRDM6	1	1	C		33		629.00	2.455	2.986	5.06	96.35	2.25	2.509	0.000	2.509	57	200	200	DWC	-62	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	0.12		0.06	2.34	2.93
421	VPLNRDM6	VPLNRDM5	1	1	C		17		646.00	2.986	3.517	2.60	98.96	2.25	2.577	0.000	2.577	58	200	200	DWC	-32	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	0.06		0.03	2.93	3.49
422	VPLNRDM5	VPLNRDM4	1	1	C		30		676.00	3.517	3.532	4.60	103.55	2.25	2.697	0.000	2.697	59	200	200	DWC	-2000	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	0.03		-0.03	3.49	3.56
423	VPLNRDM4	VPLNRDM3	1	1	C		8		684.00	3.532	4.063	1.23	104.78	2.25	2.729	0.000	2.729	59	200	200	DWC	-15	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.02	0.00	-0.03		-0.05	3.56	4.11
424	VPLNRDM3	VPLNRDM2	1	1	C		30		714.00	4.063	4.168	4.60	109.37	2.25	2.848	0.000	2.848	61	200	200	DWC	-286	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	-0.05		-0.11	4.11	4.28
425	VPLNRDM2	VPLNRDM1	1	1	C		30		744.00	4.168	4.274	4.60	113.97	2.25	2.968	0.000	2.968	62	200	200	DWC	-283	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	-0.11		-0.17	4.28	4.44
426	VPLNRDM1	DEVPLNRDM52	1	1	C		33		777.00	4.274	4.124	5.06	119.02	2.25	3.100	0.000	3.100	63	200	200	DWC	220	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	-0.17		-0.23	4.44	4.35
427	DEVPLNRDM52	DERDM53	2	1	J		15		10642.20	4.124	4.178	2.30	1630.22	2.25	42.454	0.000	42.454	233	342	400	hdpe	-278	1000	0.010	0.61	56.49	0.75	1.10	0.65	OK	0.68	OK	0.02	0.00	-0.24	-0.24	-0.26	4.36	4.44
428	DERDM53	DERDM53A	1	1	C		10		10652.41	4.178	4.165	1.56	1631.78	2.25	42.494	0.000	42.494	233	342	400	hdpe	785	1000	0.010	0.61	56.49	0.75	1.10	0.65	OK	0.68	OK	0.01	0.00	-0.26		-0.27	4.44	4.44
429	DERDM53A	DENVPLNRDM54	1	1	C		13		10665.38	4.165	4.153	1.99	1633.77	2.25	42.546	0.000	42.546	233	342	400	hdpe	1081	1000	0.010	0.61	56.49	0.75	1.10	0.65	OK	0.68	OK	0.01	0.00	-0.27		-0.28	4.44	4.43
430	DENVPLNRDM54	DERDM55	1	1	C		30		10695.38	4.153	3.975	4.60	1638.37	2.25	42.666	0.000	42.666	234	342	400	hdpe	169	1000	0.010	0.61	56.49	0.76	1.10	0.65	OK	0.68	OK	0.03	0.00	-0.28		-0.31	4.43	4.29
431	DERDM55	DERDM56	1	1	C		30		10725.38	3.975	3.980	4.60	1642.96	2.25	42.785	0.000	42.785	234	342	400	hdpe	-6000	1000	0.010	0.61	56.49	0.76	1.10	0.65	OK	0.68	OK	0.03	0.00	-0.31		-0.34	4.29	4.32
432	DERDM56	DERDM57	1	1	C		19		10744.38	3.980	3.999	2.91	1645.87	2.25	42.861	0.000	42.861	234	342	400	hdpe	-1000	1000	0.010	0.61	56.49	0.76	1.10	0.65	OK	0.68	OK	0.02	0.00	-0.34		-0.36	4.32	4.36
433	DERDM57.7	DERDM57.6	0	1	H		13		13.00	2.773	3.142	1.99	1.99	2.25	0.052	0.000	0.052	9	200	200	DWC	-35	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.67		1.60	1.10	1.54
434	DERDM57.6	DERDM57.5	1	1	C		20		33.00	3.142	3.463	3.06	5.06	2.25	0.132	0.000	0.132	13	200	200	DWC	-62	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.60		1.49	1.54	1.97
435	DERDM57.5	DERDM57.4	1	1	C		30		63.00	3.463	3.910	4.60	9.65	2.25	0.251	0.000	0.251	18	200	200	DWC	-67	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.49		1.32	1.97	2.59
436	DERDM57.4	DERDM57.3	1	1	C		30		93.00	3.910	3.992	4.60	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	-366	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.32		1.15	2.59	2.84
437	DERDM57.3	DERDM57.2	1	1	C		30		123.00	3.992	4.054	4.60	18.84	2.25	0.491	0.000	0.491	26	200	200	DWC	-484	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.15		1.06	2.84	2.99
438	DERDM57.2	DERDM57.1	1	1	C		30		153.00	4.054	3.903	4.60	23.44	2.25	0.610	0.000	0.610	28	200	200	DWC	199	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.06		0.99	2.99	2.91
439	DERDM57.1	DERDM57	1	1	C		31		183.75	3.903	3.999	4.71	28.15	2.25	0.733	0.000	0.733	31	200	200	DWC	-320	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.99		0.93	2.91	3.07
440	DERDM57	DERDM58	2	1	J		33		10961.13	3.999	4.020	5.06	1679.07	2.25	43.726	0.000	43.726	237	342	400	hdpe	-1571	1000	0.010	0.61	56.49	0.77	1.10	0.66	OK	0.68	OK	0.03	0.00	-0.36	-0.36	-0.39	4.36	4.41
441	DERDM58	DESKNLRDM59	1	1	C		28		10989.13	4.020	4.126	4.29	1683.36	2.25	43.838	0.000	43.838	237	342	400	hdpe	-264	1000	0.010	0.61	56.49	0.78	1.10	0.67	OK	0.68	OK	0.03	0.00	-0.39		-0.42	4.41	4.55
442	DERDM60	DESKNLRDM59	0	1	H		30		30.00	4.371	4.126	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	122	122	0.010	1.23	38.68	0.00	0.30	0.07	OK	0.37	OK	0.25	0.00	3.27		3.02	1.10	1.11

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
443	DESKNLRDM59	SKNLRDM1	2	1	J		30		11049.13	4.126	4.027	4.60	1692.55	2.25	44.077	0.000	44.077	237	378	400	DWC	303	1000	0.010	0.66	73.77	0.60	1.04	0.56	OK	0.68	OK	0.03	0.00	-0.42	-0.42	-0.45	4.55	4.48
444	SKNLRDM1	SKNLRDM2	1	1	C		30		11079.13	4.027	3.914	4.60	1697.15	2.25	44.197	0.000	44.197	238	378	400	DWC	265	1000	0.010	0.66	73.77	0.60	1.04	0.56	OK	0.68	OK	0.03	0.00	-0.45		-0.48	4.48	4.39
445	SKNLRDM2	SKNLRDM3	1	1	C		30		11109.13	3.914	3.421	4.60	1701.75	2.25	44.316	0.000	44.316	238	378	400	DWC	61	1000	0.010	0.66	73.77	0.60	1.04	0.56	OK	0.68	OK	0.03	0.00	-0.48		-0.51	4.39	3.93
446	SKNLRDM3	SKNLRDM4	1	1	C		30		11139.13	3.421	3.129	4.60	1706.34	2.25	44.436	0.000	44.436	238	378	400	DWC	103	1000	0.010	0.66	73.77	0.60	1.04	0.56	OK	0.68	OK	0.03	0.00	-0.51		-0.54	3.93	3.67
447	SKNLRDM4	SKNLRDM5	1	1	C		30		11169.13	3.129	2.746	4.60	1710.94	2.25	44.556	0.000	44.556	239	378	400	DWC	78	1000	0.010	0.66	73.77	0.60	1.04	0.56	OK	0.68	OK	0.03	0.00	-0.54		-0.57	3.67	3.32
448	SKNLRDM5	SKNLRDM6	1	1	C		23		11192.13	2.746	2.479	3.52	1714.46	2.25	44.647	0.000	44.647	239	378	400	DWC	86	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.02	0.00	-0.57		-0.59	3.32	3.07
449	SKNLRDM6	SKNLRDM7	1	1	C		8		11200.13	2.479	2.338	1.23	1715.68	2.25	44.679	0.000	44.679	239	378	400	DWC	57	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.01	0.00	-0.59		-0.60	3.07	2.94
450	SKNLRDM7	SKNLRDM8	1	1	C		30		11230.13	2.338	2.062	4.60	1720.28	2.25	44.799	0.000	44.799	239	378	400	DWC	109	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.03	0.00	-0.60		-0.63	2.94	2.69
451	SKNLRDM8	SKNLRDM9	1	1	C		15		11245.13	2.062	2.218	2.30	1722.58	2.25	44.859	0.000	44.859	240	378	400	DWC	-96	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.02	0.00	-0.63		-0.65	2.69	2.87
452	SKNLRDM9	SKNLRDM9.1	1	1	C		15		11260.13	2.218	1.834	2.30	1724.88	2.25	44.919	0.000	44.919	240	378	400	DWC	39	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.02	0.00	-0.65		-0.67	2.87	2.50
453	SKNLRDM9.1	SKNLRDM9.2	1	1	C		12		11272.13	1.834	1.720	1.84	1726.71	2.25	44.967	0.000	44.967	240	378	400	DWC	105	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.01	0.00	-0.67		-0.68	2.50	2.40
454	SKNLRDM9.2	SKNLRDM9.3	1	1	C		37		11309.13	1.720	2.194	5.67	1732.38	2.25	45.114	0.000	45.114	240	378	400	DWC	-78	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.04	0.00	-0.68		-0.72	2.40	2.91
455	SKNLRDM9.3	SKNLRDM9.4	1	1	C		41		11350.13	2.194	2.145	6.28	1738.66	2.25	45.278	0.000	45.278	241	378	400	DWC	837	1000	0.010	0.66	73.77	0.61	1.05	0.57	OK	0.69	OK	0.04	0.00	-0.72		-0.76	2.91	2.91
456	SKNLRDM9.4	SKNLRDM9.5	1	1	C		24		11374.13	2.145	1.720	3.68	1742.34	2.25	45.373	0.000	45.373	241	378	400	DWC	56	1000	0.010	0.66	73.77	0.62	1.05	0.57	OK	0.69	OK	0.02	0.00	-0.76		-0.78	2.91	2.50
457	KRRDMH1	KRRDMH2	0	1	H		30		30.00	2.570	2.491	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	380	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.47		1.30	1.10	1.19
458	KRRDMH2	KRRDMH3	1	1	C		30		60.00	2.491	2.417	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	405	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.30		1.13	1.19	1.29
459	KRRDMH3	KRRDMH3A	1	1	C		9		69.00	2.417	2.337	1.38	10.57	2.25	0.275	0.000	0.275	19	200	200	DWC	113	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	1.13		1.08	1.29	1.26
460	KRRDMH8	KRRDMH7	0	1	H		15		15.00	2.791	2.370	2.30	2.30	2.25	0.060	0.000	0.060	9	200	200	DWC	36	36	0.010	2.26	71.20	0.00	0.30	0.07	OK	0.68	OK	0.42	0.00	1.69		1.27	1.10	1.10
461	KRRDMH7	KRRDMH6	1	1	C		30		45.00	2.370	2.276	4.60	6.89	2.25	0.180	0.000	0.180	16	200	200	DWC	319	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.27		1.10	1.10	1.18
462	KRRDMH6.2	KRRDMH6.1	0	1	H		7		7.00	1.860	1.854	1.07	1.07	2.25	0.028	0.000	0.028	6	200	200	DWC	1167	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	0.76		0.72	1.10	1.13
463	KRRDMH6.1	KRRDMH6	1	1	C		29		36.00	1.854	2.276	4.44	5.51	2.25	0.144	0.000	0.144	14	200	200	DWC	-69	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.72		0.56	1.13	1.72
464	KRRDMH6	KRRDMH5	2	1	J		17		98.00	2.276	2.273	2.60	15.01	2.25	0.391	0.000	0.391	23	200	200	DWC	5667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.56	0.56	0.47	1.72	1.80
465	KRRDMH5	KRRDMH4	1	1	C		20		118.00	2.273	2.368	3.06	18.08	2.25	0.471	0.000	0.471	25	200	200	DWC	-211	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.47		0.41	1.80	1.96
466	KRRDMH4	KRRDMH3A	1	1	C		16		134.00	2.368	2.320	2.45	20.53	2.25	0.535	0.000	0.535	27	200	200	DWC	333	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.41		0.37	1.96	1.95
467	KRRDMH3A	KRRDMH3A.1	2	1	J		30		233.00	2.320	1.920	4.60	35.69	2.25	0.929	0.000	0.929	35	200	200	DWC	75	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.37	0.37	0.31	1.95	1.61
468	KRRDMH3A.1	KRRDMH3A.7	1	1	C		20		253.00	1.920	1.800	3.06	38.76	2.25	1.009	0.000	1.009	36	200	200	DWC	167	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.31		0.27	1.61	1.53
469	KRRDMH3A.2	KRRDMH3A.3	0	1	H		30		30.00	2.060	2.170	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-273	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.96		0.79	1.10	1.38
470	KRRDMH3A.3	KRRDMH3A.7	1	1	C		30		60.00	2.170	1.770	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	75	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.79		0.62	1.38	1.15
471	KRRDMH3A.4	KRRDMH3A.5	0	1	H		15		15.00	1.950	1.907	2.30	2.30	2.25	0.060	0.000	0.060	9	200	200	DWC	349	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.85		0.77	1.10	1.14
472	KRRDMH3A.5	KRRDMH3A.6	1	1	C		30		45.00	1.907	1.770	4.60	6.89	2.25	0.180	0.000	0.180	16	200	200	DWC	219	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	1.14	1.17
473	KRRDMH3A.6	KRRDMH3A.7	1	1	C		30		75.00	1.770	1.800	4.60	11.49	2.25	0.299	0.000	0.299	20	200	200	DWC	-1000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.60		0.43	1.17	1.37
474	KRRDMH3A.7	KRRDMH3A.8	3	1	J		20		408.00	1.800	2.049	3.06	62.50	2.25	1.628	0.000	1.628	46	200	200	DWC	-80	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	0.27	0.27	0.23	1.53	1.82
475	KRRDMH3A.8	KRRDMH3A.9	1	1	C		30		438.00	2.049	1.443	4.60	67.09	2.25	1.747	0.000	1.747	48	200	200	DWC	50	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.23		0.17	1.82	1.27
476	KRRDMH3A.9	SKNLRDM9.5	1	1	C		40		478.00	1.443	1.720	6.13	73.22	2.25	1.907	0.000	1.907	50	200	200	DWC	-144	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.08	0.00	0.17		0.09	1.27	1.63
477	SKNLRDM9.5	SKNLRDM9.6	2	1	J		20		11872.08	1.720	2.153	3.06	1818.62	2.25	47.360	0.000	47.360	246	342	400	hdpe	-46	1000	0.010	0.61	56.49	0.84	1.12	0.70	OK	0.69	OK	0.02	0.00	-0.78	-0.78	-0.80	2.50	2.95
478	SKNLRDM9.6	KRBRRDM9	1	1	C		30		11902.08	2.153	2.546	4.60	1823.21	2.25	47.479	0.000	47.479	246	342	400	hdpe	-76	1000	0.010	0.61	56.49	0.84	1.12	0.70	OK	0.69	OK	0.03	0.00	-0.80		-0.83	2.95	3.38
479	1CRRDM2	1CRRDM1	0	1	H		30		30.00	3.942	4.225	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-106	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.84		2.67	1.10	1.56
480	1CRRDM1	KRRDM18	1	1	C		23		53.00	4.225	4.483	3.52	8.12	2.25	0.211	0.000	0.211	17	200	200	DWC	-89	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.67		2.54	1.56	1.94
481	KRRDM18	KRRDM17	1	1	C		30		83.00	4.483	4.254	4.60	12.71	2.25	0.331	0.000	0.331	21	200	200	DWC	131	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.54		2.37	1.94	1.88
482	KRRDM17.3	KRRDM17.2	0	1	H		22		22.00	4.204	4.220	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	-1375	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.10		2.98	1.10	1.24
483	KRRDM17.2	KRRDM17.1	1	1	C		8		30.00	4.220	4.259	1.23	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-205	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	2.98		2.94	1.24	1.32
484	KRRDM17.1	KRRDM17	1	1	C		30		60.00	4.259	4.254	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	6000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.94		2.77	1.32	1.48
485	KRRDM17	KRRDM16	2	1	J		30		173.00	4.254	4.132	4.60	26.50	2.25	0.690	0.000	0.690	30	200	200	DWC	246	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.37	2.37	2.31	1.88	1.82
486	KRRDM16.4	KRRDM16.3	0	1	H		28		28.00	2.863	3.233	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	-76	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.76		1.60	1.10	1.63
487	KRRDM16.3	KRRDM16.2	1	1	C		30		58.00	3.233	3.574	4.60	8.88	2.25	0.231	0.000	0.231	18	200	200	DWC	-88	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.60		1.43	1.63	2.14
488	KRRDM16.2	KRRDM16.1	1	1	C		30		88.00	3.574	3.926	4.60	13.48	2.25	0.351	0.000	0.351	22	200	200	DWC	-85	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.43		1.26	2.14	2.67
489	KRRDM16.1	KRRDM16	1	1	C		30		118.00	3.926	4.132	4.60	18.08	2.25	0.471	0.000	0.471	25	200	200	DWC	-146	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.26		1.17	2.67	2.96
490	KRRDM16	KRRDM15	2	1	J		30		321.00	4.132	3.980	4.60	49.17	2.25	1.281	0.000	1.281	41	200	200	DWC	197	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.17	1.17	1.11	2.96	2.87
491	KRRDM15.3	KRRDM15.2	0	1	H		20		20.00	3.664	3.717	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	-377	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.56		2.45	1.10	1.27
492	KRRDM15.2	KRRDM15.1	1	1	C		9		29.00	3.717	3.879	1.38	4.44	2.25	0.116	0.000	0.116	13	200	200	DWC	-56	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.05	0.00	2.45		2.40	1.27	1.48
493	KRRDM15.1	KRRDM15	1	1	C		30		59.00	3.879	3.980	4.60	9.04	2.25	0.235	0.000	0.235	18	200	200	DWC	-297	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.40		2.23	1.48	1.75
494	KRRDM15	KRRDM14	2	1	J		30		410.00	3.980	3.483	4.60	62.81	2.25	1.636	0.000	1.636	46	200	200	DWC	60	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.11	1.11	1.05	2.87	2.43
495	5CRM4	5CRM3	0	1	H		24		24.00	3.022	3.090	3.68	3.68	2.25	0.096	0.000	0.096	12	200	200	DWC	-353	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.92		1.79	1.10	1.30
496	5CRM3	5CRM2	1	1	C		30		54.00	3.090	3.155	4.60	8.27	2.25	0.215	0.000	0.215	17	200	200	DWC	-462	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.79		1.62	1.30	1.54
497	5CRM2	5CRM1	1	1	C		30		84.00	3.155	3.263	4.60	12.87	2.25	0.335	0.000	0.335	21	200	200	DWC	-278	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.62		1.45	1.54	1.81
498	5CRM1	KRRDM14	1	1	C		30		114.00	3.263	3.483	4.60	17.46	2.25	0.455	0.000	0.455	25	200	200	DWC	-136	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.45		1.36	1.81	2.12
499	KRRDM14	KRRDM13	2	1	J		30		554.00	3.483	3.019	4.60	84.86	2.25	2.210	0.000	2.210	54	200	200	DWC	65	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	1.05	1.05	0.99	2.43	2.03
500	KRRDM13.3	KRRDM13.2	0	1	H		16		15.96	3.012	2.978	2.44	2.44	2.25	0.064	0.000	0.064	10	200	200	DWC	469	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.91		1.82	1.10	1.16
501	KRRDM13.2	KRRDM13.1	1	1	C		16		31.96	2.978	2.869	2.45	4.90	2.25	0.127	0.000	0.127	13	200	200	DWC	147	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.82		1.73	1.16	1.14
502	KRRDM13.1	KRRDM13	1	1	C		26		57.96	2.869	3.019	3.98	8.88	2.25	0.231	0.000	0.231	18	200	200	DWC	-173	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.73		1.59	1.14	1.43
503	KRRDM13	KRRDM12	2	1	J		30		641.96	3.019	2.572	4.60	98.34	2.25	2.561	0.000	2.561	58	200	200	DWC	67	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	0.99	0.99	0.93	2.03	1.64
504	KRRDM12	KRSKLNRDM11	1	1	C		28		670.00	2.572	2.269	4.30	102.63	2.25	2.673	0.000	2.673	59	200	200	DWC	93	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.05	0.00	0.93		0.88	1.64	1.39
505	SKLNRDM10	SKLNRDM11	0	1	H		25		25.00	2.230	2.256	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	-962	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.13		0.99	1.10	1.27
506	SKLNRDM11	KRSKLNRDM11	1	1	C		30		55.00	2.256	2.269	4.60	8.43	2.25	0.219	0.000	0.219	17	200	200	DWC	-2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.99		0.82	1.27	1.45
507	KRSKLNRDM11	KRRDM10	2	1	J		30		755.00	2.269	2.307	4.60	115.65	2.25	3.012	0.000	3.012	62	200	200	DWC	-789	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	0.82	0.82	0.76	1.45	1.55
508	KRRDM10	KRBRRDM9	1	1	C		30		785.00	2.307	2.546	4.60	120.25	2.25	3.132	0.000	3.132	64	200	200	DWC	-126	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	0.76		0.70	1.55	1.85
509	KRBRRDM9	BRLNRDM1	2	1	J		24		12711.08	2.546	2.055	3.68	1947.14	2.25	50.707	0.000	50.707	255	342	400	hdpe	49	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.02	0.00	-0.83	-0.83	-0.85	3.38	2.91
510	BRLNRDM1	BRLNRDM2	1	1	C		30		12741.08	2.055	2.083	4.60	1951.73	2.25	50.826	0.000	50.826	255	342	400	hdpe	-1071	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.03	0.00	-0.85		-0.88	2.91	2.96
511	BRLNRDM2	BRLNRDM3	1	1	C		12		12753.08	2.083	1.767	1.84	1953.57	2.25	50.874	0.000	50.874	255	342	400	hdpe	38	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.01	0.00	-0.88		-0.89	2.96	2.66
512	BRLNRDM3	BRLNRDM4	1	1	C		30		12783.08	1.767	1.790	4.60	1958.17	2.25	50.994	0.000	50.994	255	342	400	hdpe	-1304	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.03	0.00	-0.89		-0.92	2.66	2.71
513	BRLNRDM4	BRLNRDM5	1	1	C		18		12801.08	1.790	1.985	2.76	1960.93	2.25	51.066	0.000	51.066	256	342	400	hdpe	-92	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.02	0.00	-0.92		-0.94	2.71	2.93
514	BRLNRDM5	BRLNRDM6	1	1	C		27		12827.58	1.985	2.301	4.06	1964.98	2.25	51.171	0.000	51.171	256	342	400	hdpe	-84	1000	0.010	0.61	56.49	0.91	1.13	0.75	OK	0.69	OK	0.03	0.00	-0.94		-0.97	2.93	3.27
515	BRLNRDM6	BSRDM30.5A	1	1	C		30		12857.45	2.301	2.777	4.58	1969.56	2.25	51.291	0.000	51.291	256	342	400	hdpe	-63	1000	0.010	0.61	56.49	0.91	1.13	0.75	OK	0.69	OK	0.03	0.00	-0.97		-1.00	3.27	3.78
516	CMRDM1A	CMRDM2A	0	1	H		30		30.00	3.194	2.880	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	96	96	0.010	1.39	43.60	0.00	0.30	0.07	OK	0.42	OK	0.31	0.00	2.09		1.78	1.10	1.10

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
517	CMRDM2A	CMRDM3A	1	1	C		20.76		50.76	2.880	2.273	3.18	7.78	2.25	0.202	0.000	0.202	17	200	200	DWC	34	34	0.010	2.33	73.27	0.00	0.30	0.07	OK	0.70	OK	0.61	0.00	1.78		1.17	1.10	1.10
518	CMRDM3.1A	CMRDM3A	0	1	H		29.6		29.60	2.684	2.273	4.53	4.53	2.25	0.118	0.000	0.118	13	200	200	DWC	72	72	0.010	1.60	50.35	0.00	0.30	0.07	OK	0.48	OK	0.41	0.00	1.58		1.17	1.10	1.10
519	CMRDM3A	CMRDM4A	2	1	J		30		110.36	2.684	2.342	4.60	16.91	2.25	0.440	0.000	0.440	24	200	200	DWC	88	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.17	1.17	1.08	1.51	1.26
520	CMRDM4A	CMRDM5A	1	1	C		12.94		123.30	2.342	2.253	1.98	18.89	2.25	0.492	0.000	0.492	26	200	200	DWC	145	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	1.08		1.04	1.26	1.21
521	CMRDM5A	CMRDM6A	1	1	C		30		153.30	2.253	2.247	4.60	23.48	2.25	0.612	0.000	0.612	28	200	200	DWC	5000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.04		0.97	1.21	1.28
522	CMRDM6A	CMRDM7A	1	1	C		30		183.30	2.247	2.127	4.60	28.08	2.25	0.731	0.000	0.731	31	200	200	DWC	250	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.97		0.91	1.28	1.22
523	CMRDM7A	CMRDM8A	1	1	C		8.97		192.27	2.127	2.040	1.37	29.45	2.25	0.767	0.000	0.767	32	200	200	DWC	103	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.02	0.00	0.91		0.89	1.22	1.15
524	PDRDM95.1	PDRDM95.2	0	1	H		29.96		29.96	2.800	2.600	4.59	4.59	2.25	0.120	0.000	0.120	13	200	200	DWC	150	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.20	0.00	1.70		1.50	1.10	1.10
525	PDRDM95.2	PDRDM95.3	1	1	C		12.51		42.47	2.600	2.400	1.92	6.51	2.25	0.169	0.000	0.169	15	200	200	DWC	63	63	0.010	1.71	53.82	0.00	0.30	0.07	OK	0.51	OK	0.20	0.00	1.50		1.30	1.10	1.10
526	PDRDM95.3	PDRDM95.4	1	1	C		22.69		65.16	2.400	2.200	3.48	9.98	2.25	0.260	0.000	0.260	19	200	200	DWC	113	113	0.010	1.28	40.19	0.01	0.30	0.07	OK	0.38	OK	0.20	0.00	1.30		1.10	1.10	1.10
527	PDRDM95.4	CMRDM8A	1	1	C		33.62		98.78	2.200	2.040	5.15	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	210	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	1.10		0.91	1.10	1.13
528	CMRDM8A	CMRDM9A	2	1	J		30		321.05	2.038	1.954	4.60	49.18	2.25	1.281	0.000	1.281	41	200	200	DWC	357	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.89	0.89	0.83	1.15	1.12
529	CMRDM9A	CMRDM10A	1	1	C		16.48		337.53	1.954	1.934	2.52	51.70	2.25	1.346	0.000	1.346	42	200	200	DWC	824	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	0.83		0.80	1.12	1.13
530	CMRDM10.2	CMRDM10.1	0	1	H		22.7		22.70	2.124	2.029	3.48	3.48	2.25	0.091	0.000	0.091	11	200	200	DWC	239	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.02		0.89	1.10	1.14
531	CMRDM10.1	CMRDM10A	1	1	C		20.44		43.14	2.029	1.934	3.13	6.61	2.25	0.172	0.000	0.172	15	200	200	DWC	215	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.89		0.78	1.14	1.15
532	CMRDM10A	CMRDM11A	2	1	J		13.08		393.75	1.977	2.053	2.00	60.32	2.25	1.571	0.000	1.571	45	200	200	DWC	-172	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	0.78	0.78	0.75	1.20	1.30
533	CMRDM11A	CMRDM12A	1	1	C		16.5		410.25	2.053	2.053	2.53	62.84	2.25	1.637	0.000	1.637	46	200	200	DWC	0	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	0.75		0.72	1.30	1.33
534	CMRDM12A	CMRDM13A	1	1	C		12.59		422.84	2.053	1.940	1.93	64.77	2.25	1.687	0.000	1.687	47	200	200	DWC	111	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.02	0.00	0.72		0.70	1.33	1.24
535	CMRDM13A	CMRDM14A	1	1	C		20		442.84	1.940	1.846	3.06	67.84	2.25	1.767	0.000	1.767	48	200	200	DWC	213	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	0.70		0.66	1.24	1.19
536	CMRDM14A	CMPYRDM15A	1	1	C		13.08		455.92	1.846	1.860	2.00	69.84	2.25	1.819	0.000	1.819	49	200	200	DWC	-934	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.03	0.00	0.66		0.63	1.19	1.23
537	PYRDM2.1	PYRDM2.2	0	1	H		19.68		19.68	3.212	3.211	3.01	3.01	2.25	0.079	0.000	0.079	11	200	200	DWC	19680	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.11		2.00	1.10	1.21
538	PYRDM2.2	PYRDM2.3	1	1	C		17.05		36.73	3.211	3.210	2.61	5.63	2.25	0.147	0.000	0.147	14	200	200	DWC	17050	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.00		1.91	1.21	1.30
539	PYRDM2.3	PYRDM2.4	1	1	C		17.01		53.74	3.210	3.209	2.61	8.23	2.25	0.214	0.000	0.214	17	200	200	DWC	17010	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	1.91		1.82	1.30	1.39
540	PDRDM85.1	PDRDM85.2	0	1	H		15.3		15.30	3.552	3.438	2.34	2.34	2.25	0.061	0.000	0.061	9	200	200	DWC	134	133	0.010	1.18	37.04	0.00	0.30	0.07	OK	0.35	OK	0.12	0.00	2.45		2.33	1.10	1.11
541	PDRDM85.2	PYRDM2.4	1	1	C		32.51		47.81	3.438	3.210	4.98	7.32	2.25	0.191	0.000	0.191	16	200	200	DWC	143	143	0.010	1.13	35.73	0.01	0.30	0.07	OK	0.34	OK	0.23	0.00	2.33		2.10	1.11	1.11
542	PYRDM2.4	PYRDM2.5	2	1	J		18.09		119.64	3.210	2.979	2.77	18.33	2.25	0.477	0.000	0.477	25	200	200	DWC	78	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.82	1.82	1.76	1.39	1.22
543	PYRDM2.5	PYRDM2	1	1	C		13.56		133.20	2.979	2.750	2.08	20.40	2.25	0.531	0.000	0.531	27	200	200	DWC	59	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.11	0.00	1.76		1.65	1.22	1.10
544	PYRDM1	PYRDM2	0	1	H		30		30.00	3.101	2.750	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	85	85	0.010	1.47	46.34	0.00	0.30	0.07	OK	0.44	OK	0.35	0.00	2.00		1.65	1.10	1.10
545	PYRDM2	PYRDM2.6	2	1	J		33.94		197.14	2.750	2.530	5.20	30.20	2.25	0.786	0.000	0.786	32	200	200	DWC	154	155	0.010	1.09	34.32	0.02	0.40	0.10	OK	0.44	OK	0.22	0.00	1.65	1.65	1.43	1.10	1.10
546	PYRDM2.6	PYRDM2.7	1	1	C		29.4		226.54	2.530	2.303	4.50	34.70	2.25	0.904	0.000	0.904	34	200	200	DWC	130	130	0.010	1.19	37.47	0.02	0.40	0.10	OK	0.48	OK	0.23	0.00	1.43		1.20	1.10	1.10
547	PYRDM2.7	PYRDM2.8	1	1	C		28.21		254.75	2.303	2.180	4.32	39.02	2.25	1.016	0.000	1.016	36	200	200	DWC	229	230	0.010	0.89	28.17	0.04	0.51	0.15	OK	0.46	OK	0.12	0.00	1.20		1.08	1.10	1.10
548	PYRDM2.8	PYRDM2.9	1	1	C		15.77		270.52	2.180	2.020	2.42	41.44	2.25	1.079	0.000	1.079	38	200	200	DWC	99	100	0.010	1.36	42.72	0.03	0.46	0.13	OK	0.62	OK	0.16	0.00	1.08		0.92	1.10	1.10
549	PYRDM2.9	CMPYRDM15A	1	1	C		18.18		288.70	2.020	1.860	2.78	44.22	2.25	1.152	0.000	1.152	39	200	200	DWC	114	115	0.010	1.27	39.84	0.03	0.46	0.13	OK	0.58	OK	0.16	0.00	0.92		0.76	1.10	1.10
550	CMPYRDM15A	CMRDM16A	2	1	J		7.01		751.63	1.855	1.884	1.07	115.14	2.25	2.998	0.000	2.998	62	200	200	DWC	-242	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.01	0.00	0.63	0.63	0.62	1.23	1.26
551	CMRDM16A	CMRDM17A	1	1	C		18.97		770.60	1.884	1.997	2.91	118.04	2.25	3.074	0.000	3.074	63	200	200	DWC	-168	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	0.62		0.58	1.26	1.42
552	CMRDM17.2	CMRDM17.1	0	1	H		16.31		16.31	2.121	2.059	2.50	2.50	2.25	0.065	0.000	0.065	10	200	200	DWC	263	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.02		0.93	1.10	1.13
553	CMRDM17.1	CMRDM17A	1	1	C		13.2		29.51	2.059	1.997	2.02	4.52	2.25	0.118	0.000	0.118	13	200	200	DWC	213	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.93		0.86	1.13	1.14
554	CMRDM17A	CMRDM18A	2	1	J		30		830.11	1.997	2.065	4.60	127.16	2.25	3.311	0.000	3.311	65	200	200	DWC	-441	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.58	0.58	0.52	1.42	1.55
555	CMRDM18A	CMRDM19A	1	1	C		15		845.11	2.065	2.232	2.30	129.46	2.25	3.371	0.000	3.371	66	200	200	DWC	-90	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.03	0.00	0.52		0.49	1.55	1.74
556	CMRDM19A	PYRDM3	1	1	C		20.8		865.91	2.232	2.399	3.19	132.64	2.25	3.454	0.000	3.454	67	200	200	DWC	-125	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	0.49		0.45	1.74	1.95
557	CPLNRDM1	CPLNRDM2	0	1	H		32.63		32.63	3.684	3.555	5.00	5.00	2.25	0.130	0.000	0.130	13	200	200	DWC	253	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	2.58		2.40	1.10	1.16
558	CPLNRDM2	CPLNRDM3	1	1	C		18.61		51.24	3.555	3.479	2.85	7.85	2.25	0.204	0.000	0.204	17	200	200	DWC	245	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.40		2.30	1.16	1.18
559	CPLNRDM3	CPLN-VLNRDM4	1	1	C		18.85		70.09	3.479	3.404	2.89	10.74	2.25	0.280	0.000	0.280	19	200	200	DWC	251	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.30		2.20	1.18	1.20
560	CPLN-VLNRDM4	VLNRDM3	1	1	C		36.36		106.45	3.404	3.152	5.57	16.31	2.25	0.425	0.000	0.425	24	200	200	DWC	144	240	0.010	0.88	27.58	0.02	0.40	0.10	OK	0.35	OK	0.15	0.00	2.20		2.05	1.20	1.10
561	VLNRDM3.2	VLNRDM3.1	0	1	H		17.54		17.54	3.322	3.237	2.69	2.69	2.25	0.070	0.000	0.070	10	200	200	DWC	206	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.22		2.12	1.10	1.12
562	VLNRDM3.1	VLNRDM3	1	1	C		27.7		45.24	3.237	3.152	4.24	6.93	2.25	0.180	0.000	0.180	16	200	200	DWC	326	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.16	0.00	2.12		1.96	1.12	1.19
563	VLNRDM3	VLNRDM2	2	1	J		24.42		176.11	3.152	2.901	3.74	26.98	2.25	0.703	0.000	0.703	30	200	200	DWC	97	145	0.010	1.13	35.48	0.02	0.40	0.10	OK	0.45	OK	0.17	0.00	1.96	1.96	1.79	1.19	1.11
564	VLNRDM2	VLNRDM1	1	1	C		24.66		200.77	2.901	2.650	3.78	30.75	2.25	0.801	0.000	0.801	32	200	200	DWC	98	98	0.010	1.37	43.16	0.02	0.40	0.10	OK	0.55	OK	0.25	0.00	1.79		1.54	1.11	1.11
565	VLNRDM1	PYRDM3	1	1	C		23.2		223.97	2.650	2.399	3.55	34.31	2.25	0.893	0.000	0.893	34	200	200	DWC	92	92	0.010	1.41	44.54	0.02	0.40	0.10	OK	0.57	OK	0.25	0.00	1.54		1.29	1.11	1.11
566	PYRDM3	PYRDM4	2	1	J		40.24		1130.12	2.399	2.738	6.16	173.12	2.25	4.508	0.000	4.508	76	200	200	DWC	-119	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.08	0.00	0.45	0.45	0.37	1.95	2.37
567	PYRDM4.3	PYRDM4.4	0	1	H		10.65		10.65	3.723	3.665	1.63	1.63	2.25	0.042	0.000	0.042	8	200	200	DWC	184	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.62		2.56	1.10	1.11
568	PYRDM4.4	PYRDM4.5	1	1	C		14.92		25.57	3.665	3.608	2.29	3.92	2.25	0.102	0.000	0.102	12	200	200	DWC	262	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.56		2.48	1.11	1.13
569	PYRDM4.6	PYRDM4.5	0	1	H		23.71		23.71	3.894	3.610	3.63	3.63	2.25	0.095	0.000	0.095	11	200	200	DWC	83	85	0.010	1.47	46.34	0.00	0.30	0.07	OK	0.44	OK	0.28	0.00	2.79		2.51	1.10	1.10
570	PYRDM4.5	PYRDM4.2	2	1	J		19.5		68.78	3.610	3.318	2.99	10.54	2.25	0.274	0.000	0.274	19	200	200	DWC	67	72	0.010	1.60	50.35	0.01	0.30	0.07	OK	0.48	OK	0.27	0.00	2.48	2.48	2.21	1.13	1.11
571	PYRDM4.2	PYRDM4.1	1	1	C		24.51		93.29	3.318	3.028	3.75	14.29	2.25	0.372	0.000	0.372	22	200	200	DWC	85	86	0.010	1.46	46.07	0.01	0.30	0.07	OK	0.44	OK	0.29	0.00	2.21		1.92	1.11	1.11
572	PYRDM4.1	PYRDM4	1	1	C		30		123.29	3.028	2.740	4.60	18.89	2.25	0.492	0.000	0.492	26	200	200	DWC	104	105	0.010	1.32	41.69	0.01	0.30	0.07	OK	0.40	OK	0.29	0.00	1.92		1.63	1.11	1.11
573	PYRDM4	PYRDM5	2	1	J		34.09		1287.50	2.740	2.950	5.22	197.22	2.25	5.136	0.000	5.136	81	200	200	DWC	-162	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.07	0.00	0.37	0.37	0.30	2.37	2.65
574	PYRDM5	PYRDM6	1	1	C		30		1317.50	2.950	3.040	4.60	201.82	2.25	5.256	0.000	5.256	82	200	200	DWC	-333	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.06	0.00	0.30		0.24	2.65	2.80
575	PYRDM6	AHKRDMH13	1	1	C		30		1347.50	3.040	**2.991**	4.60	206.42	2.25	5.375	0.000	5.375	83	200	200	DWC	612	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.06	0.00	0.24		0.18	2.80	2.81
576	AHKRDMH27	AHKRDMH26	0	1	H		32		32.00	4.211	4.211	4.90	4.90	2.25	0.128	0.000	0.128	13	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	3.11		2.93	1.10	1.28
577	AHKRDMH26	AHKRDMH25	1	1	C		46		78.00	4.211	4.094	7.05	11.95	2.25	0.311	0.000	0.311	20	200	200	DWC	393	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.26	0.00	2.93		2.67	1.28	1.42
578	ASKRDM13.3	ASKRDM13.2	0	1	H		25		25.00	4.421	4.327	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	266	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.32		3.18	1.10	1.15
579	ASKRDM13.2	ASKRDM13.1	1	1	C		33		58.00	4.327	4.210	5.06	8.88	2.25	0.231	0.000	0.231	18	200	200	DWC	282	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	3.18		3.00	1.15	1.21
580	ASKRDM13.1	AHKRDMH25	1	1	C		32		90.00	4.210	4.094	4.90	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	276	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	3.00		2.82	1.21	1.27
581	AHKRDMH25	AHKRDMH24	2	1	J		28		196.00	4.094	3.923	4.29	30.02	2.25	0.782	0.000	0.782	32	200	200	DWC	164	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.67	2.67	2.62	1.42	1.30
582	AHKRDMH24	AHKRDMH23	1	1	C		30		226.00	3.923	3.825	4.60	34.62	2.25	0.902	0.000	0.902	34	200	200	DWC	306	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.62		2.56	1.30	1.27
583	AHKRDMH23	AHKRDMH22	1	1	C		25		251.00	3.825	3.728	3.83	38.45	2.25	1.001	0.000	1.001	36	200	200	DWC	258	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.56		2.51	1.27	1.22
584	AHKRDMH22	AHKRDMH21	1	1	C		14		265.00	3.728	3.682	2.14	40.59	2.25	1.057	0.000	1.057	37	200	200	DWC	304	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	2.51		2.48	1.22	1.20
585	7THARDMH1	7THARDMH2	0	1	H		25		25.00	3.440	3.339	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	248	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.34		2.20	1.10	1.14
586	7THARDMH2	7THARDMH3	1	1	C		18		43.00	3.339	3.374	2.76	6.59	2.25	0.172	0.000	0.172	15	200	200	DWC	-514	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.20		2.10	1.14	1.27
587	7THARDMH3	7THARDMH4	1	1	C		17		60.00	3.374	3.409	2.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-486	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.10		2.01	1.27	1.40
588	7THARDMH4	7THARDMH5	1	1	C		8		68.00	3.409	3.454	1.23	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	-178	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	2.01		1.97	1.40	1.48
589	7THARDMH5	7THARDMH6	1	1	C		30		98.00	3.454	3.746	4.60	15.01	2.25	0.391	0.000	0.391	23	200	200	DWC	-103	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.97		1.80	1.48	1.95
590	7THARDMH6	7THARDMH7	1	1	C		19		117.00	3.746	3.837	2.91	17.92	2.25	0.467	0.000	0.467	25	200	200	DWC	-209	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.80		1.74	1.95	2.10

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
591	7THARDMH7	7THARDMH8	1	1	C		20		137.00	3.837	3.929	3.06	20.99	2.25	0.547	0.000	0.547	27	200	200	DWC	-217	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	1.74		1.69	2.10	2.24
592	7THARDMH8	AHKRDMH21	1	1	C		30		167.00	3.929	3.693	4.60	25.58	2.25	0.666	0.000	0.666	30	200	200	DWC	127	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.69		1.62	2.24	2.07
593	AHKRDMH21	AHKRDMH20	2	1	J		7		439.00	3.693	3.693	1.07	67.25	2.25	1.751	0.000	1.751	48	200	200	DWC	0	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.01	0.00	1.62	1.620	1.61	2.07	2.08
594	AHKRDMH20.1	AHKRDMH20.2	0	1	H		30		30.00	3.413	3.555	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-211	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.31		2.14	1.10	1.42
595	AHKRDMH20.2	AHKRDMH20.3	1	1	C		30		60.00	3.555	3.631	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-395	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.14		1.97	1.42	1.66
596	AHKRDMH20.3	AHKRDMH20	1	1	C		30		90.00	3.631	3.601	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	1000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.97		1.80	1.66	1.80
597	AHKRDMH20	AHKRDMH19	2	1	J		25		554.00	3.693	3.470	3.83	84.86	2.25	2.210	0.000	2.210	54	200	200	DWC	112	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.05	0.00	1.61	1.610	1.56	2.08	1.91
598	AHKRDMH19	AHKRDMH18	1	1	C		16		570.00	3.470	3.377	2.45	87.32	2.25	2.274	0.000	2.274	54	200	200	DWC	172	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.03	0.00	1.56		1.53	1.91	1.85
599	AHKRDMH18.1	AHKRDMH18	0	1	H		30		30.00	3.544	3.377	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	180	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.44		2.27	1.10	1.11
600	AHKRDMH18	AHKRDMH17	2	1	J		10		610.00	3.377	3.290	1.53	93.44	2.25	2.433	0.000	2.433	56	200	200	DWC	115	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.02	0.00	1.53	1.530	1.51	1.85	1.78
601	AHKRDMH17	AHKRDMH16	1	1	C		24		634.00	3.290	3.158	3.68	97.12	2.25	2.529	0.000	2.529	57	200	200	DWC	182	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	1.51		1.46	1.78	1.70
602	AHKRDMH16	AHKRDMH15	1	1	C		8		642.00	3.158	3.101	1.23	98.34	2.25	2.561	0.000	2.561	58	200	200	DWC	140	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.02	0.00	1.46		1.44	1.70	1.66
603	AHKRDMH15.1	AHKRDMH15	0	1	H		25		25.00	3.101	3.301	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	-125	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.00		1.86	1.10	1.44
604	AHKRDMH15	AHKRDMH14	2	1	J		15		682.00	3.301	2.998	2.30	104.47	2.25	2.721	0.000	2.721	59	200	200	DWC	50	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.03	0.00	1.44	1.440	1.41	1.86	1.59
605	AHKRDMH14	AHKRDMH13	1	1	C		20		702.00	2.998	2.991	3.06	107.54	2.25	2.800	0.000	2.800	60	200	200	DWC	2857	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	1.41		1.37	1.59	1.62
606	AHKRDMH13	AHKRDMH12	2	1	J		19		2068.50	2.991	3.143	2.91	316.86	2.25	8.252	0.000	8.252	103	200	200	DWC	-125	520	0.010	0.60	18.73	0.44	0.98	0.47	OK	0.58	OK	0.04	0.00	0.18	0.180	0.14	2.81	3.00
607	FRMRDMH5	FRMRDMH6	0	1	H		17		17.00	3.790	3.756	2.60	2.60	2.25	0.068	0.000	0.068	10	200	200	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.69		2.60	1.10	1.16
608	FRMRDMH6.1	FRMRDMH6	0	1	H		30		30.00	3.940	3.756	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	163	163	0.010	1.06	33.46	0.00	0.30	0.07	OK	0.32	OK	0.18	0.00	2.84		2.66	1.10	1.10
609	FRMRDMH6	FRMRDMH7	2	1	J		30		77.00	3.756	3.749	4.60	11.80	2.25	0.307	0.000	0.307	20	200	200	DWC	4286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.60	2.600	2.43	1.16	1.32
610	FRMRDMH7.2	FRMRDMH7.1	0	1	H		30		30.00	3.620	3.684	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-469	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.52		2.35	1.10	1.33
611	FRMRDMH7.1	FRMRDMH7	1	1	C		30		60.00	3.684	3.749	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-462	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.35		2.18	1.33	1.57
612	FRMRDMH7	FRMRDMH8	2	1	J		30		167.00	3.749	3.662	4.60	25.58	2.25	0.666	0.000	0.666	30	200	200	DWC	345	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.18	2.180	2.11	1.57	1.55
613	FRMRDMH8	FRMRDMH9	1	1	C		30		197.00	3.662	3.545	4.60	30.18	2.25	0.786	0.000	0.786	32	200	200	DWC	256	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.11		2.05	1.55	1.50
614	FRMRDMH9	FRMRDMH10	1	1	C		30		227.00	3.545	3.458	4.60	34.77	2.25	0.906	0.000	0.906	34	200	200	DWC	345	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.05		1.99	1.50	1.47
615	FRMRDMH10	FRMRDMH11	1	1	C		30		257.00	3.458	3.350	4.60	39.37	2.25	1.025	0.000	1.025	37	200	200	DWC	278	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.99		1.93	1.47	1.42
616	FRMRDMH11	ASKRDM28	1	1	C		22		279.00	3.350	**3.281**	3.37	42.74	2.25	1.113	0.000	1.113	38	200	200	DWC	319	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.93		1.89	1.42	1.39
617	ASKRDM29	ASKRDM28	0	1	H		30		30.00	3.293	**3.281**	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	2500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.19		2.02	1.10	1.26
618	ASKRDM28	ASKRDM27	2	1	J		30		339.00	3.281	**3.281**	4.60	51.93	2.25	1.352	0.000	1.352	42	200	200	DWC	0	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.89	1.890	1.83	1.39	1.45
619	ASKRDM27	AHKRDM12	1	1	C		24		363.00	3.375	**3.143**	3.68	55.61	2.25	1.448	0.000	1.448	43	200	200	DWC	103	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	1.83		1.78	1.55	1.36
620	AHKRDMH12	LBRDMH8	2	1	J		21		2452.50	3.143	3.254	3.22	375.68	2.25	9.783	0.000	9.783	112	200	200	DWC	-189	520	0.010	0.60	18.73	0.52	1.01	0.52	OK	0.60	OK	0.04	0.00	0.14	0.140	0.10	3.00	3.15
621	LBRDMH8	LBRDMH7	1	1	C		17		2469.50	3.254	3.365	2.60	378.29	2.25	9.851	0.000	9.851	113	200	200	DWC	-153	520	0.010	0.60	18.73	0.53	1.02	0.52	OK	0.61	OK	0.03	0.00	0.10		0.07	3.15	3.30
622	LBRDMH7.2	LBRDMH7.3	0	1	H		17		17.00	3.501	3.432	2.60	2.60	2.25	0.068	0.000	0.068	10	200	200	DWC	246	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.40		2.31	1.10	1.12
623	LBRDMH7.3	LBRDMH7	1	1	C		17		34.00	3.432	3.365	2.60	5.21	2.25	0.136	0.000	0.136	14	200	200	DWC	254	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.31		2.22	1.12	1.15
624	LBRDMH7	LBRDMH6	2	1	J		28		2531.50	3.365	3.423	4.29	387.79	2.25	10.099	0.000	10.099	114	200	200	DWC	-483	520	0.010	0.60	18.73	0.54	1.02	0.53	OK	0.61	OK	0.05	0.00	0.07	0.070	0.02	3.30	3.40
625	LBRDMH6	LBRDMH5	1	1	C		29		2560.50	3.423	3.429	4.44	392.23	2.25	10.214	0.000	10.214	115	200	200	DWC	-4833	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.06	0.00	0.02		-0.04	3.40	3.47
626	LBRDMH5	LBRDMH4	1	1	C		21		2581.50	3.429	3.460	3.22	395.45	2.25	10.298	0.000	10.298	115	200	200	DWC	-677	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.04	0.00	-0.04		-0.08	3.47	3.54
627	LBRDMH4	LBRDMH3	1	1	C		28		2609.50	3.459	3.490	4.29	399.73	2.25	10.410	0.000	10.410	116	200	200	DWC	-903	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.05	0.00	-0.08		-0.13	3.54	3.62
628	LBRDMH3	LBRDMH2	1	1	C		22		2631.50	3.490	3.514	3.37	403.10	2.25	10.498	0.000	10.498	116	200	200	DWC	-917	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.04	0.00	-0.13		-0.17	3.62	3.68
629	LBRDMH2	LBRDMH1	1	1	C		20		2651.50	3.514	3.538	3.06	406.17	2.25	10.577	0.000	10.577	117	200	200	DWC	-833	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.04	0.00	-0.17		-0.21	3.68	3.75
630	LBRDMH1	DPRDMH1	1	1	C		27		2678.50	3.538	3.560	4.14	410.30	2.25	10.685	0.000	10.685	117	200	200	DWC	-1227	520	0.010	0.60	18.73	0.57	1.03	0.54	OK	0.61	OK	0.05	0.00	-0.21		-0.26	3.75	3.82
631	DPRDMH1	DPRDMH2	1	1	C		30		2708.50	3.560	3.550	4.60	414.90	2.25	10.805	0.000	10.805	118	200	200	DWC	3000	520	0.010	0.60	18.73	0.58	1.03	0.55	OK	0.61	OK	0.06	0.00	-0.26		-0.32	3.82	3.87
632	DPRDMH2	DPRDMH3	1	1	C		30		2738.50	3.550	3.534	4.60	419.50	2.25	10.924	0.000	10.924	118	200	200	DWC	1875	520	0.010	0.60	18.73	0.58	1.03	0.55	OK	0.61	OK	0.06	0.00	-0.32		-0.38	3.87	3.91
633	DPRDMH3	DPRDMH4	1	1	C		29		2767.50	3.534	3.480	4.44	423.94	2.25	11.040	0.000	11.040	119	200	200	DWC	537	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.06	0.00	-0.38		-0.44	3.91	3.92
634	DPRDMH4.4	DPRDMH4.3	0	1	H		28		28.00	3.850	3.794	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	2.75		2.59	1.10	1.20
635	DPRDMH4.3	DPRDMH4.2	1	1	C		27		55.00	3.794	3.667	4.14	8.43	2.25	0.219	0.000	0.219	17	200	200	DWC	213	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	2.59		2.44	1.20	1.23
636	DPRDMH4.2	DPRDMH4.1	1	1	C		18		73.00	3.667	3.539	2.76	11.18	2.25	0.291	0.000	0.291	20	200	200	DWC	141	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.44		2.34	1.23	1.20
637	DPRDMH4.1	DPRDMH4	1	1	C		16		89.00	3.539	3.480	2.45	13.63	2.25	0.355	0.000	0.355	22	200	200	DWC	271	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.34		2.25	1.20	1.23
638	DPRDMH4	DPRDMH5	2	1	J		29		2885.50	3.480	3.427	4.44	442.01	2.25	11.511	0.000	11.511	122	200	200	DWC	547	520	0.010	0.60	18.73	0.61	1.05	0.57	OK	0.62	OK	0.06	0.00	-0.44	-0.440	-0.50	3.92	3.93
639	KMLN RDM 1	KMLN RDM 2	0	1	H		26		26.00	4.162	4.014	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	176	176	0.010	1.02	32.20	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	3.06		2.91	1.10	1.10
640	KMLN RDM 2	KMLN RDM 3	1	1	C		26		52.00	4.014	3.599	3.98	7.97	2.25	0.207	0.000	0.207	17	200	200	DWC	63	62	0.010	1.72	54.26	0.00	0.30	0.07	OK	0.52	OK	0.42	0.00	2.91		2.49	1.10	1.11
641	KMLN RDM 3	DPRDMH5	1	1	C		30		82.00	3.599	3.427	4.60	12.56	2.25	0.327	0.000	0.327	21	200	200	DWC	174	174	0.010	1.03	32.39	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.49		2.32	1.11	1.11
642	DPRDMH5	DPRDMH6	2	1	J		33		3000.50	3.427	3.440	5.06	459.63	2.25	11.970	0.000	11.970	124	200	200	DWC	-2538	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.06	0.00	-0.50	-0.500	-0.56	3.93	4.00
643	DPRDMH6	DPRDMH7	1	1	C		26		3026.50	3.440	3.453	3.98	463.61	2.25	12.073	0.000	12.073	125	200	200	DWC	-2000	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.05	0.00	-0.56		-0.61	4.00	4.06
644	DPRDMH7.1	DPRDMH7	0	1	H		30		30.00	3.560	3.453	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	280	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.46		2.29	1.10	1.16
645	DPRDMH7	DPRDMH8	2	1	J		23		3079.50	3.453	3.508	3.52	471.73	2.25	12.285	0.000	12.285	126	200	200	DWC	-418	520	0.010	0.60	18.73	0.66	1.07	0.60	OK	0.64	OK	0.04	0.00	-0.61	-0.610	-0.65	4.06	4.16
646	DPRDMH8	DPRDMH9L	1	0	C	L	30		3109.50	3.508	3.563	4.60	476.33	2.25	12.404	0.000	12.404	126	200	200	DWC	-545	520	0.010	0.60	18.73	0.66	1.07	0.60	OK	0.64	OK	0.06	0.00	-0.65		-0.71	4.16	4.27
647	DPRDMH9	DPRDMH10A	0	1	H		30	3109.50	3139.50	3.563	3.619	4.60	480.92	2.25	12.524	0.000	12.524	127	200	200	DWC	-536	520	0.010	0.60	18.73	0.67	1.07	0.60	OK	0.64	OK	0.06	0.00	2.46		2.40	1.10	1.22
648	DPRDMH10A.1	DPRDMH10A	0	1	H		30		30.00	3.633	3.619	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	2143	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.53		2.36	1.10	1.26
649	DPRDMH10A	DPRDMH10	2	1	J		5		3174.50	3.619	3.609	0.77	486.28	2.25	12.664	0.000	12.664	128	200	200	DWC	500	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.01	0.00	2.36	2.360	2.35	1.26	1.26
650	AHKRDM31.3	AHKRDM31.4	0	1	H		18		18.00	4.162	4.014	2.76	2.76	2.25	0.072	0.000	0.072	10	200	200	DWC	122	122	0.010	1.23	38.68	0.00	0.30	0.07	OK	0.37	OK	0.15	0.00	3.06		2.91	1.10	1.10
651	AHKRDM31.4	AHKRDM31.5	1	1	C		30		48.00	4.014	3.599	4.60	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	72	72	0.010	1.60	50.35	0.00	0.30	0.07	OK	0.48	OK	0.42	0.00	2.91		2.49	1.10	1.11
652	AHKRDM31.5	DPRDMH10	1	1	C		24		72.00	3.599	3.424	3.68	11.03	2.25	0.287	0.000	0.287	20	200	200	DWC	137	137	0.010	1.16	36.50	0.01	0.30	0.07	OK	0.35	OK	0.18	0.00	2.49		2.31	1.11	1.11
653	DPRDMH10	DPRDMH11	2	1	J		25		3271.50	3.424	3.676	3.83	501.14	2.25	13.051	0.000	13.051	129	200	200	DWC	-99	520	0.010	0.60	18.73	0.70	1.08	0.62	OK	0.64	OK	0.05	0.00	2.31	2.310	2.26	1.11	1.42
654	DPRDMH11	DPRDMH12	1	1	C		18		3289.50	3.676	3.674	2.76	503.90	2.25	13.122	0.000	13.122	130	200	200	DWC	9000	520	0.010	0.60	18.73	0.70	1.08	0.62	OK	0.64	OK	0.03	0.00	2.26		2.23	1.42	1.44
655	DPRDMH12	DPRDMH13	1	1	C		18		3307.50	3.674	3.690	2.76	506.66	2.25	13.194	0.000	13.194	130	200	200	DWC	-1125	520	0.010	0.60	18.73	0.70	1.08	0.62	OK	0.64	OK	0.03	0.00	2.23		2.20	1.44	1.49
656	DPRDMH13	DPRDMH14	1	1	C		16		3323.50	3.690	3.722	2.45	509.11	2.25	13.258	0.000	13.258	130	200	200	DWC	-500	520	0.010	0.60	18.73	0.71	1.08	0.63	OK	0.64	OK	0.03	0.00	2.20		2.17	1.49	1.55
657	URDMH1	URDMH2	0	1	H		30		30.00	4.144	4.043	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	297	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.04		2.87	1.10	1.17
658	URDMH2	URDMH3	1	1	C		30		60.00	4.043	3.780	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	114	150	0.010	1.11	34.88	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	2.87		2.67	1.17	1.11
659	URDMH3.1	URDMH3	0	1	H		25		25.00	3.920	3.770	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	167	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	2.82		2.67	1.10	1.10
660	URDMH3	URDMH4	2	1	J		28		113.00	3.770	3.749	4.29	17.31	2.25	0.451	0.000	0.451	24	200	200	DWC	1333	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.67	2.670	2.58	1.10	1.17
661	URDMH4	DPRDMH14	1	1	C		23		136.00	3.749	3.722	3.52	20.83	2.25	0.543	0.000	0.543	27	200	200	DWC	852	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	2.58		2.53	1.17	1.19
662	DPRDMH14	DPRDMH15	2	1	J		20		3479.50	3.722	3.701	3.06	533.01	2.25	13.880	0.000	13.880	133	200	200	DWC	952	520	0.010	0.60	18.73	0.74	1.09	0.64	OK	0.65	OK	0.04	0.00	2.17	2.170	2.13	1.55	1.57
663	DPRDMH15	DPRDMH16	1	1	C		16		3495.50	3.701	3.680	2.45	535.46	2.25	13.944	0.000	13.944	134	200	200	DWC	762	520	0.010	0.60	18.73	0.74	1.09	0.64	OK	0.65	OK	0.03	0.00	2.13		2.10	1.57	1.58
664	DPRDMH16	DPRDMH17	1	1	C		21		3516.50	3.680	3.678	3.22	538.67	2.25	14.028	0.000	14.028	134	200	200	DWC	10500	520	0.010	0.60	18.73	0.75	1.10	0.65	OK	0.65	OK	0.04	0.00	2.10		2.06	1.58	1.62

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
665	DPRDMH17	PMRDMH51	1	1	C		30		3546.50	3.678	3.843	4.60	543.27	2.25	14.148	0.000	14.148	135	200	200	DWC	-182	520	0.010	0.60	18.73	0.76	1.10	0.65	OK	0.65	OK	0.06	0.00	2.06		2.00	1.62	1.84
666	PMRDMH51	PMRDMH52	1	1	C		20		3566.50	3.843	3.864	3.06	546.33	2.25	14.227	0.000	14.227	135	200	200	DWC	-952	520	0.010	0.60	18.73	0.76	1.10	0.65	OK	0.65	OK	0.04	0.00	2.00		1.96	1.84	1.90
667	PMRDMH52	PMRDMH53	1	1	C		25		3591.50	3.864	3.937	3.83	550.16	2.25	14.327	0.000	14.327	136	200	200	DWC	-342	520	0.010	0.60	18.73	0.76	1.10	0.65	OK	0.65	OK	0.05	0.00	1.96		1.91	1.90	2.03
668	PMRDMH53	PMRDMH54	1	1	C		24		3615.50	3.937	4.573	3.68	553.84	2.25	14.423	0.000	14.423	136	200	200	DWC	-38	520	0.010	0.60	18.73	0.77	1.10	0.66	OK	0.65	OK	0.05	0.00	1.91		1.86	2.03	2.71
669	PMRDMH54	PMRDMH55	1	1	C		16		3631.50	4.573	4.380	2.45	556.29	2.25	14.487	0.000	14.487	136	200	200	DWC	83	520	0.010	0.60	18.73	0.77	1.10	0.66	OK	0.65	OK	0.03	0.00	1.86		1.83	2.71	2.55
670	PMRDMH55	PMRDMH56	1	1	C		26		3657.50	4.380	4.149	3.98	560.27	2.25	14.590	0.000	14.590	137	200	200	DWC	113	520	0.010	0.60	18.73	0.78	1.10	0.67	OK	0.65	OK	0.05	0.00	1.83		1.78	2.55	2.37
671	PMRDMH56	AHKRDMH38	1	1	C		9		3666.50	4.149	3.915	1.38	561.65	2.25	14.626	0.000	14.626	137	200	200	DWC	38	520	0.010	0.60	18.73	0.78	1.10	0.67	OK	0.65	OK	0.02	0.00	1.78		1.76	2.37	2.16
672	AHKRDMH28	AHKRDMH29	0	1	H		30		30.00	4.071	4.030	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	732	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.97		2.80	1.10	1.23
673	AHKRDMH29	AHKRDMH30	1	1	C		13		43.00	4.030	3.980	1.99	6.59	2.25	0.172	0.000	0.172	15	200	200	DWC	260	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.80		2.73	1.23	1.25
674	AHKRDMH30	AHKRDMH31	1	1	C		21		64.00	3.980	3.946	3.22	9.80	2.25	0.255	0.000	0.255	19	200	200	DWC	618	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.73		2.61	1.25	1.34
675	AHKRDMH31.2	AHKRDMH31.1	0	1	H		19		19.00	4.350	4.146	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	93	92	0.010	1.41	44.54	0.00	0.30	0.07	OK	0.42	OK	0.21	0.00	3.25		3.04	1.10	1.11
676	AHKRDMH31.1	AHKRDMH31	1	1	C		18		37.00	4.146	3.946	2.76	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	90	90	0.010	1.43	45.03	0.00	0.30	0.07	OK	0.43	OK	0.20	0.00	3.04		2.84	1.11	1.11
677	AHKRDMH31	AHKRDMH32	2	1	J		15		116.00	3.946	3.898	2.30	17.77	2.25	0.463	0.000	0.463	25	200	200	DWC	313	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	2.61	2.610	2.56	1.34	1.34
678	AHKRDMH32	AHKRDMH33	1	1	C		9		125.00	3.898	3.851	1.38	19.15	2.25	0.499	0.000	0.499	26	200	200	DWC	191	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	2.56		2.53	1.34	1.32
679	ASK RDM6.3	ASK RDM6.2	0	1	H		32		32.00	3.630	3.595	4.90	4.90	2.25	0.128	0.000	0.128	13	200	200	DWC	914	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	2.53		2.35	1.10	1.25
680	ASK RDM6.2	ASK RDM6.1	1	1	C		19		51.00	3.595	3.600	2.91	7.81	2.25	0.203	0.000	0.203	17	200	200	DWC	-3800	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.35		2.24	1.25	1.36
681	ASK RDM6.1	AHKRDMH33	1	1	C		35		86.00	3.600	3.851	5.36	13.17	2.25	0.343	0.000	0.343	21	200	200	DWC	-139	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	2.24		2.05	1.36	1.80
682	AHKRDMH33	AHKRDMH34	2	1	J		14		225.00	3.851	4.168	2.14	34.47	2.25	0.898	0.000	0.898	34	200	200	DWC	-44	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	2.05	2.050	2.02	1.80	2.15
683	AHKRDMH34	AHKRDMH35	1	1	C		36		261.00	4.168	4.258	5.51	39.98	2.25	1.041	0.000	1.041	37	200	200	DWC	-400	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.07	0.00	2.02		1.95	2.15	2.31
684	AHKRDMH35.2	AHKRDMH35.1	0	1	H		27		27.00	3.990	4.124	4.14	4.14	2.25	0.108	0.000	0.108	12	200	200	DWC	-201	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.89		2.74	1.10	1.38
685	AHKRDMH35.1	AHKRDMH35	1	1	C		30		57.00	4.124	4.258	4.60	8.73	2.25	0.227	0.000	0.227	18	200	200	DWC	-224	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.74		2.57	1.38	1.69
686	AHKRDMH35	AHKRDMH36	2	1	J		23		341.00	4.258	4.109	3.52	52.24	2.25	1.360	0.000	1.360	42	200	200	DWC	154	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	1.95	1.950	1.91	2.31	2.20
687	AHKRDMH36	AHKRDMH37	1	1	C		22		363.00	4.109	3.960	3.37	55.61	2.25	1.448	0.000	1.448	43	200	200	DWC	148	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	1.91		1.87	2.20	2.09
688	AHKRDMH37	AHKRDMH38	1	1	C		28		391.00	3.960	3.915	4.29	59.90	2.25	1.560	0.000	1.560	45	200	200	DWC	622	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	1.87		1.82	2.09	2.10
689	AHKRDMH38	YKTRDMH30	2	1	J		19		4076.50	3.915	3.954	2.91	624.46	2.25	16.262	0.000	16.262	144	200	200	DWC	-487	520	0.010	0.60	18.73	0.87	1.12	0.72	OK	0.67	OK	0.04	0.00	1.76	1.760	1.72	2.16	2.23
690	YKTRDMH30	YKTRDMH29	1	1	C		21		4097.50	3.954	3.937	3.22	627.67	2.25	16.346	0.000	16.346	145	200	200	DWC	1235	520	0.010	0.60	18.73	0.87	1.12	0.72	OK	0.67	OK	0.04	0.00	1.72		1.68	2.23	2.26
691	KNRDMH1	KNRDMH2	0	1	H		18		18.00	4.000	3.996	2.76	2.76	2.25	0.072	0.000	0.072	10	200	200	DWC	4500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.90		2.80	1.10	1.20
692	KNRDMH2	KNRDMH3	1	1	C		6		24.00	3.996	3.995	0.92	3.68	2.25	0.096	0.000	0.096	12	200	200	DWC	6000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	2.80		2.77	1.20	1.23
693	KNRDMH3	KNRDMH4	1	1	C		20		44.00	3.995	3.925	3.06	6.74	2.25	0.176	0.000	0.176	15	200	200	DWC	286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.77		2.66	1.23	1.27
694	KNRDMH4	YKTRDMH29	1	1	C		18		62.00	3.925	3.937	2.76	9.50	2.25	0.247	0.000	0.247	18	200	200	DWC	-1500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.66		2.56	1.27	1.38
695	YKTRDMH29	YKTRDMH28	2	1	J		38		4197.50	3.937	3.759	5.82	642.99	2.25	16.745	0.000	16.745	147	200	200	DWC	213	520	0.010	0.60	18.73	0.89	1.13	0.74	OK	0.67	OK	0.07	0.00	1.68	1.680	1.61	2.26	2.15
696	YKTRDMH28	YKTRDMH27	1	1	C		17		4214.50	3.759	3.826	2.60	645.60	2.25	16.812	0.000	16.812	147	200	200	DWC	-254	520	0.010	0.60	18.73	0.90	1.13	0.74	OK	0.67	OK	0.03	0.00	1.61		1.58	2.15	2.25
697	YKTRDMH27	YKTRDMH26	1	1	C		18		4232.50	3.830	4.009	2.76	648.35	2.25	16.884	0.000	16.884	147	200	200	DWC	-101	520	0.010	0.60	18.73	0.90	1.13	0.74	OK	0.67	OK	0.03	0.00	1.58		1.55	2.25	2.46
698	YKTRDMH26	YKTRDMH25	1	1	C		17		4249.50	4.009	4.048	2.60	650.96	2.25	16.952	0.000	16.952	147	200	200	DWC	-436	520	0.010	0.60	18.73	0.90	1.13	0.74	OK	0.67	OK	0.03	0.00	1.55		1.52	2.46	2.53
699	YKTRDMH25	YKTRDMH24	1	1	C		21		4270.50	4.048	3.892	3.22	654.17	2.25	17.036	0.000	17.036	148	200	200	DWC	135	520	0.010	0.60	18.73	0.91	1.13	0.75	OK	0.67	OK	0.04	0.00	1.52		1.48	2.53	2.41
700	YKTRDMH24	YKTRDMH23	1	1	C		30		4300.50	3.892	3.765	4.60	658.77	2.25	17.155	0.000	17.155	148	200	200	DWC	236	520	0.010	0.60	18.73	0.92	1.14	0.76	OK	0.68	OK	0.06	0.00	1.48		1.42	2.41	2.35
701	YKTRDMH23	YKTRDMH22	1	1	C		8		4308.50	3.765	3.755	1.23	659.99	2.25	17.187	0.000	17.187	148	200	200	DWC	800	520	0.010	0.60	18.73	0.92	1.14	0.76	OK	0.68	OK	0.02	0.00	1.42		1.40	2.35	2.36
702	YKTRDMH22	YKTRDMH21	1	1	C		34		4342.50	3.755	3.836	5.21	665.20	2.25	17.323	0.000	17.323	149	200	200	DWC	-420	520	0.010	0.60	18.73	0.92	1.14	0.76	OK	0.68	OK	0.07	0.00	1.40		1.33	2.36	2.51
703	YKTRDMH21	YKTRDMH20A	1	1	C		23		4365.50	3.836	3.825	3.52	668.73	2.25	17.415	0.000	17.415	149	200	200	DWC	2091	520	0.010	0.60	18.73	0.93	1.14	0.77	OK	0.68	OK	0.04	0.00	1.33		1.29	2.51	2.54
704	YKTRDMH20A	YKTRDMH20	1	1	C		21		4386.50	3.825	3.818	3.22	671.94	2.25	17.499	0.000	17.499	150	200	200	DWC	3000	520	0.010	0.60	18.73	0.93	1.14	0.77	OK	0.68	OK	0.04	0.00	1.29		1.25	2.54	2.57
705	YKTRDMH20	YKTRDMH19	1	1	C		21		4407.50	3.818	3.811	3.22	675.16	2.25	17.582	0.000	17.582	150	200	200	DWC	3000	520	0.010	0.60	18.73	0.94	1.14	0.77	OK	0.68	OK	0.04	0.00	1.25		1.21	2.57	2.60
706	YKTRDMH19	YKTRDMH18	1	1	C		34		4441.50	3.811	3.868	5.21	680.37	2.25	17.718	0.000	17.718	151	200	200	DWC	-596	520	0.010	0.60	18.73	0.95	1.14	0.78	OK	0.68	OK	0.07	0.00	1.21		1.14	2.60	2.73
707	YKTRDMH18.1	YKTRDMH18	0	1	H		30		30.00	3.930	3.868	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	484	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.83		2.66	1.10	1.21
708	YKTRDMH18	YKTRDMH17	2	1	J		15		4486.50	3.868	3.929	2.30	687.26	2.25	17.897	0.000	17.897	151	200	200	DWC	-246	520	0.010	0.60	18.73	0.96	1.14	0.79	OK	0.68	OK	0.03	0.00	1.14	1.140	1.11	2.73	2.82
709	YKTRDMH17	YKTRDMH16	1	1	C		27		4513.50	3.929	3.930	4.14	691.40	2.25	18.005	0.000	18.005	152	200	200	DWC	-27000	520	0.010	0.60	18.73	0.96	1.14	0.79	OK	0.68	OK	0.05	0.00	1.11		1.06	2.82	2.87
710	YKTRDMH16	YKTRDMH15	1	1	C		16		4529.50	3.930	3.903	2.45	693.85	2.25	18.069	0.000	18.069	152	200	200	DWC	593	520	0.010	0.60	18.73	0.96	1.14	0.79	OK	0.68	OK	0.03	0.00	1.06		1.03	2.87	2.87
711	YKTRDMH15	YKTRDMH14	1	1	C		11		4540.50	3.903	3.940	1.69	695.53	2.25	18.113	0.000	18.113	152	200	200	DWC	-297	520	0.010	0.60	18.73	0.97	1.14	0.80	OK	0.68	OK	0.02	0.00	1.03		1.01	2.87	2.93
712	YKTRDMH14.1	YKTRDMH14.2	0	1	H		28		28.00	4.150	4.105	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	622	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	3.05		2.89	1.10	1.22
713	YKTRDMH14.2	YKTRDMH14.3	1	1	C		19		47.00	4.105	4.082	2.91	7.20	2.25	0.187	0.000	0.187	16	200	200	DWC	826	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.89		2.78	1.22	1.30
714	YKTRDMH14.3	YKTRDMH14.4	1	1	C		11		58.00	4.082	4.059	1.69	8.88	2.25	0.231	0.000	0.231	18	200	200	DWC	478	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	2.78		2.72	1.30	1.34
715	YKTRDMH14.4	YKTRDMH14.5	1	1	C		32		90.00	4.059	4.014	4.90	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	711	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	2.72		2.54	1.34	1.47
716	YKTRDMH14.5	YKTRDMH14.6	1	1	C		24		114.00	4.014	4.011	3.68	17.46	2.25	0.455	0.000	0.455	25	200	200	DWC	8000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.54		2.46	1.47	1.55
717	YKTRDMH14.6	YKTRDMH14.7	1	1	C		30		144.00	4.011	4.007	4.60	22.06	2.25	0.574	0.000	0.574	28	200	200	DWC	7500	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.46		2.39	1.55	1.62
718	YKTRDMH14.7	YKTRDMH14.8	1	1	C		18		162.00	4.007	4.004	2.76	24.82	2.25	0.646	0.000	0.646	29	200	200	DWC	6000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	2.39		2.35	1.62	1.65
719	YKTRDMH14.8	YKTRDMH14.9	1	1	C		19		181.00	4.004	3.994	2.91	27.73	2.25	0.722	0.000	0.722	31	200	200	DWC	1900	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.35		2.31	1.65	1.68
720	YKTRDMH14.9	YKTRDMH14.10	1	1	C		20		201.00	3.994	3.974	3.06	30.79	2.25	0.802	0.000	0.802	32	200	200	DWC	1000	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.31		2.27	1.68	1.70
721	YKTRDMH14.10	YKTRDMH14.11	1	1	C		25		226.00	3.974	3.954	3.83	34.62	2.25	0.902	0.000	0.902	34	200	200	DWC	1250	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.27		2.22	1.70	1.73
722	YKTRDMH14.11	YKTRDMH14	1	1	C		30		256.00	3.954	3.940	4.60	39.22	2.25	1.021	0.000	1.021	37	200	200	DWC	2143	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.22		2.16	1.73	1.78
723	YKTRDMH14	YKTRDMH13	2	1	J		10		4806.50	3.940	3.967	1.53	736.28	2.25	19.174	0.000	19.174	157	250	250	DWC	-370	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.01	0.00	1.01	1.010	1.00	2.93	2.97
724	YKTRDMH13	YKTRDMH12	1	1	C		20		4826.50	3.967	3.858	3.06	739.34	2.25	19.254	0.000	19.254	157	250	250	DWC	183	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.03	0.00	1.00		0.97	2.97	2.89
725	YKTRDMH12	YKTRDMH11	1	1	C		30		4856.50	3.858	3.910	4.60	743.94	2.25	19.373	0.000	19.373	158	250	250	DWC	-577	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.04	0.00	0.97		0.93	2.89	2.98
726	YKTRDMH11	YKTRDMH10	1	1	C		11		4867.50	3.910	4.091	1.69	745.62	2.25	19.417	0.000	19.417	158	250	250	DWC	-61	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.02	0.00	0.93		0.91	2.98	3.18
727	YKTRDMH10.1	YKTRDMH10.2	0	1	H		19		19.00	4.063	4.333	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	-70	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.96		2.85	1.10	1.48
728	YKTRDMH10.2	YKTRDMH10.3	1	1	C		16		35.00	4.333	4.124	2.45	5.36	2.25	0.140	0.000	0.140	14	200	200	DWC	77	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.85		2.76	1.48	1.36
729	YKTRDMH10.3	YKTRDMH10.4	1	1	C		9		44.00	4.124	3.915	1.38	6.74	2.25	0.176	0.000	0.176	15	200	200	DWC	43	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	2.76		2.71	1.36	1.21
730	YKTRDMH10.4.1	YKTRDMH10.4	0	1	H		29		29.00	3.920	3.915	4.44	4.44	2.25	0.116	0.000	0.116	13	200	200	DWC	5800	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	2.82		2.66	1.10	1.26
731	YKTRDMH10.4	YKTRDMH10.5	2	1	J		18		91.00	3.915	4.002	2.76	13.94	2.25	0.363	0.000	0.363	22	200	200	DWC	-207	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.66	2.660	2.56	1.26	1.44
732	YKTRDMH10.5	YKTRDMH10	1	1	C		20		111.00	4.002	4.090	3.06	17.00	2.25	0.443	0.000	0.443	24	200	200	DWC	-227	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	2.56		2.50	1.44	1.59
733	YKTRDMH10	YKTRDMH9	2	1	J		26		5004.50	4.091	4.072	3.98	766.61	2.25	19.964	0.000	19.964	160	250	250	DWC	1368	700	0.010	0.60	29.28	0.68	1.07	0.61	OK	0.64	OK	0.04	0.00	0.91	0.910	0.87	3.18	3.20
734	YKTRDMH9	YKTRDM8	1	1	C		35		5039.50	4.072	4.135	5.36	771.97	2.25	20.103	0.000	20.103	161	250	250	DWC	-556	700	0.010	0.60	29.28	0.69	1.08	0.61	OK	0.64	OK	0.05	0.00	0.87		0.82	3.20	3.32
735	YKTRDM1A	YKTRDM1	0	1	H		24		24.00	4.324	4.348	3.68	3.68	2.25	0.096	0.000	0.096	12	200	200	DWC	-1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	3.22		3.09	1.10	1.26
736	YKTRDM1	YKTRDM2	1	1	C		30		54.00	4.348	4.304	4.60	8.27	2.25	0.215	0.000	0.215	17	200	200	DWC	682	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.09		2.92	1.26	1.38
737	YKTRDM2	YKTRDM2A	1	1	C		18		72.00	4.304	4.257	2.76	11.03	2.25	0.287	0.000	0.287	20	200	200	DWC	383	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.92		2.82	1.38	1.44
738	YKTRDM2A.1	YKTRDM2A	0	1	H		30		30.00	4.134	4.257	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-244	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.03		2.86	1.10	1.40

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
739	YKTRDM2A	YKTRDM3	2	1	J		12		113.92	4.257	4.204	1.83	17.45	2.25	0.454	0.000	0.454	25	200	200	DWC	225	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	2.82	2.820	2.78	1.44	1.42
740	YKTRDM3	YKTRDM4	1	1	C		12		125.92	4.204	4.113	1.84	19.29	2.25	0.502	0.000	0.502	26	200	200	DWC	132	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	2.78		2.74	1.42	1.37
741	YKTRDM4.9	YKTRDM4.8	0	1	H		20		20.00	4.303	4.342	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	-513	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.20		3.09	1.10	1.25
742	YKTRDM4.8	YKTRDM4.7	1	1	C		30		50.00	4.284	4.252	4.60	7.66	2.25	0.199	0.000	0.199	16	200	200	DWC	937	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.09		2.92	1.19	1.33
743	YKTRDM4.7	YKTRDM4.6	1	1	C		30		80.00	4.233	4.270	4.60	12.25	2.25	0.319	0.000	0.319	21	200	200	DWC	-811	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.92		2.75	1.31	1.52
744	YKTRDM4.6	YKTRDM4.1	1	1	C		13		93.00	4.177	4.286	1.99	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	-119	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	2.75		2.71	1.43	1.58
745	YKTRDM4.5	YKTRDM4.1	0	1	H		15		15.00	4.167	4.153	2.30	2.30	2.25	0.060	0.000	0.060	9	200	200	DWC	1071	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.07		2.99	1.10	1.16
746	YKTRDM4.4	YKTRDM4.3	0	1	H		18		18.00	4.253	4.221	2.76	2.76	2.25	0.072	0.000	0.072	10	200	200	DWC	563	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	3.15		3.05	1.10	1.17
747	YKTRDM4.3	YKTRDM4.2	1	1	C		35		53.00	4.226	4.199	5.36	8.12	2.25	0.211	0.000	0.211	17	200	200	DWC	1296	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	3.05		2.86	1.18	1.34
748	YKTRDM4.2	YKTRDM4.1	1	1	C		15		68.00	4.175	4.153	2.30	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	682	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.86		2.78	1.32	1.37
749	YKTRDM4.1	YKTRDM4	3	1	J		26		202.00	4.153	4.105	3.98	30.94	2.25	0.806	0.000	0.806	33	200	200	DWC	542	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.71	2.710	2.66	1.44	1.45
750	YKTRDM4	YKTRDM5	2	1	J		30		357.92	4.105	4.052	4.60	54.83	2.25	1.428	0.000	1.428	43	200	200	DWC	566	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	2.66	2.660	2.60	1.45	1.45
751	YKTRDM5	YKTRDM6	1	1	C		30		387.92	4.052	4.128	4.60	59.42	2.25	1.547	0.000	1.547	45	200	200	DWC	-395	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	2.60		2.54	1.45	1.59
752	YKTRDM6	YKTRDM7	1	1	C		11		398.92	4.128	4.263	1.69	61.11	2.25	1.591	0.000	1.591	46	200	200	DWC	-81	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.02	0.00	2.54		2.52	1.59	1.74
753	KRRDM4	KRRDM3	0	1	H		34		34.00	4.030	4.190	5.21	5.21	2.25	0.136	0.000	0.136	14	200	200	DWC	-213	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	2.93		2.74	1.10	1.45
754	KRRDM3	KRRDM2	1	1	C		33		67.00	4.354	4.117	5.06	10.26	2.25	0.267	0.000	0.267	19	200	200	DWC	139	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	2.74		2.56	1.61	1.56
755	KRRDM2.2	KRRDM2.1	0	1	H		20		20.00	4.174	4.158	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.07		2.96	1.10	1.20
756	KRRDM2.1	KRRDM2	1	1	C		20		40.00	4.184	4.117	3.06	6.13	2.25	0.160	0.000	0.160	15	200	200	DWC	299	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.96		2.85	1.22	1.27
757	KRRDM2	KRRDM1	2	1	J		30		137.00	4.194	4.210	4.60	20.99	2.25	0.547	0.000	0.547	27	200	200	DWC	-1875	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.56	2.560	2.49	1.63	1.72
758	KRRDM1	YKTRDM7	1	1	C		15		152.00	4.210	4.128	2.30	23.28	2.25	0.606	0.000	0.606	28	200	200	DWC	183	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	2.49		2.45	1.72	1.68
759	YKTRDM7	YKTRDM8	2	1	J		14		564.92	4.263	4.135	2.14	86.54	2.25	2.254	0.000	2.254	54	200	200	DWC	109	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.03	0.00	2.45	2.450	2.42	1.81	1.72
760	YKTRDM8	YKTRDM9	2	1	J		30		5634.42	4.135	4.066	4.60	863.11	2.25	22.477	0.000	22.477	170	250	250	DWC	435	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.04	0.00	0.82	0.820	0.78	3.32	3.29
761	YKTRDM9	YKTRDM10	1	1	C		30		5664.42	4.066	3.998	4.60	867.70	2.25	22.596	0.000	22.596	170	250	250	DWC	441	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.04	0.00	0.78		0.74	3.29	3.26
762	YKTRDM10	TKNRDM5.9	1	1	C		12		5676.42	3.998	3.913	1.84	869.54	2.25	22.644	0.000	22.644	170	250	250	DWC	141	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.02	0.00	0.74		0.72	3.26	3.19
763	TKNRDM5.9.1	TKNRDM5.9	0	1	H		27		27.00	3.954	3.913	4.14	4.14	2.25	0.108	0.000	0.108	12	200	200	DWC	659	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.85		2.70	1.10	1.21
764	TKNRDM5.9	TKNRDM5.8A	2	1	J		22		5725.69	3.913	3.908	3.41	877.09	2.25	22.841	0.000	22.841	171	250	250	DWC	4454	700	0.010	0.60	29.28	0.78	1.10	0.67	OK	0.65	OK	0.03	0.00	0.72	0.720	0.69	3.19	3.22
765	TKNRDM5.8E	TKNRDM5.8D	0	1	H		22		22.00	3.913	3.813	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	220	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.81		2.69	1.10	1.12
766	TKNRDM5.8D	TKNRDM5.8C	1	1	C		30		52.00	3.813	3.723	4.60	7.97	2.25	0.207	0.000	0.207	17	200	200	DWC	333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.69		2.52	1.12	1.20
767	TKNRDM5.8C	TKNRDM5.8B	1	1	C		30		82.00	3.723	3.812	4.60	12.56	2.25	0.327	0.000	0.327	21	200	200	DWC	-337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.52		2.35	1.20	1.46
768	TKNRDM5.8B	TKNRDM5.8A	1	1	C		30		112.00	3.812	3.908	4.60	17.16	2.25	0.447	0.000	0.447	24	200	200	DWC	-313	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.35		2.26	1.46	1.65
769	TKNRDM5.8A	TKNRDM5.8	2	1	J		19		5856.69	3.908	3.931	2.91	897.15	2.25	23.363	0.000	23.363	173	250	250	DWC	-826	700	0.010	0.60	29.28	0.80	1.11	0.68	OK	0.66	OK	0.03	0.00	0.69	0.690	0.66	3.22	3.27
770	TKNRDM5.8.3	TKNRDM5.8.2	0	1	H		27		27.00	4.077	3.990	4.14	4.14	2.25	0.108	0.000	0.108	12	200	200	DWC	310	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.98		2.83	1.10	1.16
771	TKNRDM5.8.2	TKNRDM5.8.1	1	1	C		33		60.00	3.990	3.802	5.06	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	176	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	2.83		2.65	1.16	1.15
772	TKNRDM5.8.1	TKNRDM5.8	1	1	C		24		84.00	3.802	3.931	3.68	12.87	2.25	0.335	0.000	0.335	21	200	200	DWC	-186	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	2.65		2.52	1.15	1.41
773	TKNRDM5.8	TKNRDM5.7	2	1	J		9		5949.69	3.931	3.901	1.38	911.40	2.25	23.734	0.000	23.734	174	250	250	DWC	300	700	0.010	0.60	29.28	0.81	1.11	0.68	OK	0.66	OK	0.01	0.00	0.66	0.660	0.65	3.27	3.25
774	TKNRDM5.7	TKNRDM5.6	1	1	C		30		5979.69	3.901	3.943	4.60	916.00	2.25	23.854	0.000	23.854	175	250	250	DWC	-714	700	0.010	0.60	29.28	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	0.65		0.61	3.25	3.33
775	TKNRDM5.6	TKNRDM5.5A	1	1	C		10		5989.69	3.943	3.932	1.53	917.53	2.25	23.894	0.000	23.894	175	250	250	DWC	909	700	0.010	0.60	29.28	0.82	1.11	0.69	OK	0.66	OK	0.01	0.00	0.61		0.60	3.33	3.33
776	TKNRDM5.5C	TKNRDM5.5B	0	1	H		22		22.00	3.992	3.963	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	759	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.89		2.77	1.10	1.19
777	TKNRDM5.5B	TKNRDM5.5A	1	1	C		30		52.00	3.963	3.932	4.60	7.97	2.25	0.207	0.000	0.207	17	200	200	DWC	968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.77		2.60	1.19	1.33
778	TKNRDM5.5A	TKNRDM5.5	2	1	J		13		6054.69	3.932	3.917	1.99	927.48	2.25	24.153	0.000	24.153	176	250	250	DWC	867	700	0.010	0.60	29.28	0.82	1.11	0.69	OK	0.66	OK	0.02	0.00	0.60	0.600	0.58	3.33	3.34
779	TKNRDM5.5	TKNRDM5.4	1	1	C		30		6084.69	3.917	3.827	4.60	932.08	2.25	24.273	0.000	24.273	176	250	250	DWC	333	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.04	0.00	0.58		0.54	3.34	3.29
780	TKNRDM5.4	TKNRDM5.3	1	1	C		20		6104.69	3.827	3.861	3.06	935.14	2.25	24.353	0.000	24.353	177	250	250	DWC	-588	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.03	0.00	0.54		0.51	3.29	3.35
781	TKNRDM5.3	TKNRDM5.2A	1	1	C		13		6117.69	3.861	3.768	1.99	937.13	2.25	24.405	0.000	24.405	177	250	250	DWC	140	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.02	0.00	0.51		0.49	3.35	3.28
782	TKNRDM5.2B	TKNRDM5.2A	0	1	H		30		30.00	3.890	3.768	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	246	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.79		2.62	1.10	1.15
783	TKNRDM5.2A	TKNRDM5.2	2	1	J		17		6164.69	3.768	3.739	2.60	944.33	2.25	24.592	0.000	24.592	177	250	250	DWC	586	700	0.010	0.60	29.28	0.84	1.12	0.70	OK	0.67	OK	0.02	0.00	0.49	0.490	0.47	3.28	3.27
784	TKNRDM5.2	TKNRDM5.1A	1	1	C		8		6172.69	3.739	3.966	1.23	945.56	2.25	24.624	0.000	24.624	178	250	250	DWC	-35	700	0.010	0.60	29.28	0.84	1.12	0.70	OK	0.67	OK	0.01	0.00	0.47		0.46	3.27	3.51
785	TKNRDM5.1C	TKNRDM5.1B	0	1	H		22		22.00	3.963	3.966	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	-7333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.86		2.74	1.10	1.23
786	TKNRDM5.1B	TKNRDM5.1A	1	1	C		45		67.00	3.966	3.966	6.89	10.26	2.25	0.267	0.000	0.267	19	200	200	DWC	0	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.25	0.00	2.74		2.49	1.23	1.48
787	TKNRDM5.1A	TKNRDM5.1	2	1	J		22		6261.69	3.966	3.963	3.37	959.19	2.25	24.979	0.000	24.979	179	250	250	DWC	7333	700	0.010	0.60	29.28	0.85	1.12	0.71	OK	0.67	OK	0.03	0.00	0.46	0.460	0.43	3.51	3.53
788	TKNRDM5.1	TKNRDM5	1	1	C		30		6291.69	3.963	4.024	4.60	963.79	2.25	25.099	0.000	25.099	179	250	250	DWC	-492	700	0.010	0.60	29.28	0.86	1.12	0.72	OK	0.67	OK	0.04	0.00	0.43		0.39	3.53	3.63
789	TKNRDM5K	TKNRDM5J	0	1	H		30		30.00	3.804	3.776	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	1071	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.70		2.53	1.10	1.25
790	TKNRDM5J	TKNRDM5I	1	1	C		30		60.00	3.776	3.751	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	1200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.53		2.36	1.25	1.39
791	TKNRDM5I	TKNRDM5H	1	1	C		30		90.00	3.751	3.715	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.36		2.19	1.39	1.53
792	TKNRDM5H	TKNRDM5G	1	1	C		25		115.00	3.715	3.680	3.83	17.62	2.25	0.459	0.000	0.459	25	200	200	DWC	714	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.19		2.11	1.53	1.57
793	TKNRDM5G	TKNRDM5F	1	1	C		30		145.00	3.680	3.621	4.60	22.21	2.25	0.578	0.000	0.578	28	200	200	DWC	508	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.11		2.04	1.57	1.58
794	TKNRDM5F	TKNRDM5E	1	1	C		20		165.00	3.621	3.563	3.06	25.28	2.25	0.658	0.000	0.658	29	200	200	DWC	345	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	2.04		1.99	1.58	1.57
795	TKNRDM5E	TKNRDM5D	1	1	C		25		190.00	3.563	3.883	3.83	29.11	2.25	0.758	0.000	0.758	32	200	200	DWC	-78	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	1.99		1.94	1.57	1.94
796	TKNRDM5D	TKNRDM5C	1	1	C		13		203.00	3.883	3.914	1.99	31.10	2.25	0.810	0.000	0.810	33	200	200	DWC	-419	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	1.94		1.91	1.94	2.00
797	TKNRDM5C	TKNRDM5B	1	1	C		18		221.00	3.914	3.953	2.76	33.85	2.25	0.882	0.000	0.882	34	200	200	DWC	-462	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	1.91		1.88	2.00	2.07
798	TKNRDM5B	TKNRDM5A	1	1	C		20		241.00	3.953	3.988	3.06	36.92	2.25	0.961	0.000	0.961	35	200	200	DWC	-571	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	1.88		1.84	2.07	2.15
799	TKNRDM5A	TKNRDM5A.1	1	1	C		23		264.00	3.988	4.015	3.52	40.44	2.25	1.053	0.000	1.053	37	200	200	DWC	-852	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.84		1.80	2.15	2.22
800	TKNRDM5A.1	TKNRDM5	1	1	C		10		274.00	4.015	4.024	1.53	41.97	2.25	1.093	0.000	1.093	38	200	200	DWC	-1111	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	1.80		1.78	2.22	2.24
801	TKN-YKTRDM9A.	TKN-YKTRDM9A.	0	1	H		30		30.00	3.973	4.243	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-111	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.87		2.70	1.10	1.54
802	TKN-YKTRDM9A.	TKN-YKTRDM9A	1	1	C		30		60.00	4.243	4.514	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.70		2.53	1.54	1.98
803	TKN-YKTRDM9A	TKNRDM8	1	1	C		15		75.00	4.514	4.462	2.30	11.49	2.25	0.299	0.000	0.299	20	200	200	DWC	288	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.53		2.45	1.98	2.01
804	TKNRDM8	TKNRDM8A	1	1	C		16		91.00	4.462	4.437	2.45	13.94	2.25	0.363	0.000	0.363	22	200	200	DWC	640	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.45		2.36	2.01	2.08
805	TKNRDM8A.6	TKNRDM8A.5	0	1	H		25		25.00	3.600	3.637	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	-676	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.50		2.36	1.10	1.28
806	TKNRDM8A.5	TKNRDM8A.4	1	1	C		18		43.00	3.637	3.674	2.76	6.59	2.25	0.172	0.000	0.172	15	200	200	DWC	-486	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.36		2.26	1.28	1.41
807	TKNRDM8A.4	TKNRDM8A.3	1	1	C		14		57.00	3.674	3.843	2.14	8.73	2.25	0.227	0.000	0.227	18	200	200	DWC	-83	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.26		2.18	1.41	1.66
808	TKNRDM8A.3	TKNRDM8A.2	1	1	C		30		87.00	3.843	4.012	4.60	13.33	2.25	0.347	0.000	0.347	22	200	200	DWC	-178	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.18		2.01	1.66	2.00
809	TKNRDM8A.2	TKNRDM8A.1	1	1	C		30		117.00	4.012	4.224	4.60	17.92	2.25	0.467	0.000	0.467	25	200	200	DWC	-142	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.01		1.92	2.00	2.30
810	TKNRDM8A.1	TKNRDM8A	1	1	C		30		147.00	4.224	4.437	4.60	22.52	2.25	0.586	0.000	0.586	28	200	200	DWC	-141	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.92		1.83	2.30	2.61
811	TKNRDM8A	TKNRDM7	2	1	J		17		255.00	4.437	4.409	2.60	39.06	2.25	1.017	0.000	1.017	36	200	200	DWC	607	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	1.83	1.830	1.80	2.61	2.61
812	TKNRDM7	TKNRDM6	1	1	C		19		274.00	4.409	4.437	2.91	41.97	2.25	1.093	0.000	1.093	38	200	200	DWC	-679	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.80		1.76	2.61	2.68

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
813	TKNRDM6.2	TKNRDM6.1	0	1	H		18		18.00	4.014	4.227	2.76	2.76	2.25	0.072	0.000	0.072	10	200	200	DWC	-85	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.91		2.81	1.10	1.42
814	TKNRDM6.1	TKNRDM6	1	1	C		30		48.00	4.227	4.437	4.60	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	-143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.81		2.64	1.42	1.80
815	TKNRDM6	TKNRDM6A	2	1	J		11		333.00	4.437	4.216	1.69	51.01	2.25	1.328	0.000	1.328	42	200	200	DWC	50	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	1.76	1.760	1.74	2.68	2.48
816	TKNRDM6A	TKNRDM5	1	1	C		26		359.00	4.216	4.024	3.98	54.99	2.25	1.432	0.000	1.432	43	200	200	DWC	135	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	1.74		1.69	2.48	2.33
817	TKNRDM5	TKNRDM4	3	1	J		30		6954.69	4.024	3.913	4.60	1065.35	2.25	27.743	0.000	27.743	188	250	250	DWC	270	700	0.010	0.60	29.28	0.95	1.14	0.78	OK	0.68	OK	0.04	0.00	1.69	1.690	1.65	2.33	2.26
818	TKNRDM4	TKNRDM3	1	1	C		30		6984.69	3.913	4.020	4.60	1069.95	2.25	27.863	0.000	27.863	189	250	250	DWC	-280	700	0.010	0.60	29.28	0.95	1.14	0.78	OK	0.68	OK	0.04	0.00	1.65		1.61	2.26	2.41
819	TKNRDM3	TKNRDM2	1	1	C		30		7014.69	4.020	4.088	4.60	1074.54	2.25	27.983	0.000	27.983	189	250	250	DWC	-441	700	0.010	0.60	29.28	0.96	1.14	0.79	OK	0.68	OK	0.04	0.00	1.61		1.57	2.41	2.52
820	TKNRDM2	TKNRDM1	1	1	C		30		7044.69	4.088	4.513	4.60	1079.14	2.25	28.103	0.000	28.103	190	250	250	DWC	-71	700	0.010	0.60	29.28	0.96	1.14	0.79	OK	0.68	OK	0.04	0.00	1.57		1.53	2.52	2.98
821	TKNRDM1	DERDM61	1	1	C		39		7083.69	4.513	4.730	5.97	1085.11	2.25	28.258	0.000	28.258	190	250	250	DWC	-180	700	0.010	0.60	29.28	0.97	1.14	0.80	OK	0.68	OK	0.06	0.00	1.53		1.47	2.98	3.26
822	DERDM61	DERDM62	1	1	C		38		7121.69	4.730	4.800	5.82	1090.93	2.25	28.410	0.000	28.410	191	250	250	DWC	-543	700	0.010	0.60	29.28	0.97	1.14	0.80	OK	0.68	OK	0.05	0.00	1.47		1.42	3.26	3.38
823	DERDM62	DERDM63A	1	1	C		20		7141.72	4.800	4.765	3.07	1094.00	2.25	28.490	0.000	28.490	191	300	300	DWC	572	870	0.010	0.60	42.70	0.67	1.07	0.60	OK	0.65	OK	0.02	0.00	1.42		1.40	3.38	3.37
824	DERDM63A.2	DERDM63A.1	0	1	H		30		30.00	4.354	4.562	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-144	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.25		3.08	1.10	1.48
825	DERDM63A.1	DERDM63A	1	1	C		30		60.00	4.562	4.765	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-148	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.08		2.91	1.48	1.86
826	DERDM63A	DERDM63	2	1	J		10		7211.61	4.765	4.730	1.51	1104.71	2.25	28.768	0.000	28.768	192	300	300	DWC	283	870	0.010	0.60	42.70	0.67	1.07	0.60	OK	0.65	OK	0.01	0.00	1.40	1.400	1.39	3.37	3.34
827	DERDM63	DERDM64	1	1	C		30		7241.61	4.730	4.513	4.60	1109.30	2.25	28.888	0.000	28.888	192	300	300	DWC	138	870	0.010	0.60	42.70	0.68	1.07	0.61	OK	0.65	OK	0.03	0.00	1.39		1.36	3.34	3.15
828	DERDM64	DEBSRDM65	1	1	C		30		7271.61	4.513	4.297	4.60	1113.90	2.25	29.008	0.000	29.008	193	300	300	DWC	139	870	0.010	0.60	42.70	0.68	1.07	0.61	OK	0.65	OK	0.03	0.00	1.36		1.33	3.15	2.97
829	VPRDM5	VPRDM4	0	1	H		11		11.17	3.523	3.415	1.71	1.71	2.25	0.045	0.000	0.045	8	200	200	DWC	103	105	0.010	1.32	41.69	0.00	0.30	0.07	OK	0.40	OK	0.11	0.00	2.42		2.31	1.10	1.11
830	VPRDM4	VPRDM3	1	1	C		30		41.17	3.415	3.250	4.60	6.31	2.25	0.164	0.000	0.164	15	200	200	DWC	182	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.31		2.14	1.11	1.11
831	VPRDM3	VPRDM2	1	1	C		30		71.17	3.250	3.350	4.60	10.90	2.25	0.284	0.000	0.284	20	200	200	DWC	-300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.14		1.97	1.11	1.38
832	VPRDM2	VPRDM1	1	1	C		30		101.17	3.350	3.480	4.60	15.50	2.25	0.404	0.000	0.404	23	200	200	DWC	-231	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.97		1.88	1.38	1.60
833	VPRDM1	DEBSRDM65	1	1	C		27		128.17	3.480	4.297	4.14	19.63	2.25	0.511	0.000	0.511	26	200	200	DWC	-33	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	1.88		1.80	1.60	2.50
834	DERDM87.1	DERDM87	0	1	H		30		30.00	5.314	5.463	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-201	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.21		4.04	1.10	1.42
835	DERDM87	DERDM86	1	1	C		23		53.00	5.463	5.307	3.52	8.12	2.25	0.211	0.000	0.211	17	200	200	DWC	147	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	4.04		3.91	1.42	1.40
836	DERDM86.2	DERDM86.1	0	1	H		30.46		30.46	5.193	5.287	4.67	4.67	2.25	0.122	0.000	0.122	13	200	200	DWC	-324	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.09		3.92	1.10	1.37
837	DERDM86.1	DERDM86	1	1	C		30		60.46	5.287	5.307	4.60	9.26	2.25	0.241	0.000	0.241	18	200	200	DWC	-1500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.92		3.75	1.37	1.56
838	DERDM86	DEKKRDM85	2	1	J		34.8		148.26	5.307	5.178	5.33	22.71	2.25	0.591	0.000	0.591	28	200	200	DWC	470	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.19	0.00	3.75	3.750	3.56	1.56	1.62
839	KKRDM4	KKRDM3	0	1	H		26		26.00	4.883	4.902	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	-1368	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.78		3.64	1.10	1.26
840	KKRDM3	KKRDM2	1	1	C		30		56.00	4.902	4.994	4.60	8.58	2.25	0.223	0.000	0.223	17	200	200	DWC	-326	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.64		3.47	1.26	1.52
841	KKRDM2	KKRDM1	1	1	C		20		76.00	4.994	5.034	3.06	11.64	2.25	0.303	0.000	0.303	20	200	200	DWC	-500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.47		3.36	1.52	1.67
842	KKRDM1	DEKKRDM85	1	1	C		30		106.00	5.034	5.178	4.60	16.24	2.25	0.423	0.000	0.423	24	200	200	DWC	-208	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.36		3.27	1.67	1.91
843	DEKKRDM85	DERDM84	2	1	J		19		273.03	5.178	5.110	2.88	41.82	2.25	1.089	0.000	1.089	38	200	200	DWC	276	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	3.27	3.270	3.23	1.91	1.88
844	DERDM84	DERDM83	1	1	C		27		300.36	5.110	5.025	4.19	46.01	2.25	1.198	0.000	1.198	40	200	200	DWC	322	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	3.23		3.18	1.88	1.85
845	DERDM83	DERDM82	1	1	C		12		312.36	5.025	5.033	1.84	47.85	2.25	1.246	0.000	1.246	40	200	200	DWC	-1500	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	3.18		3.16	1.85	1.87
846	DERDM82.4	DERDM82.3	0	1	H		20		20.00	5.013	4.982	3.06	3.06	2.25	0.080	0.000	0.080	11	200	200	DWC	645	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.91		3.80	1.10	1.18
847	DERDM82.3	DERDM82.2	1	1	C		30		50.00	4.982	4.971	4.60	7.66	2.25	0.199	0.000	0.199	16	200	200	DWC	2727	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.80		3.63	1.18	1.34
848	DERDM82.2	DERDM82.1	1	1	C		18		68.00	4.971	5.001	2.76	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	-600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	3.63		3.53	1.34	1.47
849	DERDM82.1	DERDM82	1	1	C		23		91.00	5.001	5.033	3.52	13.94	2.25	0.363	0.000	0.363	22	200	200	DWC	-719	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	3.53		3.40	1.47	1.63
850	DERDM82	DERDM81	2	1	J		18		421.49	5.033	5.025	2.78	64.57	2.25	1.681	0.000	1.681	47	200	200	DWC	2266	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	3.16	3.160	3.13	1.87	1.90
851	DERDM81.1	DERDM81	0	1	H		32		32.41	5.012	5.025	4.96	4.96	2.25	0.129	0.000	0.129	13	200	200	DWC	-2493	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	3.91		3.73	1.10	1.30
852	DERDM81	DERDM80	2	1	J		19		472.77	5.025	4.972	2.89	72.42	2.25	1.886	0.000	1.886	50	200	200	DWC	356	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	3.13	3.130	3.09	1.90	1.88
853	DERDM80	DEKERDM79	1	1	C		30		502.77	4.972	4.929	4.60	77.02	2.25	2.006	0.000	2.006	51	200	200	DWC	698	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	3.09		3.03	1.88	1.90
854	KERDM6	KERDM5	0	1	H		30		30.00	4.441	4.248	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	155	155	0.010	1.09	34.37	0.00	0.30	0.07	OK	0.33	OK	0.19	0.00	3.34		3.15	1.10	1.10
855	KERDM5	KERDM4	1	1	C		11		41.00	4.248	4.229	1.69	6.28	2.25	0.164	0.000	0.164	15	200	200	DWC	579	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.15		3.09	1.10	1.14
856	KERDM4	KERDM3	1	1	C		30		71.00	4.229	4.841	4.60	10.88	2.25	0.283	0.000	0.283	19	200	200	DWC	-49	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.09		2.92	1.14	1.92
857	KERDM3	KERDM2	1	1	C		30		101.00	4.841	5.042	4.60	15.47	2.25	0.403	0.000	0.403	23	200	200	DWC	-149	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.92		2.83	1.92	2.21
858	KERDM2	KERDM1	1	1	C		23		123.98	5.042	5.024	3.52	18.99	2.25	0.495	0.000	0.495	26	200	200	DWC	1277	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.83		2.76	2.21	2.26
859	KERDM1	KERDM1A	1	1	C		19		142.71	5.024	4.976	2.87	21.86	2.25	0.569	0.000	0.569	27	200	200	DWC	390	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	2.76		2.70	2.26	2.28
860	KERDM1A	DEKERDM79	1	1	C		18		161.00	4.976	4.929	2.80	24.66	2.25	0.642	0.000	0.642	29	200	200	DWC	389	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	2.70		2.66	2.28	2.27
861	DEKERDM79	DERDM78	2	1	J		14		677.77	4.929	4.841	2.14	103.82	2.25	2.704	0.000	2.704	59	200	200	DWC	159	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	2.66	2.660	2.63	2.27	2.21
862	DERDM78	DERDM77	1	1	C		28		705.31	4.841	4.841	4.22	108.04	2.25	2.814	0.000	2.814	60	200	200	DWC	0	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.05	0.00	2.63		2.58	2.21	2.26
863	DERDM77	DEBSRDM76	1	1	C		32		737.77	4.841	4.889	4.97	113.01	2.25	2.943	0.000	2.943	62	200	200	DWC	-676	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	2.58		2.52	2.26	2.37
864	DEBSRDM76	DEADRDM75	1	1	C		28		765.77	4.889	4.909	4.29	117.30	2.25	3.055	0.000	3.055	63	200	200	DWC	-1400	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.05	0.00	2.52		2.47	2.37	2.44
865	ADRDM7	ADRDM6	0	1	H		25		25.00	4.473	4.340	3.83	3.83	2.25	0.100	0.000	0.100	12	200	200	DWC	188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.37		3.23	1.10	1.11
866	ADRDM6	ADRDM5	1	1	C		17		42.00	4.340	4.289	2.60	6.43	2.25	0.168	0.000	0.168	15	200	200	DWC	333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.23		3.14	1.11	1.15
867	ADRDM5	ADRDM4	1	1	C		19		60.71	4.289	4.239	2.87	9.30	2.25	0.242	0.000	0.242	18	200	200	DWC	374	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	3.14		3.04	1.15	1.20
868	ADRDM4	ADRDM3	1	1	C		30		90.71	4.239	4.471	4.60	13.90	2.25	0.362	0.000	0.362	22	200	200	DWC	-129	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.04		2.87	1.20	1.60
869	ADRDM3.4	ADRDM3.3	0	1	H		19		19.00	4.814	4.798	2.91	2.91	2.25	0.076	0.000	0.076	10	200	200	DWC	1188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.71		3.60	1.10	1.20
870	ADRDM3.3.1	ADRDM3.3	0	1	H		27		26.60	4.944	4.798	4.07	4.07	2.25	0.106	0.000	0.106	12	200	200	DWC	182	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	3.84		3.69	1.10	1.11
871	ADRDM3.3	ADRDM3.2	2	1	J		28		74.01	4.798	4.756	4.35	11.34	2.25	0.295	0.000	0.295	20	200	200	DWC	676	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	3.60	3.600	3.44	1.20	1.32
872	ADRDM3.2	ADRDM3.1	1	1	C		25		99.16	4.756	4.613	3.85	15.19	2.25	0.396	0.000	0.396	23	200	200	DWC	176	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.44		3.30	1.32	1.31
873	ADRDM3.1	ADRDM3	1	1	C		32		131.17	4.613	4.471	4.90	20.09	2.25	0.523	0.000	0.523	26	200	200	DWC	225	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.10	0.00	3.30		3.20	1.31	1.27
874	ADRDM3	ADRDM2	2	1	J		30		251.88	4.471	4.704	4.60	38.58	2.25	1.005	0.000	1.005	36	200	200	DWC	-129	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.87	2.870	2.81	1.60	1.89
875	ADRDM2	ADRDM1	1	1	C		30		281.88	4.704	4.808	4.60	43.18	2.25	1.124	0.000	1.124	38	200	200	DWC	-288	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.81		2.75	1.89	2.06
876	ADRDM1	DEADRDM75	1	1	C		20		301.88	4.808	4.909	3.06	46.24	2.25	1.204	0.000	1.204	40	200	200	DWC	-198	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	2.75		2.71	2.06	2.20
877	DEADRDM75	DERDM74	2	1	J		28		1095.17	4.909	4.926	4.22	167.76	2.25	4.369	0.000	4.369	75	200	200	DWC	-1619	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.05	0.00	2.47	2.470	2.42	2.44	2.51
878	DERDM74.1	DERDM74	0	1	H		30		30.00	4.822	4.926	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-288	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.72		3.55	1.10	1.38
879	DERDM74	DERDM73	2	1	J		19		1143.67	4.926	4.913	2.83	175.19	2.25	4.562	0.000	4.562	77	200	200	DWC	1423	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.04	0.00	2.42	2.420	2.38	2.51	2.53
880	DERDM73	DERDM72	1	1	C		30		1173.67	4.913	4.912	4.60	179.79	2.25	4.682	0.000	4.682	78	200	200	DWC	30000	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.06	0.00	2.38		2.32	2.53	2.59
881	DERDM72	DERDM71	1	1	C		18		1191.21	4.912	4.926	2.69	182.47	2.25	4.752	0.000	4.752	78	200	200	DWC	-1253	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.03	0.00	2.32		2.29	2.59	2.64
882	BSRDM1A	BSRDM2A	0	1	H		17		17.00	4.704	4.557	2.60	2.60	2.25	0.068	0.000	0.068	10	200	200	DWC	116	117	0.010	1.25	39.50	0.00	0.30	0.07	OK	0.38	OK	0.15	0.00	3.60		3.45	1.10	1.11
883	BSRDM2A	BSRDM3A	1	1	C		25		42.00	4.557	4.285	3.83	6.43	2.25	0.168	0.000	0.168	15	200	200	DWC	92	92	0.010	1.41	44.54	0.00	0.30	0.07	OK	0.42	OK	0.27	0.00	3.45		3.18	1.11	1.11
884	BSRDM3A	BSRDM4A	1	1	C		30		72.00	4.285	4.172	4.60	11.03	2.25	0.287	0.000	0.287	20	200	200	DWC	265	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.18		3.00	1.11	1.17
885	BSRDM4A	BSRDM5A	1	1	C		30		102.00	4.172	3.671	4.60	15.62	2.25	0.407	0.000	0.407	23	200	200	DWC	60	68	0.010	1.65	51.81	0.01	0.30	0.07	OK	0.49	OK	0.44	0.00	3.00		2.56	1.17	1.11
886	BSRDM5A	BSRDM6A	1	1	C		30		132.00	3.671	3.332	4.60	20.22	2.25	0.527	0.000	0.527	26	200	200	DWC	88	88	0.010	1.45	45.54	0.01	0.30	0.07	OK	0.43	OK	0.34	0.00	2.56		2.22	1.11	1.11

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
887	BSRDM6A	BSRDM7A	1	1	C		19		150.51	3.332	3.190	2.84	23.06	2.25	0.600	0.000	0.600	28	200	200	DWC	130	130	0.010	1.19	37.47	0.02	0.40	0.10	OK	0.48	OK	0.14	0.00	2.22		2.08	1.11	1.11
888	BSRDM7A	BSRDM8A	1	1	C		23		173.37	3.190	3.046	3.50	26.56	2.25	0.692	0.000	0.692	30	200	200	DWC	159	159	0.010	1.08	33.88	0.02	0.40	0.10	OK	0.43	OK	0.14	0.00	2.08		1.94	1.11	1.11
889	BSRDM8A	BSRDM9A	1	1	C		7		180.37	3.046	2.938	1.07	27.63	2.25	0.720	0.000	0.720	31	200	200	DWC	65	65	0.010	1.68	52.99	0.01	0.30	0.07	OK	0.51	OK	0.11	0.00	1.94		1.83	1.11	1.11
890	BSRDM16A	BSRDM15A	0	1	H		38		37.70	2.002	2.002	5.78	5.78	2.25	0.150	0.000	0.150	14	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.21	0.00	0.90		0.69	1.10	1.31
891	BSRDM15A	BSRDM14A	1	1	C		30		67.70	2.002	2.014	4.60	10.37	2.25	0.270	0.000	0.270	19	200	200	DWC	-2500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.69		0.52	1.31	1.49
892	BSRDM14A	BSRDM13A	1	1	C		30		97.70	2.014	2.051	4.60	14.97	2.25	0.390	0.000	0.390	23	200	200	DWC	-811	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.52		0.43	1.49	1.62
893	BSRDM13A	BSRDM12A	1	1	C		30		127.70	2.051	2.185	4.60	19.56	2.25	0.509	0.000	0.509	26	200	200	DWC	-224	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.43		0.34	1.62	1.85
894	BSRDM12A	BSRDM11A	1	1	C		10		137.70	2.185	2.281	1.53	21.09	2.25	0.549	0.000	0.549	27	200	200	DWC	-104	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	0.34		0.32	1.85	1.96
895	BSRDM11A	BSRDM10A	1	1	C		19		156.70	2.281	2.578	2.91	24.00	2.25	0.625	0.000	0.625	29	200	200	DWC	-64	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.32		0.27	1.96	2.31
896	BSRDM10A	BSRDM9A	1	1	C		20		176.70	2.578	2.938	3.06	27.07	2.25	0.705	0.000	0.705	30	200	200	DWC	-56	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.27		0.23	2.31	2.71
897	BSRDM9A	DERDM71.10	2	1	J		30		387.07	2.938	2.781	4.60	59.29	2.25	1.544	0.000	1.544	45	200	200	DWC	191	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.23	0.230	0.17	2.71	2.61
898	DERDM71.10	DERDM71.9	1	1	C		14		401.07	2.781	2.754	2.14	61.44	2.25	1.600	0.000	1.600	46	200	200	DWC	519	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	0.17		0.14	2.61	2.61
899	DERDM71.9	DERDM71.8	1	1	C		16		417.16	2.754	2.758	2.46	63.90	2.25	1.664	0.000	1.664	47	200	200	DWC	-4023	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	0.14		0.11	2.61	2.65
900	DERDM71.8	DERDM71.7	1	1	C		30		447.16	2.758	2.763	4.60	68.50	2.25	1.784	0.000	1.784	48	200	200	DWC	-6000	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.11		0.05	2.65	2.71
901	DERDM71.7	DERDM71.6	1	1	C		20		467.17	2.763	2.767	3.07	71.56	2.25	1.864	0.000	1.864	49	200	200	DWC	-5003	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	0.05		0.01	2.71	2.76
902	DERDM71.6	DERDM71.5	1	1	C		25		492.49	2.767	3.171	3.88	75.44	2.25	1.965	0.000	1.965	51	200	200	DWC	-63	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.05	0.00	0.01		-0.04	2.76	3.21
903	DERDM71.5	DERDM71.4	1	1	C		30		522.49	3.171	3.576	4.60	80.04	2.25	2.084	0.000	2.084	52	200	200	DWC	-74	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.04		-0.10	3.21	3.68
904	DERDM71.4	DERDM71.3	1	1	C		30		552.49	3.580	3.846	4.60	84.63	2.25	2.204	0.000	2.204	53	200	200	DWC	-113	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.10		-0.16	3.68	4.01
905	DERDM71.3	DERDM71.2L	1	0	C	L	30		582.49	3.846	4.251	4.60	89.23	2.25	2.324	0.000	2.324	55	200	200	DWC	-74	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.16		-0.22	4.01	4.47
906	DERDM71.2	DERDM71.1	0	1	H		30	582.49	612.49	4.251	4.656	4.60	93.82	2.25	2.443	0.000	2.443	56	200	200	DWC	-74	180	0.010	1.01	31.84	0.08	0.61	0.20	OK	0.62	OK	0.17	0.00	3.15		2.98	1.10	1.68
907	DERDM71.1	DERDM71	1	1	C		34		646.21	4.656	4.926	5.17	98.99	2.25	2.578	0.000	2.578	58	200	200	DWC	-125	180	0.010	1.01	31.84	0.08	0.61	0.20	OK	0.62	OK	0.19	0.00	2.98		2.79	1.68	2.14
908	DERDM71	DERDM70	2	1	J		12		1849.79	4.926	4.855	1.89	283.36	2.25	7.379	0.000	7.379	97	200	200	DWC	174	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.02	0.00	2.29	2.290	2.27	2.64	2.59
909	DERDM70.4	DERDM70.3	0	1	H		30		30.00	4.681	4.724	4.60	4.60	2.25	0.120	0.000	0.120	13	200	200	DWC	-698	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.58		3.41	1.10	1.31
910	DERDM70.3	DERDM70.2	1	1	C		30		60.00	4.724	4.756	4.60	9.19	2.25	0.239	0.000	0.239	18	200	200	DWC	-937	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.41		3.24	1.31	1.52
911	DERDM70.2	DERDM70.1	1	1	C		30		90.00	4.756	4.802	4.60	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	-652	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.24		3.07	1.52	1.73
912	DERDM70.1	DERDM70	1	1	C		30		120.00	4.802	4.855	4.60	18.38	2.25	0.479	0.000	0.479	25	200	200	DWC	-566	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.07		2.98	1.73	1.88
913	DERDM70	DERDM69	2	1	J		37		2006.29	4.855	4.784	5.59	307.33	2.25	8.003	0.000	8.003	101	200	200	DWC	514	520	0.010	0.60	18.73	0.43	0.97	0.46	OK	0.58	OK	0.07	0.00	2.27	2.270	2.20	2.59	2.58
914	DERDM69	DERDM68	1	1	C		24		2029.79	4.784	4.737	3.60	310.93	2.25	8.097	0.000	8.097	102	200	200	DWC	500	520	0.010	0.60	18.73	0.43	0.97	0.46	OK	0.58	OK	0.05	0.00	2.20		2.15	2.58	2.59
915	DERDM68	DEASRDM67	1	1	C		30		2059.79	4.737	4.313	4.60	315.53	2.25	8.217	0.000	8.217	103	200	200	DWC	71	520	0.010	0.60	18.73	0.44	0.98	0.47	OK	0.58	OK	0.06	0.00	2.15		2.09	2.59	2.22
916	2ASRDM6	2ASRDM5	0	1	H		17		17.44	3.762	3.719	2.67	2.67	2.25	0.070	0.000	0.070	10	200	200	DWC	406	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.66		2.56	1.10	1.16
917	2ASRDM5	2ASRDM4	1	1	C		30		47.44	3.719	3.703	4.60	7.27	2.25	0.189	0.000	0.189	16	200	200	DWC	1875	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.56		2.39	1.16	1.31
918	2ASRDM4	2ASRDM3A.2	1	1	C		22		69.62	3.703	3.750	3.40	10.66	2.25	0.278	0.000	0.278	19	200	200	DWC	-472	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.39		2.27	1.31	1.48
919	2ASRDM3A.2	2ASRDM3A.1	1	1	C		25		94.84	3.750	3.630	3.86	14.53	2.25	0.378	0.000	0.378	22	200	200	DWC	210	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.27		2.13	1.48	1.50
920	2ASRDM3A.1	2ASRDM3A	1	1	C		25		119.84	3.630	3.750	3.83	18.36	2.25	0.478	0.000	0.478	25	200	200	DWC	-208	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.13		2.05	1.50	1.70
921	2ASRDM3A	2ASRDM3	1	1	C		8		127.66	3.750	3.812	1.20	19.56	2.25	0.509	0.000	0.509	26	200	200	DWC	-126	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	2.05		2.03	1.70	1.78
922	2ASRDM3	2ASRDM2	1	1	C		30		157.66	3.812	4.060	4.60	24.15	2.25	0.629	0.000	0.629	29	200	200	DWC	-121	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.03		1.96	1.78	2.10
923	2ASRDM2	2ASRDM1	1	1	C		30		187.66	4.060	4.216	4.60	28.75	2.25	0.749	0.000	0.749	31	200	200	DWC	-192	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.96		1.90	2.10	2.32
924	2ASRDM1	DEASRDM67	1	1	C		30		217.66	4.216	4.313	4.60	33.34	2.25	0.868	0.000	0.868	34	200	200	DWC	-309	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.90		1.84	2.32	2.47
925	DEASRDM67	DERDM67A	2	1	J		20		2297.45	4.313	4.235	3.06	351.93	2.25	9.165	0.000	9.165	109	200	200	DWC	256	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.04	0.00	1.84	1.840	1.80	2.47	2.44
926	DERDM67A	DERDM66	1	1	C		15		2312.45	4.235	4.157	2.30	354.23	2.25	9.225	0.000	9.225	109	200	200	DWC	192	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.03	0.00	1.80		1.77	2.44	2.39
927	DERDM66	DEBSRDM65	1	1	C		30		2342.45	4.157	4.297	4.60	358.83	2.25	9.344	0.000	9.344	110	200	200	DWC	-214	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.06	0.00	1.77		1.71	2.39	2.59
928	DEBSRDM65	BSRDM30.15	3	1	J		30		9772.23	4.297	3.480	4.60	1496.95	2.25	38.983	0.000	38.983	223	300	300	DWC	37	870	0.010	0.60	42.70	0.91	1.13	0.75	OK	0.68	OK	0.03	0.00	1.33	1.330	1.30	2.97	2.18
929	BSRDM30.15	BSRDM30.14	1	1	C		30		9802.23	3.480	3.403	4.60	1501.55	2.25	39.103	0.000	39.103	224	300	300	DWC	390	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.03	0.00	1.30		1.27	2.18	2.13
930	BSRDM30.14	BSRDM30.13	1	1	C		20		9822.23	3.403	2.912	3.06	1504.61	2.25	39.183	0.000	39.183	224	300	300	DWC	41	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.02	0.00	1.27		1.25	2.13	1.66
931	BSRDM30.13	BSRDM30.12	1	1	C		18		9840.01	2.912	3.074	2.72	1507.34	2.25	39.254	0.000	39.254	224	300	300	DWC	-110	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.02	0.00	1.25		1.23	1.66	1.84
932	BSRDM30.12	BSRDM30.11	1	1	C		30		9870.01	3.074	4.315	4.60	1511.93	2.25	39.373	0.000	39.373	224	300	300	DWC	-24	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.03	0.00	1.23		1.20	1.84	3.12
933	BSRDM30.11	BSRDM30.11A	1	1	C		8		9877.64	4.315	4.764	1.17	1513.10	2.25	39.404	0.000	39.404	225	300	300	DWC	-17	870	0.010	0.60	42.70	0.92	1.14	0.76	OK	0.69	OK	0.01	0.00	1.20		1.19	3.12	3.57
934	BSRDM30.11A.7	BSRDM30.11A.6	0	1	H		14		14.13	2.143	2.305	2.16	2.16	2.25	0.056	0.000	0.056	9	200	200	DWC	-87	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.04		0.96	1.10	1.35
935	BSRDM30.11A.6	BSRDM30.11A.5	1	1	C		30		44.24	2.305	2.175	4.61	6.78	2.25	0.176	0.000	0.176	15	200	200	DWC	232	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.96		0.79	1.35	1.39
936	BSRDM30.11A.5	BSRDM30.11A.4	1	1	C		12		56.47	2.175	2.316	1.87	8.65	2.25	0.225	0.000	0.225	17	200	200	DWC	-87	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.79		0.72	1.39	1.60
937	BSRDM30.11A.4	BSRDM30.11A.3	1	1	C		18		74.06	2.316	3.073	2.69	11.34	2.25	0.295	0.000	0.295	20	200	200	DWC	-23	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.72		0.62	1.60	2.45
938	BSRDM30.11A.3	BSRDM30.11A.2	1	1	C		18		91.56	3.073	3.837	2.68	14.03	2.25	0.365	0.000	0.365	22	200	200	DWC	-23	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.62		0.52	2.45	3.32
939	BSRDM30.11A.2	BSRDM30.11A.2	0	1	H		23		22.76	3.524	3.837	3.49	3.49	2.25	0.091	0.000	0.091	11	200	200	DWC	-73	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.42		2.29	1.10	1.55
940	BSRDM30.11A.2	BSRDM30.11A.1	2	1	J		32		146.01	3.837	4.300	4.85	22.37	2.25	0.582	0.000	0.582	28	200	200	DWC	-68	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.08	0.00	0.52	0.520	0.44	3.32	3.86
941	BSRDM30.11A.1	BSRDM30.11A	1	1	C		32		178.13	4.300	4.750	4.92	27.29	2.25	0.711	0.000	0.711	31	200	200	DWC	-71	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.44		0.38	3.86	4.37
942	BSRDM30.11A	BSRDM30.10	2	1	J		23		10078.40	4.750	2.596	3.47	1543.85	2.25	40.205	0.000	40.205	227	300	300	DWC	11	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.03	0.00	0.38	0.380	0.35	4.37	2.25
943	BSRDM30.10	BSRDM30.9	1	1	C		20		10098.40	2.596	2.372	3.06	1546.92	2.25	40.284	0.000	40.284	227	300	300	DWC	89	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.02	0.00	0.35		0.33	2.25	2.04
944	BSRDM30.9	BSRDM30.8	1	1	C		10		10108.40	2.372	2.364	1.53	1548.45	2.25	40.324	0.000	40.324	227	300	300	DWC	1250	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.01	0.00	0.33		0.32	2.04	2.04
945	BSRDM30.8	BSRDM30.7	1	1	C		30		10138.40	2.364	2.349	4.60	1553.04	2.25	40.444	0.000	40.444	227	300	300	DWC	2000	870	0.010	0.60	42.70	0.95	1.14	0.78	OK	0.69	OK	0.03	0.00	0.32		0.29	2.04	2.06
946	BSRDM30.7	BSRDM30.6	1	1	C		30		10168.40	2.349	2.617	4.60	1557.64	2.25	40.564	0.000	40.564	228	300	300	DWC	-112	870	0.010	0.60	42.70	0.95	1.14	0.78	OK	0.69	OK	0.03	0.00	0.29		0.26	2.06	2.36
947	BSRDM30.6	BSRDM30.5A	1	1	C		15		10183.41	2.617	2.777	2.30	1559.94	2.25	40.623	0.000	40.623	228	300	300	DWC	-94	870	0.010	0.60	42.70	0.95	1.14	0.78	OK	0.69	OK	0.02	0.00	0.26		0.24	2.36	2.54
948	BSRDM30.5A	WW1	2	0	J	L	10		23050.86	2.777	2.820	1.53	3531.03	2.25	91.954	0.000	91.954	343	427	500	hdpe	-233	1000	0.010	0.71	102.11	0.90	1.13	0.74	OK	0.80	OK	0.01	0.00	0.00		-0.01	2.78	2.83
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SEWER NETWORK DESIGN __Muttar STP_ Block3A

Sl. No.	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	ERRDMH23.6	ERRDMH23.5	0	1	H		20.00		20.00	5.183	5.212	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-690	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	4.08		3.97	1.10	1.24
2	ERRDMH23.5	ERRDMH23.4	1	1	C		30.00		50.00	5.212	4.953	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	116	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.97		3.80	1.24	1.15
3	ERRDMH23.4	ERRDMH23.3	1	1	C		30.00		80.00	4.953	4.700	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	119	150	0.010	1.11	34.88	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	3.80		3.60	1.15	1.10
4	ERRDMH23.3	ERRDMH23.2	1	1	C		30.00		110.00	4.700	4.424	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	109	109	0.010	1.30	40.92	0.01	0.30	0.07	OK	0.39	OK	0.28	0.00	3.60		3.32	1.10	1.10
5	ERRDMH23.2	ERRDMH23.1	1	1	C		20.00		130.00	4.424	4.280	2.52	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	139	140	0.010	1.15	36.11	0.01	0.30	0.07	OK	0.34	OK	0.14	0.00	3.32		3.18	1.10	1.10
6	ERRDMH23.1	ERRDMH23	1	1	C		18.00		148.00	4.280	4.020	2.27	18.66	2.25	0.486	0.000	0.486	25	200	200	DWC	69	70	0.010	1.62	51.06	0.01	0.30	0.07	OK	0.49	OK	0.26	0.00	3.18		2.92	1.10	1.10
7	ERRDMH26	ERRDMH25	0	1	H		30.00		30.00	4.361	4.304	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	526	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.26		3.09	1.10	1.21
8	ERRDMH25	ERRDMH24	1	1	C		30.00		60.00	4.304	4.305	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-30000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.09		2.92	1.21	1.39
9	ERRDMH24	ERRDMH23	1	1	C		20.00		80.00	4.305	4.020	2.52	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	70	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.92		2.81	1.39	1.21
10	ERRDMH23	ERRDMH22	2	1	J		20.00		248.00	4.020	4.179	2.52	31.27	2.25	0.814	0.000	0.814	33	200	200	DWC	-126	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.81	2.810	2.77	1.21	1.41
11	ERRDMH22	ERRDMH21	1	1	C		20.00		268.00	4.179	4.132	2.52	33.79	2.25	0.880	0.000	0.880	34	200	200	DWC	426	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	2.77		2.73	1.41	1.40
12	ERRDMH21	ERRDMH20	1	1	C		20.00		288.00	4.132	4.094	2.52	36.31	2.25	0.946	0.000	0.946	35	200	200	DWC	526	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	2.73		2.69	1.40	1.40
13	ERRDMH20	ERRDMH19	1	1	C		30.00		318.00	4.094	4.068	3.78	40.09	2.25	1.044	0.000	1.044	37	200	200	DWC	1154	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.69		2.63	1.40	1.44
14	ERRDMH19	ERRDMH18	1	1	C		30.00		348.00	4.068	4.091	3.78	43.88	2.25	1.143	0.000	1.143	39	200	200	DWC	-1304	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.63		2.57	1.44	1.52
15	ERRDMH18	ERRDMH17	1	1	C		27.00		375.00	4.091	4.031	3.40	47.28	2.25	1.231	0.000	1.231	40	200	200	DWC	450	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.05	0.00	2.57		2.52	1.52	1.51
16	ERRDMH17.10	ERRDMH17.9	0	1	H		10.00		10.00	4.744	4.775	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	-323	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.64		3.58	1.10	1.20
17	ERRDMH17.9	ERRDMH17.8	1	1	C		25.00		35.00	4.775	4.810	3.15	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	-714	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.58		3.44	1.20	1.37
18	ERRDMH17.8	ERRDMH17.7	1	1	C		10.00		45.00	4.810	4.747	1.26	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	159	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.44		3.38	1.37	1.37
19	ERRDMH17.7	ERRDMH17.6	1	1	C		10.00		55.00	4.747	4.647	1.26	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	100	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.38		3.32	1.37	1.33
20	ERRDMH17.6	ERRDMH17.5	1	1	C		30.00		85.00	4.647	4.543	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	288	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.32		3.15	1.33	1.39
21	ERRDMH17.11.2	ERRDMH17.11.1	0	1	H		19.00		19.00	4.614	4.668	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	-352	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.51		3.40	1.10	1.27
22	ERRDMH17.11.1	ERRDMH17.11	1	1	C		5.00		24.00	4.668	4.746	0.63	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-64	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.40		3.37	1.27	1.38
23	ERRDMH17.11	ERRDMH17.12	1	1	C		14.00		38.00	4.746	4.697	1.77	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	286	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.37		3.29	1.38	1.41
24	ERRDMH17.12	ERRDMH17.5	1	1	C		30.00		68.00	4.697	4.543	3.78	8.57	2.25	0.223	0.000	0.223	17	200	200	DWC	195	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.29		3.12	1.41	1.42
25	ERRDMH17.5	ERRDMH17.4	2	1	J		20.00		173.00	4.543	4.372	2.52	21.81	2.25	0.568	0.000	0.568	27	200	200	DWC	117	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.12	3.120	3.06	1.42	1.31
26	ERRDMH17.4	ERRDMH17.3	1	1	C		8.00		181.00	4.372	4.374	1.01	22.82	2.25	0.594	0.000	0.594	28	200	200	DWC	-4000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	3.06		3.04	1.31	1.33
27	ERRDMH17.3	ERRDMH17.2	1	1	C		10.00		191.00	4.374	4.283	1.26	24.08	2.25	0.627	0.000	0.627	29	200	200	DWC	110	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	3.04		3.02	1.33	1.26
28	ERRDMH17.2	ERRDMH17.1	1	1	C		30.00		221.00	4.283	4.121	3.78	27.86	2.25	0.726	0.000	0.726	31	200	200	DWC	185	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	3.02		2.96	1.26	1.16
29	ERRDMH17.1	ERRDMH17	1	1	C		5.00		226.00	4.121	4.031	0.63	28.49	2.25	0.742	0.000	0.742	31	200	200	DWC	56	120	0.010	1.24	39.00	0.02	0.40	0.10	OK	0.50	OK	0.04	0.00	2.96		2.92	1.16	1.11
30	ERRDMH17	ERRDMH16.1	2	1	J		16.00		617.00	4.031	4.003	2.02	77.79	2.25	2.026	0.000	2.026	51	200	200	DWC	571	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	2.52	2.520	2.49	1.51	1.51
31	ERRDMH16.1	ERRDMH16	1	1	C		20.00		637.00	4.003	3.975	2.52	80.32	2.25	2.092	0.000	2.092	52	200	200	DWC	714	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	2.49		2.45	1.51	1.53
32	ERRDMH16	ERRDMH15	1	1	C		30.00		667.00	3.975	4.166	3.78	84.10	2.25	2.190	0.000	2.190	53	200	200	DWC	-157	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	2.45		2.39	1.53	1.78
33	ERRDMH15	ERRDMH14	1	1	C		30.00		697.00	4.166	4.304	3.78	87.88	2.25	2.289	0.000	2.289	54	200	200	DWC	-217	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	2.39		2.33	1.78	1.97
34	ERRDMH14	ERRDMH13	1	1	C		30.00		727.00	4.304	3.887	3.78	91.66	2.25	2.387	0.000	2.387	56	200	200	DWC	72	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	2.33		2.27	1.97	1.62
35	ERRDMH13	ERRDMH12	1	1	C		30.00		757.00	3.887	3.834	3.78	95.45	2.25	2.486	0.000	2.486	57	200	200	DWC	566	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	2.27		2.21	1.62	1.62
36	MNPRDM1	ERRDMH12	0	1	H		30.00		30.00	3.462	3.834	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-81	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.36		2.19	1.10	1.64
37	ERRDMH12	ERRDMH11	2	1	J		15.00		802.00	3.834	3.455	1.89	101.12	2.25	2.633	0.000	2.633	58	200	200	DWC	40	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	2.21	2.210	2.18	1.62	1.28
38	ERRDMH11	ERCHRDMH10	1	1	C		20.00		822.00	3.455	3.465	2.52	103.64	2.25	2.699	0.000	2.699	59	200	200	DWC	-2000	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.04	0.00	2.18		2.14	1.28	1.33
39	CHRDMH21	CHRDMH22	0	1	H		30.00		30.00	4.511	4.560	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-612	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.41		3.24	1.10	1.32
40	CHRDMH22	CHRDMH22.1	1	1	C		17.00		47.00	4.560	4.357	2.14	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	84	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	3.24		3.15	1.32	1.21
41	CHRDMH22.1.2	CHRDMH22.1.1	0	1	H		20.00		20.00	3.720	4.084	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-55	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.62		2.51	1.10	1.57
42	CHRDMH22.1.1	CHRDMH22.1	1	1	C		25.00		45.00	4.084	4.357	3.15	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-92	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.51		2.37	1.57	1.99
43	CHRDMH22.1	CHTHRDMH23	2	1	J		14.00		106.00	4.357	4.155	1.77	13.36	2.25	0.348	0.000	0.348	22	200	200	DWC	69	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.37	2.370	2.29	1.99	1.87
44	THRDMH9	THRDMH8	0	1	H		27.00		27.00	3.700	3.778	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-346	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.60		2.45	1.10	1.33
45	THRDMH8	THRDMH7	1	1	C		30.00		57.00	3.778	3.928	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	-200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.45		2.28	1.33	1.65
46	THRDMH7	THRDMH6	1	1	C		5.00		62.00	3.928	3.902	0.63	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	192	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.28		2.25	1.65	1.65
47	THRDMH6	THRDMH5	1	1	C		15.00		77.00	3.902	4.112	1.89	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	-71	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.25		2.17	1.65	1.94
48	THRDMH5	THRDMH4	1	1	C		30.00		107.00	4.112	4.312	3.78	13.49	2.25	0.351	0.000	0.351	22	200	200	DWC	-150	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.17		2.00	1.94	2.31
49	THRDMH4	THRDMH3	1	1	C		30.00		137.00	4.312	4.623	3.78	17.27	2.25	0.450	0.000	0.450	24	200	200	DWC	-96	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.00		1.91	2.31	2.71
50	THRDMH3	THRDMH2	1	1	C		30.00		167.00	4.623	4.630	3.78	21.06	2.25	0.548	0.000	0.548	27	200	200	DWC	-4286	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.91		1.84	2.71	2.79
51	THRDMH2	THRDMH1	1	1	C		25.00		192.00	4.630	4.362	3.15	24.21	2.25	0.630	0.000	0.630	29	200	200	DWC	93	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	1.84		1.78	2.79	2.58
52	THRDMH1	CHTHRDMH23	1	1	C		15.00		207.00	4.362	4.155	1.89	26.10	2.25	0.680	0.000	0.680	30	200	200	DWC	72	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	1.78		1.74	2.58	2.42
53	CHTHRDMH23	CHRDMH24	2	1	J		12.00		325.00	4.155	4.110	1.51	40.98	2.25	1.067	0.000	1.067	37	200	200	DWC	267	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	1.74	1.740	1.72	2.42	2.39
54	CHRDMH24	CHRDMH25	1	1	C		20.00		345.00	4.110	3.900	2.52	43.50	2.25	1.133	0.000	1.133	38	200	200	DWC	95	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.72		1.68	2.39	2.22
55	CHRDMH25	ERCHRDMH10	1	1	C		30.00		375.00	3.900	3.465	3.78	47.28	2.25	1.231	0.000	1.231	40	200	200	DWC	69	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.68		1.62	2.22	1.85
56	ERCHRDMH10	ERRDMH9	2	1	J		22.00		1219.00	3.465	3.606	2.77	153.70	2.25	4.003	0.000	4.003	72	200	200	DWC	-156	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.04	0.00	1.62	1.620	1.58	1.85	2.03
57	ERRDMH9	ERRDMH8	1	1	C		30.00		1249.00	3.606	2.799	3.78	157.48	2.25	4.101	0.000	4.101	73	200	200	DWC	37	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.06	0.00	1.58		1.52	2.03	1.28
58	ERRDMH8	ERRDMH7	1	1	C		30.00		1279.00	2.799	2.652	3.78	161.26	2.25	4.200	0.000	4.200	74	200	200	DWC	204	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.06	0.00	1.52		1.46	1.28	1.19
59	ERRDMH7	ERRDMH6	1	1	C		30.00		1309.00	2.652	2.281	3.78	165.04	2.25	4.298	0.000	4.298	74	200	200	DWC	81	105	0.010	1.32	41.69	0.10	0.65	0.22	OK	0.86	OK	0.29	0.00	1.46		1.17	1.19	1.11
60	ERRDMH6	ERRDMH5	1	1	C		30.00		1339.00	2.281	2.201	3.78	168.83	2.25	4.397	0.000	4.397	75	200	200	DWC	375	400	0.010	0.68	21.36	0.21	0.79	0.32	OK	0.54	OK	0.08	0.00	1.17		1.09	1.11	1.11
61	ERRDMH5	ERRDMH5.1	1	1	C		20.00		1359.00	2.201	2.161	2.52	171.35	2.25	4.462	0.000	4.462	76	200	200	DWC	500	470	0.010	0.63	19.71	0.23	0.81	0.33	OK	0.51	OK	0.04	0.00	1.09		1.05	1.11	1.11
62	ERRDMH5.1	ERRDMH4	1	1	C		10.00		1369.00	2.161	2.121	1.26	172.61	2.25	4.495	0.000	4.495	76	200	200	DWC	250	250	0.010	0.86	27.02	0.17	0.75	0.29	OK	0.64	OK	0.04	0.00	1.05		1.01	1.11	1.11
63	ERRDMH4	ERSNRDMH3	1	1	C		20.00		1389.00	2.121	2.374	2.52	175.13	2.25	4.561	0.000	4.561	77	200	200	DWC	-79	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.04	0.00	1.01		0.97	1.11	1.40
64	ERRDMH1	ERRDMH2	0	1	H		23.00		23.00	3.885	2.903	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	23	23	0.010	2.83	89.08	0.00	0.30	0.07	OK	0.85	OK	1.00	0.00	2.79		1.79	1.10	1.11
65	ERRDMH2	ERSNRDMH3	1	1	C		15.00		38.00	2.903	2.374	1.89	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	28	28	0.010	2.56	80.74	0.00	0.30	0.07	OK	0.77	OK	0.54	0.00	1.79		1.25	1.11	1.12
66	ERSNRDMH3	SNRDMH1	2	1	J		30.00		1457.00	2.374	2.205	3.78	183.70	2.25	4.784	0.000	4.784	79	200	200	DWC	178	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	0.97	0.970	0.91	1.40	1.30
67	SNRDMH1	SNRDMH2	1	1	C		30.00		1487.00	2.205	2.151	3.78	187.49	2.25	4.882	0.000	4.882	79	200	200	DWC	556	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	0.91		0.85	1.30	1.30
68	SNRDMH2	SNRDMH3	1	1	C		30.00		1517.00	2.151	2.098	3.78	191.27	2.25	4.981	0.000	4.981	80	200	200	DWC	566	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	0.85		0.79	1.30	1.31
69	SNRDMH3	SNRDMH4	1	1	C		30.00		1547.00	2.098	2.106	3.78	195.05	2.25	5.079	0.000	5.079	81	200	200	DWC	-3750	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	0.79		0.73	1.31	1.38
70	SNRDMH4	SNRDMH5	1	1	C		30.00		1577.00	2.106	2.115	3.78	198.83	2.25	5.178	0.000	5.178	82	200	200	DWC	-3333	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.06	0.00	0.73		0.67	1.38	1.45
71	SNRDMH5	SNRDMH6	1	1	C		30.00		1607.00	2.115	2.089	3.78	202.62	2.25	5.276	0.000	5.276	82	200	200	DWC	1154	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.06	0.00	0.67		0.61	1.45	1.48
72	SNRDMH6	SNRDMH7	1	1	C		30.00		1637.00	2.089	2.046	3.78	206.40	2.25	5.375	0.000	5.375	83	200	200	DWC	698	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.06	0.00	0.61		0.55	1.48	1.50

73	SNRDMH7	SNRDMH8	1	1	C		30.00		1667.00	2.046	2.054	3.78	210.18	2.25	5.473	0.000	5.473	84	200	200	DWC	-3750	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.06	0.00	0.55		0.49	1.50	1.56
74	ERRDM64	ERRDM63	0	1	H		30.00		30.00	5.134	4.893	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	124	125	0.010	1.21	38.21	0.00	0.30	0.07	OK	0.36	OK	0.24	0.00	4.03		3.79	1.10	1.10
75	ERRDM63	ERRDM61	1	1	C		37.00		67.00	4.893	4.514	4.67	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	98	98	0.010	1.37	43.16	0.01	0.30	0.07	OK	0.41	OK	0.38	0.00	3.79		3.41	1.10	1.10
76	ASRDM10	ASRDM9	0	1	H		36.00		36.00	4.502	4.426	4.54	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	474	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.20	0.00	3.40		3.20	1.10	1.23
77	ASRDM9	ASRDM8	1	1	C		30.00		66.00	4.426	4.565	3.78	8.32	2.25	0.217	0.000	0.217	17	200	200	DWC	-216	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.20		3.03	1.23	1.54
78	ASRDM8.1	ASRDM8	0	1	H		14.00		14.00	4.584	4.565	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	737	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.48		3.40	1.10	1.17
79	ASRDM8	ASRDM7	2	1	J		10.00		90.00	4.565	4.527	1.26	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	263	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.03	3.030	2.97	1.54	1.56
80	ASRDM7	ASRDM5	1	1	C		25.00		115.00	4.527	4.502	3.15	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	1000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.97		2.89	1.56	1.61
81	ASRDM5	ASRDM4	1	1	C		8.00		123.00	4.502	3.830	1.01	15.51	2.25	0.404	0.000	0.404	23	200	200	DWC	12	50	0.010	1.92	60.42	0.01	0.30	0.07	OK	0.58	OK	0.16	0.00	2.89		2.73	1.61	1.10
82	ASRDM4.3	ASRDM4.2	0	1	H		29.00		29.00	4.800	4.789	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	2636	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	3.70		3.54	1.10	1.25
83	ASRDM4.2	ASRDM4.1	1	1	C		10.00		39.00	4.789	4.764	1.26	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.54		3.48	1.25	1.28
84	ASRDM4.1	ASRDM4	1	1	C		18.00		57.00	4.764	3.830	2.27	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	19	24	0.010	2.77	87.21	0.00	0.30	0.07	OK	0.83	OK	0.75	0.00	3.48		2.73	1.28	1.10
85	ASRDM4	ASRDM3	2	1	J		8.00		188.00	3.830	3.817	1.01	23.70	2.25	0.617	0.000	0.617	29	200	200	DWC	615	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.02	0.00	2.73	2.730	2.71	1.10	1.11
86	ASRDM3	ASRDM2	1	1	C		14.00		202.00	3.810	4.502	1.77	25.47	2.25	0.663	0.000	0.663	30	200	200	DWC	-20	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	2.71		2.68	1.10	1.82
87	ASRDM2	ERRDM61	1	1	C		30.00		232.00	4.502	4.514	3.78	29.25	2.25	0.762	0.000	0.762	32	200	200	DWC	-2500	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.68		2.62	1.82	1.89
88	ERRDM61	ERRDM61.1	2	1	J		9.00		308.00	4.514	4.502	1.13	38.83	2.25	1.011	0.000	1.011	36	200	200	DWC	750	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.02	0.00	2.62	2.620	2.60	1.89	1.90
89	ERRDM61.1A	ERRDM61.1	0	1	H		40.00		40.00	4.634	4.502	5.04	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	303	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.24	0.00	3.53		3.29	1.10	1.21
90	ERRDM61.1	ERRDM60	2	1	J		20.00		368.00	4.502	4.104	2.52	46.40	2.25	1.208	0.000	1.208	40	200	200	DWC	50	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	2.60	2.600	2.56	1.90	1.54
91	ERRDM60.1	ERRDM60	0	1	H		30.00		30.00	4.230	4.104	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	238	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.13		2.96	1.10	1.14
92	ERRDM60	ERRDM59	2	1	J		18.00		416.00	4.104	3.755	2.27	52.45	2.25	1.366	0.000	1.366	42	200	200	DWC	52	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.04	0.00	2.56	2.560	2.52	1.54	1.24
93	ERRDM59.1	ERRDM59	0	1	H		30.00		30.00	3.880	3.755	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	240	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.78		2.61	1.10	1.15
94	ERRDM59	ER-PVRDM58	2	1	J		27.00		473.00	3.755	3.562	3.40	59.64	2.25	1.553	0.000	1.553	45	200	200	DWC	140	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	2.52	2.520	2.46	1.24	1.10
95	PVRDM12	PVRDM11	0	1	H		23.00		23.00	3.790	3.928	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	-167	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.69		2.56	1.10	1.37
96	PVRDM11.1	PVRDM11	0	1	H		18.00		18.00	4.040	3.930	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	164	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.11	0.00	2.94		2.83	1.10	1.10
97	PVRDM11	PVRDM10	2	1	J		30.00		71.00	3.930	4.116	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	-161	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.56	2.560	2.39	1.37	1.73
98	PVRDM10	PVRDM9	1	1	C		7.00		78.00	4.116	4.167	0.88	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	-137	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	2.39		2.35	1.73	1.82
99	DERDM83.1	DERDM83.2	0	1	H		30.00		30.00	4.750	4.725	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1200	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.65		3.48	1.10	1.25
100	DERDM83.2	DERDM83.3	1	1	C		30.00		60.00	4.725	4.695	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	1000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.48		3.31	1.25	1.39
101	DERDM83.3	DERDM83.4	1	1	C		28.00		88.00	4.695	4.671	3.53	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	1167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	3.31		3.15	1.39	1.52
102	DERDM83.4	PVRDM9	1	1	C		21.00		109.00	4.710	4.167	2.65	13.74	2.25	0.358	0.000	0.358	22	200	200	DWC	39	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	3.15		3.03	1.56	1.14
103	PVRDM9	PVRDM8	2	1	J		30.00		217.00	4.167	4.172	3.78	27.36	2.25	0.713	0.000	0.713	31	200	200	DWC	-6000	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.35	2.350	2.29	1.82	1.88
104	PVRDM8	PVRDM7	1	1	C		20.00		237.00	4.172	3.935	2.52	29.88	2.25	0.778	0.000	0.778	32	200	200	DWC	84	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.29		2.25	1.88	1.69
105	PVRDM7.3	PVRDM7.2	0	1	H		39.00		39.00	3.030	3.355	4.92	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-120	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	1.93		1.71	1.10	1.65
106	PVRDM7.2	PVRDM7.1	1	1	C		30.00		69.00	3.355	3.711	3.78	8.70	2.25	0.227	0.000	0.227	17	200	200	DWC	-84	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.71		1.54	1.65	2.17
107	PVRDM7.1	PVRDM7	1	1	C		30.00		99.00	3.711	3.935	3.78	12.48	2.25	0.325	0.000	0.325	21	200	200	DWC	-134	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.54		1.37	2.17	2.57
108	PVRDM7	PVRDM6	2	1	J		7.00		343.00	3.930	4.015	0.88	43.25	2.25	1.126	0.000	1.126	38	200	200	DWC	-82	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.01	0.00	1.37	1.370	1.36	2.56	2.66
109	PVRDM6	PVRDM5	1	1	C		12.00		355.00	4.015	4.096	1.51	44.76	2.25	1.166	0.000	1.166	39	200	200	DWC	-148	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	1.36		1.34	2.66	2.76
110	PVRDM5	PVRDM4	1	1	C		20.00		375.00	4.096	4.255	2.52	47.28	2.25	1.231	0.000	1.231	40	200	200	DWC	-126	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	1.34		1.30	2.76	2.96
111	PVRDM4	PVRDM3	1	1	C		11.00		386.00	4.255	4.252	1.39	48.67	2.25	1.267	0.000	1.267	41	200	200	DWC	3667	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	1.30		1.28	2.96	2.97
112	PVRDM3	PVRDM2	1	1	C		30.00		416.00	4.252	3.923	3.78	52.45	2.25	1.366	0.000	1.366	42	200	200	DWC	91	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.28		1.22	2.97	2.70
113	PVRDM2.8	PVRDM2.7	0	1	H		30.00		30.00	3.190	3.308	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-254	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.09		1.92	1.10	1.39
114	PVRDM2.7	PVRDM2.6	1	1	C		7.00		37.00	3.308	3.331	0.88	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	-304	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	1.92		1.88	1.39	1.45
115	PVRDM2.6	PVRDM2.5	1	1	C		8.00		45.00	3.331	3.395	1.01	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-125	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	1.88		1.84	1.45	1.56
116	PVRDM2.5	PVRDM2.4	1	1	C		29.00		74.00	3.395	3.509	3.66	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	-254	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	1.84		1.68	1.56	1.83
117	PVRDM2.4	PVRDM2.2	1	1	C		33.00		107.00	3.510	3.589	4.16	13.49	2.25	0.351	0.000	0.351	22	200	200	DWC	-418	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.68		1.50	1.83	2.09
118	PVRDM2.2	PVRDM2.1	1	1	C		28.00		135.00	3.589	3.793	3.53	17.02	2.25	0.443	0.000	0.443	24	200	200	DWC	-137	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.50		1.41	2.09	2.38
119	PVRDM2.1	PVRDM2	1	1	C		30.00		165.00	3.793	3.923	3.78	20.80	2.25	0.542	0.000	0.542	27	200	200	DWC	-231	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.41		1.34	2.38	2.58
120	PVRDM2	PVRDM1	2	1	J		24.00		605.00	3.923	3.781	3.03	76.28	2.25	1.986	0.000	1.986	51	200	200	DWC	169	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.05	0.00	1.22	1.220	1.17	2.70	2.61
121	PVRDM1	ER-PVRDM58	1	1	C		30.00		635.00	3.781	3.562	3.78	80.06	2.25	2.085	0.000	2.085	52	200	200	DWC	137	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	1.17		1.11	2.61	2.45
122	ER-PVRDM58	ER-NVRDM56	2	1	J		32.00		1140.00	3.562	3.061	4.03	143.74	2.25	3.743	0.000	3.743	70	200	200	DWC	64	470	0.010	0.63	19.71	0.19	0.77	0.30	OK	0.48	OK	0.07	0.00	1.11	1.110	1.04	2.45	2.02
123	NVRDM9	NVRDM8	0	1	H		20.00		20.00	3.072	3.265	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-104	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.97		1.86	1.10	1.41
124	NVRDM8	NVRDM7	1	1	C		30.00		50.00	3.265	3.462	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-152	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.86		1.69	1.41	1.77
125	NVRDM7	NVRDM6	1	1	C		30.00		80.00	3.462	3.624	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-185	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.69		1.52	1.77	2.10
126	NVRDM6	NVRDM5	1	1	C		13.00		93.00	3.624	3.799	1.64	11.73	2.25	0.305	0.000	0.305	20	200	200	DWC	-74	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	1.52		1.45	2.10	2.35
127	NVRDM5	NVRDM4	1	1	C		12.00		105.00	3.799	3.874	1.51	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-160	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	1.45		1.38	2.35	2.49
128	NVRDM4.1	NVRDM4.2	0	1	H		35.00		35.00	3.850	3.821	4.41	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	1207	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	2.75		2.56	1.10	1.26
129	NVRDM4.2	NVRDM4	1	1	C		50.00		85.00	3.821	3.874	6.30	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	-943	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.28	0.00	2.56		2.28	1.26	1.59
130	NVRDM4	NVRDM3	2	1	J		13.00		203.00	3.874	3.993	1.64	25.60	2.25	0.667	0.000	0.667	30	200	200	DWC	-109	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	1.38	1.380	1.35	2.49	2.64
131	NVRDM3	NVRDM2	1	1	C		25.00		228.00	3.993	3.922	3.15	28.75	2.25	0.749	0.000	0.749	31	200	200	DWC	352	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	1.35		1.30	2.64	2.62
132	NVRDM2	NVRDM1	1	1	C		30.00		258.00	3.992	3.851	3.78	32.53	2.25	0.847	0.000	0.847	33	200	200	DWC	213	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.30		1.24	2.69	2.61
133	NVRDM1	ER-NVRDM56	1	1	C		30.00		288.00	3.851	3.061	3.78	36.31	2.25	0.946	0.000	0.946	35	200	200	DWC	38	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.24		1.18	2.61	1.88
134	ER-NVRDM56	ERRDM53	2	1	J		39.00		1467.00	3.061	2.781	4.92	184.97	2.25	4.817	0.000	4.817	79	200	200	DWC	139	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.08	0.00	1.04	1.040	0.96	2.02	1.82
135	ERRDM53.1	ERRDM53	0	1	H		51.00		51.00	2.813	2.781	6.43	6.43	2.25	0.167	0.000	0.167	15	200	200	DWC	1594	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.28	0.00	1.71		1.43	1.10	1.35
136	ERRDM53	ERRDM52	2	1	J		33.00		1551.00	2.781	2.248	4.16	195.56	2.25	5.093	0.000	5.093	81	200	200	DWC	62	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	0.96	0.960	0.90	1.82	1.35
137	ERRDM52.1	ERRDM52	0	1	H		43.00		43.00	3.063	2.250	5.42	5.42	2.25	0.141	0.000	0.141	14	200	200	DWC	53	53	0.010	1.86	58.68	0.00	0.30	0.07	OK	0.56	OK	0.81	0.00	1.96		1.15	1.10	1.10
138	ERRDM52	ER-M1RDM51	2	1	J		37.00		1631.00	2.250	2.300	4.67	205.64	2.25	5.355	0.000	5.355	83	200	200	DWC	-740	470	0.010	0.63	19.71	0.27	0.85	0.36	OK	0.53	OK	0.08	0.00	0.90	0.900	0.82	1.35	1.48
139	ERRDM47	ERRDM46	0	1	H		35.00		35.00	3.542	3.199	4.41	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	102	101	0.010	1.35	42.51	0.00	0.30	0.07	OK	0.41	OK	0.35	0.00	2.44		2.09	1.10	1.11
140	ERRDM46	ER-PORDM47	1	1	C		20.00		55.00	3.199	2.234	2.52	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	21	21	0.010	2.99	94.13	0.00	0.30	0.07	OK	0.90	OK	0.97	0.00	2.09		1.12	1.11	1.11
141	2PORDM5	2PORDM4	0	1	H		16.00		16.00	1.960	1.980	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	-800	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.86		0.77	1.10	1.21
142	2PORDM4	2PORDM3	1	1	C		30.00		46.00	1.980	2.031	3.78	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	-588	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	1.21	1.43
143	2PORDM3	2PORDM2	1	1	C		30.00		76.00	2.031	2.001	3.78	9.58	2.25	0.250	0.000	0.250	18	200	200	DWC	1000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.60		0.43	1.43	1.57
144	2PORDM2	2PORDM1	1	1	C		30.00		106.00	2.001	2.117	3.78	13.36	2.25	0.348	0.000	0.348	22	200	200	DWC	-259	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.43		0.26	1.57	1.86
145	2PORDM1	ER-PORDM47	1	1	C		30.00		136.00	2.117	2.234	3.78	17.15	2.25	0.447	0.000	0.447	24	200	200	DWC	-256	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.26		0.17	1.86	2.06
146	ER-PORDM47	ERRDM48	2	1	J		24.00		215.00	2.112	2.095	3.03	27.11	2.25	0.706	0.000	0.706	30	200	200	DWC	1412	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	0.17	0.17	0.12	1.94	1.98
147	SHRDM4.2	SHRDM4.1	0	1	H		34.00		34.00	2.271	2.265	4.29	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	5667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.17		0.98	1.10	1.29
148	SHRDM4.1	SHRDM4	1	1	C		29.00		63.00	2.265	2.260	3.66	7.94	2.25	0.207	0.000	0.207	17	200	200	DWC	5800	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.98		0.82	1.29	1.44
149	SHRDM4	SHRDM3	1	1	C		48.00		111.00	2.260	2.382	6.05	14.00	2.25	0.364	0.000	0.364	22	200	200	DWC	-393	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.27	0.00	0.82		0.55	1.44	1.83
150	SHRDM3.2	SHRDM3.1	0	1	H		41.00		41.00	2.400	2.394	5.17	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	6833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.23	0.00	1.30		1.07	1.10	1.32
151	SHRDM3.1	SHRDM3	1	1	C		30.00		71.00	2.394	2.382	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	2500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.07		0.90	1.32	1.48

152	SHRDM3	SHRDM2	2	1	J		31.00		213.00	2.382	2.358	3.91	26.86	2.25	0.699	0.000	0.699	30	200	200	DWC	1292	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.55	0.550	0.49	1.83	1.87
153	SHRDM2	SHRDM1	1	1	C		44.00		257.00	2.358	2.305	5.55	32.40	2.25	0.844	0.000	0.844	33	200	200	DWC	830	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.08	0.00	0.49		0.41	1.87	1.90
154	SHRDM1	ERRDM48	1	1	C		30.00		287.00	2.300	2.236	3.78	36.19	2.25	0.942	0.000	0.942	35	200	200	DWC	469	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.41		0.35	1.89	1.89
155	ERRDM48	ER-M2RDM49	2	1	J		26.00		528.00	2.236	2.286	3.28	66.57	2.25	1.734	0.000	1.734	47	200	200	DWC	-520	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	0.12	0.120	0.07	2.12	2.22
156	M2RDM5	M2RDM4	0	1	H		30.00		30.00	2.564	2.446	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	254	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.46		1.29	1.10	1.16
157	M2RDM4	M2RDM3	1	1	C		30.00		60.00	2.446	2.328	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	254	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.29		1.12	1.16	1.21
158	M2RDM3	M2RDM2	1	1	C		30.00		90.00	2.328	2.304	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.12		0.95	1.21	1.35
159	M2RDM2	M2RDM1	1	1	C		30.00		120.00	2.304	2.280	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	1250	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.95		0.86	1.35	1.42
160	M2RDM1	ER-M2RDM49	1	1	C		30.00		150.00	2.280	2.286	3.78	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	-5000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.86		0.77	1.42	1.52
161	ER-M2RDM49	ERRDM50	2	1	J		30.00		708.00	2.286	2.622	3.78	89.27	2.25	2.325	0.000	2.325	55	200	200	DWC	-89	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.07	0.07	0.01	2.22	2.61
162	ERRDM50.2	ERRDM50.1	0	1	H		28.00		28.00	2.850	2.766	3.53	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.75		1.59	1.10	1.18
163	ERRDM50.1	ERRDM50	1	1	C		50.00		78.00	2.766	2.622	6.30	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	347	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.28	0.00	1.59		1.31	1.18	1.31
164	ERRDM50	ER-M1RDM51	2	1	J		30.00		816.00	2.622	2.300	3.78	102.88	2.25	2.679	0.000	2.679	59	200	200	DWC	93	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	0.01	0.01	-0.05	2.61	2.35
165	ER-M1RDM51	M1RDM1	2	1	J		30.00		2477.00	2.300	2.134	3.78	312.31	2.25	8.133	0.000	8.133	102	200	200	DWC	181	520	0.010	0.60	18.73	0.43	0.97	0.46	OK	0.58	OK	0.06	0.00	-0.05	-0.05	-0.11	2.35	2.24
166	M1RDM1	M1RDM2	1	1	C		30.00		2507.00	2.134	2.117	3.78	316.09	2.25	8.232	0.000	8.232	103	200	200	DWC	1765	520	0.010	0.60	18.73	0.44	0.98	0.47	OK	0.58	OK	0.06	0.00	-0.11		-0.17	2.24	2.29
167	M1RDM2	M1RDM3	1	1	C		30.00		2537.00	2.117	2.101	3.78	319.88	2.25	8.330	0.000	8.330	104	200	200	DWC	1875	520	0.010	0.60	18.73	0.44	0.98	0.47	OK	0.58	OK	0.06	0.00	-0.17		-0.23	2.29	2.33
168	M1RDM3	M1RDM4	1	1	C		30.00		2567.00	2.101	2.108	3.78	323.66	2.25	8.429	0.000	8.429	104	200	200	DWC	-4286	520	0.010	0.60	18.73	0.45	0.98	0.47	OK	0.58	OK	0.06	0.00	-0.23		-0.29	2.33	2.40
169	M1RDM4	M1RDM4.1	1	1	C		12.00		2579.00	2.108	2.123	1.51	325.17	2.25	8.468	0.000	8.468	104	200	200	DWC	-800	520	0.010	0.60	18.73	0.45	0.98	0.47	OK	0.58	OK	0.02	0.00	-0.29		-0.31	2.40	2.43
170	M1RDM4.1A	M1RDM4.1	0	1	H		25.00		25.00	2.150	2.123	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	926	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.05		0.91	1.10	1.21
171	M1RDM4.1	M1RDM5	2	1	J		19.00		2623.00	2.123	2.112	2.40	330.72	2.25	8.612	0.000	8.612	105	200	200	DWC	1727	520	0.010	0.60	18.73	0.46	0.98	0.48	OK	0.58	OK	0.04	0.00	-0.31	-0.31	-0.35	2.43	2.46
172	M1RDM5	M1RDM6	1	1	C		30.00		2653.00	2.112	2.095	3.78	334.50	2.25	8.711	0.000	8.711	106	200	200	DWC	1765	520	0.010	0.60	18.73	0.46	0.98	0.48	OK	0.58	OK	0.06	0.00	-0.35		-0.41	2.46	2.51
173	M1RDM6.1	M1RDM6	0	1	H		40.00		40.00	2.090	2.095	5.04	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	-8000	520	0.010	0.60	18.73	0.01	0.30	0.07	OK	0.18	Check	0.08	0.00	0.99		0.91	1.10	1.19
174	M1RDM6	M1RDM7	2	1	J		30.00		2723.00	2.095	2.030	3.78	343.33	2.25	8.941	0.000	8.941	107	200	200	DWC	462	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.06	0.00	-0.41	-0.41	-0.47	2.51	2.50
175	M1RDM7.2	M1RDM7.1	0	1	H		42.00		42.00	2.650	2.160	5.30	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	86	86	0.010	1.46	46.07	0.00	0.30	0.07	OK	0.44	OK	0.49	0.00	1.55		1.06	1.10	1.10
176	M1RDM7.1	M1RDM7	1	1	C		16.00		58.00	2.160	2.030	2.02	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	123	125	0.010	1.21	38.21	0.00	0.30	0.07	OK	0.36	OK	0.13	0.00	1.06		0.93	1.10	1.10
177	M1RDM7	M1RDM8	2	1	J		30.00		2811.00	2.030	1.961	3.78	354.42	2.25	9.230	0.000	9.230	109	200	200	DWC	435	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.06	0.00	-0.47	-0.47	-0.53	2.50	2.49
178	M1RDM8	M1RDM9	1	1	C		40.00		2851.00	1.961	1.850	5.04	359.47	2.25	9.361	0.000	9.361	110	200	200	DWC	360	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.08	0.00	-0.53		-0.61	2.49	2.46
179	M1RDM9	M1RDM10	1	1	C		50.00		2901.00	1.850	1.753	6.30	365.77	2.25	9.525	0.000	9.525	111	200	200	DWC	515	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.10	0.00	-0.61		-0.71	2.46	2.46
180	M1RDM10.2	M1RDM10.1	0	1	H		24.00		24.00	1.861	1.690	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	140	140	0.010	1.15	36.11	0.00	0.30	0.07	OK	0.34	OK	0.17	0.00	0.76		0.59	1.10	1.10
181	M1RDM10.1	M1RDM10	1	1	C		30.00		54.00	1.690	1.753	3.78	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	-476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.59		0.42	1.10	1.33
182	M1RDM10	M1RDM11	2	1	J		30.00		2985.00	1.753	1.618	3.78	376.36	2.25	9.801	0.000	9.801	112	200	200	DWC	222	520	0.010	0.60	18.73	0.52	1.01	0.52	OK	0.60	OK	0.06	0.00	-0.71	-0.71	-0.77	2.46	2.39
183	M1RDM11	M1RDM12	1	1	C		24.00		3009.00	1.618	1.524	3.03	379.39	2.25	9.880	0.000	9.880	113	200	200	DWC	255	520	0.010	0.60	18.73	0.53	1.02	0.52	OK	0.61	OK	0.05	0.00	-0.77		-0.82	2.39	2.34
184	M1RDM12	SNRDMH26	1	1	C		40.00		3049.00	1.524	1.922	5.04	384.43	2.25	10.011	0.000	10.011	113	200	200	DWC	-101	520	0.010	0.60	18.73	0.53	1.02	0.52	OK	0.61	OK	0.08	0.00	-0.82		-0.90	2.34	2.82
185	SNRDMH26	SNRDMH27	1	1	C		30.00		3079.00	1.922	1.930	3.78	388.21	2.25	10.110	0.000	10.110	114	200	200	DWC	-3750	520	0.010	0.60	18.73	0.54	1.02	0.53	OK	0.61	OK	0.06	0.00	-0.90		-0.96	2.82	2.89
186	SNRDMH27	SNRDMH28	1	1	C		30.00		3109.00	1.930	1.989	3.78	392.00	2.25	10.208	0.000	10.208	115	200	200	DWC	-508	520	0.010	0.60	18.73	0.54	1.02	0.53	OK	0.61	OK	0.06	0.00	-0.96		-1.02	2.89	3.01
187	SNRDMH28	SNRDMH29	1	1	C		5.00		3114.00	1.989	2.041	0.63	392.63	2.25	10.225	0.000	10.225	115	200	200	DWC	-96	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.01	0.00	-1.02		-1.03	3.01	3.07
188	SNRDMH29	SNRDMH30	1	1	C		15.00		3129.00	2.041	2.053	1.89	394.52	2.25	10.274	0.000	10.274	115	200	200	DWC	-1250	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.03	0.00	-1.03		-1.06	3.07	3.11
189	SNRDMH30	SNRDMH31	1	1	C		25.00		3154.00	2.053	2.071	3.15	397.67	2.25	10.356	0.000	10.356	115	200	200	DWC	-1389	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.05	0.00	-1.06		-1.11	3.11	3.18
190	SNRDMH31	SNRDMH32	1	1	C		20.00		3174.00	2.071	1.994	2.52	400.19	2.25	10.422	0.000	10.422	116	200	200	DWC	260	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.04	0.00	-1.11		-1.15	3.18	3.14
191	SNRDMH32	SNRDMH33	1	1	C		20.00		3194.00	1.994	2.052	2.52	402.71	2.25	10.487	0.000	10.487	116	200	200	DWC	-345	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.04	0.00	-1.15		-1.19	3.14	3.24
192	SNRDMH33	SNRDMH34L	1	0	C	L	30.00		3224.00	2.052	2.054	3.78	406.49	2.25	10.586	0.000	10.586	117	200	200	DWC	-15000	520	0.010	0.60	18.73	0.57	1.03	0.54	OK	0.61	OK	0.06	0.00	-1.19		-1.25	3.24	3.30
193	SNRDMH34	SNRDMH8	0	1	H		15.00	3224	3239.00	2.054	2.054	1.89	408.39	2.25	10.635	0.000	10.635	117	200	200	DWC	0	180	0.010	1.01	31.84	0.33	0.90	0.40	OK	0.91	OK	0.08	0.00	0.95		0.87	1.10	1.18
194	SNRDMH8	SNRDMH9	2	1	J		29.00		4935.00	2.054	2.145	3.66	622.22	2.25	16.204	0.000	16.204	144	250	250	DWC	-319	700	0.010	0.60	29.28	0.55	1.02	0.53	OK	0.61	OK	0.04	0.00	-0.53	-0.530	-0.57	2.58	2.72
195	SNRDMH25	SNRDMH24	0	1	H		11.00		11.00	1.909	1.939	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	-367	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	0.81		0.75	1.10	1.19
196	SNRDMH24	SNRDMH23	1	1	C		15.00		26.00	1.939	1.880	1.89	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	254	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.75		0.67	1.19	1.21
197	SNRDMH23	SNRDMH22	1	1	C		20.00		46.00	1.880	1.834	2.52	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	435	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.67		0.56	1.21	1.27
198	SNRDMH22	SNRDMH21	1	1	C		20.00		66.00	1.834	1.793	2.52	8.32	2.25	0.217	0.000	0.217	17	200	200	DWC	488	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.56		0.45	1.27	1.34
199	SNRDMH21	SNRDMH20	1	1	C		7.00		73.00	1.793	1.832	0.88	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	-179	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	0.45		0.41	1.34	1.42
200	SNRDMH20	SNRDMH19	1	1	C		10.00		83.00	1.832	1.791	1.26	10.46	2.25	0.273	0.000	0.273	19	200	200	DWC	244	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.41		0.35	1.42	1.44
201	SNRDMH19	SNRDMH18	1	1	C		30.00		113.00	1.791	1.962	3.78	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	-175	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.35		0.18	1.44	1.78
202	SNRDMH18	SNRDMH17	1	1	C		30.00		143.00	1.962	1.912	3.78	18.03	2.25	0.470	0.000	0.470	25	200	200	DWC	600	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.18		0.09	1.78	1.82
203	SNRDMH17	SNRDMH16	1	1	C		30.00		173.00	1.912	2.022	3.78	21.81	2.25	0.568	0.000	0.568	27	200	200	DWC	-273	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.09		0.02	1.82	2.00
204	SNRDMH16	SNRDMH15	1	1	C		20.00		193.00	2.022	2.091	2.52	24.33	2.25	0.634	0.000	0.634	29	200	200	DWC	-290	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.02		-0.03	2.00	2.12
205	SNRDMH15	SNRDMH14	1	1	C		7.00		200.00	2.091	2.129	0.88	25.22	2.25	0.657	0.000	0.657	29	200	200	DWC	-184	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	-0.03		-0.05	2.12	2.18
206	SNRDMH14	SNRDMH13	1	1	C		20.00		220.00	2.129	1.993	2.52	27.74	2.25	0.722	0.000	0.722	31	200	200	DWC	147	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.05		-0.10	2.18	2.09
207	SNRDMH13	SNRDMH12	1	1	C		30.00		250.00	1.993	2.082	3.78	31.52	2.25	0.821	0.000	0.821	33	200	200	DWC	-337	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.10		-0.16	2.09	2.24
208	SNRDMH31.1	SNRDMH31.2	0	1	H		15.00		15.00	2.053	2.035	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.95		0.87	1.10	1.17
209	SNRDMH31.2	SNRDMH31.3	1	1	C		30.00		45.00	2.035	1.994	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	732	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.87		0.70	1.17	1.29
210	SNRDMH31.3	SNRDMH31.4	1	1	C		30.00		75.00	1.994	1.958	3.78	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.70		0.53	1.29	1.43
211	SNRDMH31.4	SNRDMH24.2	1	1	C		7.00		82.00	1.958	1.952	0.88	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	1167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	0.53		0.49	1.43	1.46
212	SNRDMH24.2	SNRDMH24.3	1	1	C		21.00		103.00	1.952	2.112	2.65	12.99	2.25	0.338	0.000	0.338	21	200	200	DWC	-131	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.49		0.37	1.46	1.74
213	SNRDMH24.3	SNRDMH24.4	1	1	C		20.00		123.00	2.112	2.010	2.52	15.51	2.25	0.404	0.000	0.404	23	200	200	DWC	196	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.37		0.31	1.74	1.70
214	SNRDMH33.1	SNRDMH33.2	0	1	H		15.00		15.00	2.053	2.133	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.95		0.87	1.10	1.26
215	SNRDMH33.2	SNRDMH33.3	1	1	C		30.00		45.00	2.133	1.966	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	180	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.87		0.70	1.26	1.27
216	SNRDMH33.3	SNRDMH33.4	1	1	C		30.00		75.00	1.966	1.995	3.78	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	-1034	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.70		0.53	1.27	1.47
217	SNRDMH33.4	SNRDMH24.4	1	1	C		11.00		86.00	1.995	2.010	1.39	10.84	2.25	0.282	0.000	0.282	19	200	200	DWC	-733	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.53		0.47	1.47	1.54
218	SNRDMH24.4	SNRDMH24.5	2	1	J		25.00		234.00	2.010	2.062	3.15	29.50	2.25	0.768	0.000	0.768	32	200	200	DWC	-481	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	0.31	0.310	0.26	1.70	1.80
219	SNRDMH24.5	SNRDMH12	1	1	C		17.00		251.00	2.062	2.082	2.14	31.65	2.25	0.824	0.000	0.824	33	200	200	DWC	-850	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	0.26		0.23	1.80	1.85
220	SNRDMH12	SNRDMH11	2	1	J		20.00		521.00	2.082	2.047	2.52	65.69	2.25	1.711	0.000	1.711	47	200	200	DWC	571	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	-0.16	-0.160	-0.20	2.24	2.25
221	SNRDMH11	SNRDMH10	1	1	C		30.00		551.00	2.047	2.145	3.78	69.47	2.25	1.809	0.000	1.809	49	200	200	DWC	-306	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.20		-0.26	2.25	2.41
222	SNRDMH10	SNRDMH9	1	1	C		30.00		581.00	2.145	2.145	3.78	73.25	2.25	1.908	0.000	1.908	50	200	200	DWC	0	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.26		-0.32	2.41	2.47
223	SNRDMH9	CHRDMH15.9	2	1	J		26.00		5542.00	2.145	2.270	3.28	698.76	2.25	18.197	0.000	18.197	153	250	250	DWC	-208	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.04	0.00	-0.57	-0.570	-0.61	2.72	2.88
224	CHRDMH15.9	CHRDMH15.8	1	1	C		10.00		5552.00	2.270	2.316	1.26	700.02	2.25	18.230	0.000	18.230	153	250	250	DWC	-217	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.01	0.00	-0.61		-0.62	2.88	2.94
225	CHRDMH15.8	CHRDMH15.7	1	1	C		7.00		5559.00	2.316	2.348	0.88	700.90	2.25	18.253	0.000	18.253	153	250	250	DWC	-217	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.01	0.00	-0.62		-0.63	2.94	2.98
226	CHRDMH15.7	CHRDMH15.6	1	1	C		10.00		5569.00	2.348	2.387	1.26	702.16	2.25	18.285	0.000	18.285	153	250	250	DWC	-256	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.01	0.00	-0.63		-0.64	2.98	3.03
227	CHRDMH15.6	CHRDMH15.5	1	1	C		10.00		5579.00	2.387	2.418	1.26	703.42	2.25	18.318	0.000	18.318	153	250	250	DWC	-323	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.01	0.00	-0.64		-0.65	3.03	3.07
228	CHRDMH15.5	CHRDMH15.4	1	1	C		30.00		5609.00	2.418	2.642	3.78	707.21	2.25	18.417	0.000	18.417	154	250	250	DWC	-134	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.04	0.00	-0.65		-0.69	3.07	3.33
229	CHRDMH15.4	CHRDMH15.3	1	1	C		30.00		5639.00	2.642	3.083	3.78	710.99	2.25	18.515	0.000	18.515	154	250	250	DWC	-68	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.04	0.00	-0.69		-0.73	3.33	3.81
230	CHRDMH19	CHRDMH19.1	0	1	H		27.00		27.00	4.633	4.174	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	59	59	0.010	1.77	55.62	0.00	0.30	0.07	OK	0.53	OK	0.46	0.00	3.53		3.07	1.10	1.10

231	CHRDMH19.1	CHRDMH19.2	1	1	C		28.00		55.00	4.174	3.720	3.53	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	62	62	0.010	1.72	54.26	0.00	0.30	0.07	OK	0.52	OK	0.45	0.00	3.07		2.62	1.10	1.10
232	CHRDMH19.2	CHRDMH15.3.1.2	1	1	C		30.00		85.00	3.720	3.557	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	184	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.62		2.45	1.10	1.11
233	CHRDMH15.3.1.2	CHRDMH15.3.1	1	1	C		30.00		115.00	3.557	3.320	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	127	132	0.010	1.18	37.18	0.01	0.30	0.07	OK	0.35	OK	0.23	0.00	2.45		2.22	1.11	1.10
234	CHRDMH15.3.1	CHRDMH15.3	1	1	C		30.00		145.00	3.320	3.083	3.78	18.28	2.25	0.476	0.000	0.476	25	200	200	DWC	127	127	0.010	1.20	37.91	0.01	0.30	0.07	OK	0.36	OK	0.24	0.00	2.22		1.98	1.10	1.10
235	CHRDMH15.3	CHRDMH15.2	2	1	J		20.00		5804.00	3.083	3.555	2.52	731.79	2.25	19.057	0.000	19.057	156	250	250	DWC	700	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.03	0.00	-0.73	-0.730	-0.76	3.81	4.32
236	CHRDMH15.2	CHRDMH15.1	1	1	C		15.00		5819.00	3.555	3.935	1.89	733.68	2.25	19.106	0.000	19.106	157	250	250	DWC	700	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.02	0.00	-0.76		-0.78	4.32	4.72
237	CHRDMH15.1	CHRDMH15	1	1	C		8.00		5827.00	3.935	4.120	1.01	734.69	2.25	19.133	0.000	19.133	157	250	250	DWC	700	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.01	0.00	-0.78		-0.79	4.72	4.91
238	CHRDMH15	CHRDM14	1	1	C		29.00		5856.00	4.120	3.913	3.66	738.35	2.25	19.228	0.000	19.228	157	250	250	DWC	700	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.04	0.00	-0.79		-0.83	4.91	4.74
239	CHRDM14	CHRDM13	1	1	C		20.00		5876.00	3.913	3.700	2.52	740.87	2.25	19.293	0.000	19.293	157	250	250	DWC	700	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.03	0.00	-0.83		-0.86	4.74	4.56
240	CHRDM13.5	CHRDM13.4	0	1	H		10.00		10.00	2.552	2.673	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	700	700	0.010	0.51	16.15	0.00	0.30	0.07	OK	0.15	Check	0.01	0.00	1.45		1.44	1.10	1.23
241	CHRDM13.4	CHRDM13.3	1	1	C		10.00		20.00	2.673	3.029	1.26	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-28	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.44		1.38	1.23	1.65
242	CHRDM13.3	CHRDM13.2	1	1	C		30.00		50.00	3.029	3.160	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-229	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.38		1.21	1.65	1.95
243	CHRDM13.2	CHRDM13.1	1	1	C		10.00		60.00	3.160	3.460	1.26	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-33	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	1.21		1.15	1.95	2.31
244	CHRDM13.1	CHRDM13	1	1	C		30.00		90.00	3.460	3.700	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-125	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.15		0.98	2.31	2.72
245	CHRDM13	CHRDM12	2	1	J		30.00		5996.00	3.700	3.742	3.78	756.00	2.25	19.687	0.000	19.687	159	250	250	DWC	-714	700	0.010	0.60	29.28	0.67	1.07	0.60	OK	0.64	OK	0.04	0.00	-0.86	-0.860	-0.90	4.56	4.64
246	CHRDM12.3	CHRDM12.2	0	1	H		30.00		30.00	3.084	3.201	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-256	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.98		1.81	1.10	1.39
247	CHRDM12.2	CHRDM12.1	1	1	C		30.00		60.00	3.201	3.473	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-110	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.81		1.64	1.39	1.83
248	CHRDM12.1	CHRDM12	1	1	C		30.00		90.00	3.473	3.742	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-112	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.64		1.47	1.83	2.27
249	CHRDM12	CH-GPRDM11	2	1	J		30.00		6116.00	3.742	3.884	3.78	771.13	2.25	20.082	0.000	20.082	160	250	250	DWC	-211	700	0.010	0.60	29.28	0.69	1.08	0.61	OK	0.64	OK	0.04	0.00	-0.90	-0.900	-0.94	4.64	4.82
250	GPRDM7	GPRDM6	0	1	H		25.00		25.00	3.694	3.943	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-100	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.59		2.45	1.10	1.49
251	GPRDM6	GPRDM5	1	1	C		30.00		55.00	3.943	4.032	3.78	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	-337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.45		2.28	1.49	1.75
252	GPRDM5	GPRDM4	1	1	C		5.00		60.00	4.032	4.002	0.63	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.28		2.25	1.75	1.75
253	GPRDM4	GPRDM3	1	1	C		10.00		70.00	4.002	4.098	1.26	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	-104	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	2.25		2.19	1.75	1.91
254	GPRDM3	GPRDM2	1	1	C		5.00		75.00	4.098	4.110	0.63	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	-417	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.19		2.16	1.91	1.95
255	GPRDM2	GPRDM1	1	1	C		20.00		95.00	4.110	4.150	2.52	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	-500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.16		2.05	1.95	2.10
256	GPRDM1	CH-GPRDM11	1	1	C		30.00		125.00	4.150	3.884	3.78	15.76	2.25	0.410	0.000	0.410	23	200	200	DWC	113	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.05		1.96	2.10	1.92
257	CH-GPRDM11	CHRDM10	2	1	J		15.00		6256.00	3.884	3.817	1.89	788.78	2.25	20.541	0.000	20.541	162	250	250	DWC	224	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.02	0.00	-0.94	-0.940	-0.96	4.82	4.78
258	CHRDM10	CHRDM9	1	1	C		17.00		6273.00	3.817	3.830	2.14	790.92	2.25	20.597	0.000	20.597	162	250	250	DWC	-1308	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.02	0.00	-0.96		-0.98	4.78	4.81
259	CHRDM9.4	CHRDM9.3	0	1	H		14.00		14.00	3.572	3.525	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	298	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.47		2.39	1.10	1.14
260	CHRDM9.3	CHRDM9.2	1	1	C		30.00		44.00	3.525	3.479	3.78	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	652	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.39		2.22	1.14	1.26
261	CHRDM9.2	CHRDM9.1	1	1	C		30.00		74.00	3.479	3.562	3.78	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	-361	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.22		2.05	1.26	1.51
262	CHRDM9.1	CHRDM9	1	1	C		30.00		104.00	3.562	3.830	3.78	13.11	2.25	0.341	0.000	0.341	21	200	200	DWC	-112	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.05		1.88	1.51	1.95
263	CHRDM9	CHRDM9A	2	1	J		14.00		6391.00	3.830	3.830	1.77	805.80	2.25	20.984	0.000	20.984	164	250	250	DWC	0	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.02	0.00	-0.98	-0.980	-1.00	4.81	4.83
264	CHRDM9A	CHUSRDM8	1	1	C		20.00		6411.00	3.830	3.902	2.52	808.32	2.25	21.050	0.000	21.050	164	250	250	DWC	-278	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.03	0.00	-1.00		-1.03	4.83	4.93
265	USRDM6	USRDM5	0	1	H		24.00		24.00	3.642	3.527	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	209	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.54		2.41	1.10	1.12
266	USRDM5.2	USRDM5.1	0	1	H		18.00		18.00	3.820	3.806	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	1286	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.72		2.62	1.10	1.19
267	USRDM5.1	USRDM5	1	1	C		5.00		23.00	3.806	3.527	0.63	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	18	25	0.010	2.71	85.44	0.00	0.30	0.07	OK	0.81	OK	0.20	0.00	2.62		2.42	1.19	1.11
268	USRDM5	USRDM4	2	1	J		20.00		67.00	3.527	3.584	2.52	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-351	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.41	2.410	2.30	1.12	1.28
269	USRDM4	USRDM3	1	1	C		16.00		83.00	3.584	3.641	2.02	10.46	2.25	0.273	0.000	0.273	19	200	200	DWC	-281	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.30		2.21	1.28	1.43
270	USRDM3	USRDM2	1	1	C		30.00		113.00	3.641	3.714	3.78	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	-411	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.21		2.12	1.43	1.59
271	USRDM2	USRDM1	1	1	C		30.00		143.00	3.714	3.803	3.78	18.03	2.25	0.470	0.000	0.470	25	200	200	DWC	-337	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.12		2.03	1.59	1.77
272	USRDM1	CHUSRDM8	1	1	C		6.00		149.00	3.803	3.902	0.76	18.79	2.25	0.489	0.000	0.489	25	200	200	DWC	-61	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	2.03		2.01	1.77	1.89
273	CHRDM8.3	CHRDM8.2	0	1	H		17.00		17.00	2.871	3.019	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	-115	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.77		1.68	1.10	1.34
274	CHRDM8.2	CHRDM8.1	1	1	C		25.00		42.00	3.019	3.168	3.15	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	-168	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.68		1.54	1.34	1.63
275	CHRDM8.1	CHUSRDM8	1	1	C		25.00		67.00	3.168	3.902	3.15	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-34	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.54		1.40	1.63	2.50
276	CHUSRDM8	CHRDM7	3	1	J		20.00		6647.00	3.902	4.345	2.52	838.08	2.25	21.825	0.000	21.825	167	250	250	DWC	-45	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.03	0.00	1.40	1.400	1.37	2.50	2.98
277	CHRDM7	CHRDM6	1	1	C		30.00		6677.00	4.345	4.660	3.78	841.86	2.25	21.924	0.000	21.924	168	250	250	DWC	-95	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.04	0.00	1.37		1.33	2.98	3.33
278	CHRDM6	CHRDM5	1	1	C		15.00		6692.00	4.660	4.558	1.89	843.75	2.25	21.973	0.000	21.973	168	250	250	DWC	147	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.02	0.00	1.33		1.31	3.33	3.25
279	CHRDM5.2	CHRDM5.1	0	1	H		24.00		24.00	3.473	4.068	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-40	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.37		2.24	1.10	1.83
280	CHRDM5.1	CHRDM5	1	1	C		30.00		54.00	4.068	4.558	3.78	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	-61	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.24		2.07	1.83	2.49
281	CHRDM5	CHRDM4	2	1	J		12.00		6758.00	4.558	4.551	1.51	852.08	2.25	22.189	0.000	22.189	169	250	250	DWC	1714	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.02	0.00	1.31	1.310	1.29	3.25	3.26
282	CHRDM4	CHRDM3	1	1	C		15.00		6773.00	4.551	4.310	1.89	853.97	2.25	22.239	0.000	22.239	169	250	250	DWC	62	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.02	0.00	1.29		1.27	3.26	3.04
283	CHRDM3	CHRDM2	1	1	C		15.00		6788.00	4.310	4.166	1.89	855.86	2.25	22.288	0.000	22.288	169	250	250	DWC	104	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.02	0.00	1.27		1.25	3.04	2.92
284	CHRDM2	CHRDM1	1	1	C		20.00		6808.00	4.166	4.131	2.52	858.38	2.25	22.354	0.000	22.354	169	250	250	DWC	571	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.03	0.00	1.25		1.22	2.92	2.91
285	CHRDM1	MTRDM8	1	1	C		10.00		6818.00	4.131	4.096	1.26	859.64	2.25	22.386	0.000	22.386	169	250	250	DWC	286	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.01	0.00	1.22		1.21	2.91	2.89
286	MNCRDM5.17	MNCRDM5.16	0	1	H		30.00		30.00	4.493	4.050	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	68	68	0.010	1.65	51.81	0.00	0.30	0.07	OK	0.49	OK	0.44	0.00	3.39		2.95	1.10	1.10
287	MNCRDM5.16	MNCRDM5.15	1	1	C		30.00		60.00	4.050	3.948	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	294	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.95		2.78	1.10	1.17
288	MNCRDM5.15	MNCRDM5.14	1	1	C		15.00		75.00	3.948	3.872	1.89	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	197	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.78		2.70	1.17	1.17
289	MNCRDM5.14	MNCRDM5.13	1	1	C		30.00		105.00	3.872	3.913	3.78	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-732	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.70		2.53	1.17	1.38
290	MNCRDM5.13	MNCRDM5.12	1	1	C		5.00		110.00	3.913	3.832	0.63	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	62	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.53		2.50	1.38	1.33
291	MNCRDM5.12	MNCRDM5.11	1	1	C		27.00		137.00	3.832	3.724	3.40	17.27	2.25	0.450	0.000	0.450	24	200	200	DWC	250	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.50		2.42	1.33	1.30
292	MNCRDM5.11	MNCRDM5.10	1	1	C		10.00		147.00	3.724	3.639	1.26	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	118	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	2.42		2.39	1.30	1.25
293	MNCRDM5.10	MNCRDM5.9	1	1	C		15.00		162.00	3.639	3.653	1.89	20.43	2.25	0.532	0.000	0.532	27	200	200	DWC	-1071	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	2.39		2.34	1.25	1.31
294	MNCRDM5.9.3	MNCRDM5.9.2	0	1	H		27.00		27.00	3.823	3.714	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	248	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.72		2.57	1.10	1.14
295	MNCRDM5.9.2	MNCRDM5.9.1	1	1	C		30.00		57.00	3.714	3.683	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.57		2.40	1.14	1.28
296	MNCRDM5.9.1	MNCRDM5.9	1	1	C		15.00		72.00	3.683	3.653	1.89	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.40		2.32	1.28	1.33
297	MNCRDM5.9	MNCRDM5.8	2	1	J		10.00		244.00	3.653	3.665	1.26	30.76	2.25	0.801	0.000	0.801	32	200	200	DWC	-833	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.02	0.00	2.32	2.320	2.30	1.33	1.37
298	MNCRDM5.8	MNCRDM5.7	1	1	C		25.00		269.00	3.665	3.507	3.15	33.92	2.25	0.883	0.000	0.883	34	200	200	DWC	158	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.30		2.25	1.37	1.26
299	MNCRDM5.7	MNCRDM5.6	1	1	C		20.00		289.00	3.507	3.429	2.52	36.44	2.25	0.949	0.000	0.949	35	200	200	DWC	256	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	2.25		2.21	1.26	1.22
300	MNCRDM5.6	MNCRDM5.5	1	1	C		25.00		314.00	3.429	3.605	3.15	39.59	2.25	1.031	0.000	1.031	37	200	200	DWC	-142	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	2.21		2.16	1.22	1.45
301	MNCRDM5.5	MNCRDM5.4	1	1	C		5.00		319.00	3.605	3.605	0.63	40.22	2.25	1.047	0.000	1.047	37	200	200	DWC	0	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.01	0.00	2.16		2.15	1.45	1.46
302	MNCRDM5.4.2	MNCRDM5.4.1	0	1	H		8.00		8.00	3.564	3.584	1.01	1.01	2.25	0.026	0.000	0.026	6	200	200	DWC	-400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	2.46		2.42	1.10	1.16
303	MNCRDM5.4.1	MNCRDM5.4	1	1	C		20.00		28.00	3.584	3.605	2.52	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	-952	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.42		2.31	1.16	1.30
304	MNCRDM5.4	MNCRDM5.3	2	1	J		15.00		362.00	3.605	3.337	1.89	45.64	2.25	1.189	0.000	1.189	39	200	200	DWC	56	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	2.15	2.150	2.12	1.46	1.22
305	MNCRDM5.3	MNCRDM5.2	1	1	C		20.00		382.00	3.337	3.287	2.52	48.16	2.25	1.254	0.000	1.254	40	200	200	DWC	400	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	2.12		2.08	1.22	1.21
306	MNCRDM5.2	MNCRDM5.1	1	1	C		20.00		402.00	3.287	3.085	2.52	50.69	2.25	1.320	0.000	1.320	42	200	200	DWC	99	200	0.010	0.96	30.21	0.04	0.51	0.15	OK	0.49	OK	0.10	0.00	2.08		1.98	1.21	1.11
307	MNCRDM5.1	MNCRDM5	1	1	C		10.00		412.00	3.085	3.082	1.26	51.95	2.25	1.353	0.000	1.353	42	200	200	DWC	3333	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	1.98		1.96	1.11	1.12
308	MNCRDM14	MNCRDM13	0	1	H		10.00		10.00	4.340	4.236	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	96	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.11	0.00	3.24		3.13	1.10	1.11
309	MNCRDM13	MNCRDM12	1	1	C		15.00		25.00	4.236	4.134	1.89	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	147	155	0.010	1.09	34.32	0.00	0.30	0.07	OK	0.33	OK	0.10	0.00	3.13		3.03	1.11	1.10

310	MNCRDM12	MNCRDM11	1	1	C		15.00		40.00	4.134	4.050	1.89	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	179	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.09	0.00	3.03		2.94	1.10	1.11
311	MNCRDM11	MNCRDM10	1	1	C		10.00		50.00	4.050	3.760	1.26	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	34	35	0.010	2.29	72.21	0.00	0.30	0.07	OK	0.69	OK	0.29	0.00	2.94		2.65	1.11	1.11
312	MNCRDM10	MNCRDM9	1	1	C		30.00		80.00	3.760	3.640	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.65		2.48	1.11	1.16
313	MNCRDM9	MNCRDM8	1	1	C		20.00		100.00	3.640	3.316	2.52	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	62	75	0.010	1.57	49.33	0.01	0.30	0.07	OK	0.47	OK	0.27	0.00	2.48		2.21	1.16	1.11
314	MNCRDM8	MNCRDM7	1	1	C		15.00		115.00	3.316	3.274	1.89	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	357	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.05	0.00	2.21		2.16	1.11	1.11
315	MNCRDM7	MNCRDM6	1	1	C		20.00		135.00	3.274	3.181	2.52	17.02	2.25	0.443	0.000	0.443	24	200	200	DWC	215	250	0.010	0.86	27.02	0.02	0.40	0.10	OK	0.34	OK	0.08	0.00	2.16		2.08	1.11	1.10
316	MNCRDM6	MNCRDM5	1	1	C		30.00		165.00	3.181	3.082	3.78	20.80	2.25	0.542	0.000	0.542	27	200	200	DWC	303	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.08		1.98	1.10	1.10
317	MNCRDM5	MNCRDM4	2	1	J		21.00		598.00	3.082	3.171	2.65	75.40	2.25	1.963	0.000	1.963	51	200	200	DWC	520	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	1.96	1.960	1.92	1.12	1.25
318	MNCRDM4	MNCRDM3	1	1	C		20.00		618.00	3.171	3.258	2.52	77.92	2.25	2.029	0.000	2.029	51	200	200	DWC	520	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	1.92		1.88	1.25	1.38
319	MNCRDM3	MNCRDM2	1	1	C		20.00		638.00	3.258	3.382	2.52	80.44	2.25	2.095	0.000	2.095	52	200	200	DWC	520	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	1.88		1.84	1.38	1.54
320	MNCRDM2	MNCRDM1	1	1	C		30.00		668.00	3.382	4.730	3.78	84.22	2.25	2.193	0.000	2.193	53	200	200	DWC	520	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	1.84		1.78	1.54	2.95
321	MNCRDM1	PNKRDM41	1	1	C		30.00		698.00	4.730	4.610	3.78	88.01	2.25	2.292	0.000	2.292	55	200	200	DWC	520	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	1.78		1.72	2.95	2.89
322	PNKRDM41	PNK-MNCRDM40	1	1	C		13.00		711.00	4.610	4.645	1.64	89.65	2.25	2.335	0.000	2.335	55	200	200	DWC	520	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.03	0.00	1.72		1.69	2.89	2.96
323	PNK-MNCRDM40	PNKRDM39	1	1	C		25.00		736.00	4.645	4.651	3.15	92.80	2.25	2.417	0.000	2.417	56	200	200	DWC	520	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	1.69		1.64	2.96	3.01
324	PNKRDM39	PNKRDM38	1	1	C		20.00		756.00	4.651	4.658	2.52	95.32	2.25	2.482	0.000	2.482	57	200	200	DWC	520	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	1.64		1.60	3.01	3.06
325	1CKRDM15	1CKRDM14	0	1	H		24.00		24.00	3.653	3.333	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	75	75	0.010	1.57	49.33	0.00	0.30	0.07	OK	0.47	OK	0.32	0.00	2.55		2.23	1.10	1.10
326	1CKRDM14	1CKRDM13	1	1	C		20.00		44.00	3.333	3.190	2.52	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	140	145	0.010	1.13	35.48	0.00	0.30	0.07	OK	0.34	OK	0.14	0.00	2.23		2.09	1.10	1.10
327	1CKRDM13	1CKRDM12	1	1	C		10.00		54.00	3.190	3.145	1.26	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	222	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	2.09		2.03	1.10	1.12
328	1CKRDM12	1CKRDM11	1	1	C		41.00		95.00	3.145	3.078	5.17	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	612	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.23	0.00	2.03		1.80	1.12	1.28
329	1CKRDM11	1CKRDM10	1	1	C		20.00		115.00	3.078	3.104	2.52	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	320	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.80		1.74	1.28	1.36
330	1CKRDM10	1CKRDM9	1	1	C		15.00		130.00	3.104	3.086	1.89	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	320	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	1.74		1.69	1.36	1.40
331	1CKRDM9	1CKRDM8	1	1	C		30.00		160.00	3.086	2.903	3.78	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	164	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.69		1.60	1.40	1.30
332	1CKRDM8	1CKRDM7	1	1	C		15.00		175.00	2.903	2.988	1.89	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	-176	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	1.60		1.56	1.30	1.43
333	1CKRDM7	1CKRDM6	1	1	C		30.00		205.00	2.988	3.350	3.78	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	-83	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.56		1.49	1.43	1.86
334	1CKRDM6	1CKRDM5	1	1	C		25.00		230.00	3.350	3.941	3.15	29.00	2.25	0.755	0.000	0.755	32	200	200	DWC	-42	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	1.49		1.44	1.86	2.50
335	1CKRDM5	1CKRDM4	1	1	C		30.00		260.00	3.941	4.622	3.78	32.78	2.25	0.854	0.000	0.854	33	200	200	DWC	-44	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.44		1.38	2.50	3.24
336	1CKRDM4	1CKRDM3	1	1	C		10.00		270.00	4.622	4.736	1.26	34.04	2.25	0.887	0.000	0.887	34	200	200	DWC	-88	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	1.38		1.36	3.24	3.38
337	1CKRDM3.2	1CKRDM3.1	0	1	H		18.00		18.00	4.832	4.710	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	148	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.12	0.00	3.73		3.61	1.10	1.10
338	1CKRDM3.1	1CKRDM3	1	1	C		15.00		33.00	4.710	4.736	1.89	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	-577	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.61		3.53	1.10	1.21
339	1CKRDM3	1CKRDM2	2	1	J		25.00		328.00	4.736	4.651	3.15	41.36	2.25	1.077	0.000	1.077	38	200	200	DWC	294	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	1.36	1.360	1.31	3.38	3.34
340	1CKRDM2	1CKRDM1	1	1	C		30.00		358.00	4.651	4.573	3.78	45.14	2.25	1.175	0.000	1.175	39	200	200	DWC	385	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	1.31		1.25	3.34	3.32
341	1CKRDM1	PNKRDM38	1	1	C		10.00		368.00	4.573	4.658	1.26	46.40	2.25	1.208	0.000	1.208	40	200	200	DWC	-118	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	1.25		1.23	3.32	3.43
342	PNKRDM38	PNKRDM37	2	1	J		20.00		1144.00	4.658	4.646	2.52	144.24	2.25	3.756	0.000	3.756	70	200	200	DWC	1667	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.04	0.00	1.23	1.230	1.19	3.43	3.46
343	PNKRDM37	PNKRDM37A	1	1	C		20.00		1164.00	4.646	4.639	2.52	146.76	2.25	3.822	0.000	3.822	70	200	200	DWC	2857	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.04	0.00	1.19		1.15	3.46	3.49
344	PNKRDM37A	PNKRDM36	1	1	C		30.00		1194.00	4.639	4.622	3.78	150.54	2.25	3.920	0.000	3.920	71	200	200	DWC	1765	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.06	0.00	1.15		1.09	3.49	3.53
345	PNKRDM36	PNKRDM35	1	1	C		25.00		1219.00	4.622	4.940	3.15	153.70	2.25	4.003	0.000	4.003	72	200	200	DWC	-79	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.05	0.00	1.09		1.04	3.53	3.90
346	PNKRDM35	PNKRDM34	1	1	C		30.00		1249.00	4.940	5.270	3.78	157.48	2.25	4.101	0.000	4.101	73	200	200	DWC	-91	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.06	0.00	1.04		0.98	3.90	4.29
347	PNKRDM34	PNKRDM33	1	1	C		25.00		1274.00	5.270	4.998	3.15	160.63	2.25	4.183	0.000	4.183	73	200	200	DWC	92	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.05	0.00	0.98		0.93	4.29	4.07
348	PNKRDM33	PNKRDM32	1	1	C		30.00		1304.00	4.998	4.553	3.78	164.41	2.25	4.282	0.000	4.282	74	200	200	DWC	67	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.06	0.00	0.93		0.87	4.07	3.68
349	PNKRDM32	PNKRDM31	1	1	C		20.00		1324.00	4.553	4.260	2.52	166.94	2.25	4.347	0.000	4.347	75	200	200	DWC	68	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.04	0.00	0.87		0.83	3.68	3.43
350	PNKRDM31	MTRDM1	1	1	C		30.00		1354.00	4.260	3.807	3.78	170.72	2.25	4.446	0.000	4.446	76	200	200	DWC	66	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	0.83		0.77	3.43	3.04
351	MTRDM1	MTRDM2	1	1	C		30.00		1384.00	3.807	3.627	3.78	174.50	2.25	4.544	0.000	4.544	77	200	200	DWC	167	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	0.77		0.71	3.04	2.92
352	PNKRDM56	PNKRDM55	0	1	H		30.00		30.00	4.330	4.491	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-186	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.23		3.06	1.10	1.43
353	PNKRDM55	PNKRDM54	1	1	C		30.00		60.00	4.491	4.652	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-186	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.06		2.89	1.43	1.76
354	PNKRDM54	PNKRDM53	1	1	C		30.00		90.00	4.652	4.421	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	130	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.89		2.72	1.76	1.70
355	PNKRDM53	PNKRDM52	1	1	C		25.00		115.00	4.421	4.240	3.15	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	138	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.72		2.64	1.70	1.60
356	PNKRDM52	PNKRDM51	1	1	C		15.00		130.00	4.240	4.160	1.89	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	188	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	2.64		2.59	1.60	1.57
357	PNKRDM51	PNKRDM50	1	1	C		20.00		150.00	4.160	4.099	2.52	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	328	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	2.59		2.53	1.57	1.57
358	PNKRDM50	PNKRDM49	1	1	C		15.00		165.00	4.099	4.046	1.89	20.80	2.25	0.542	0.000	0.542	27	200	200	DWC	283	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	2.53		2.49	1.57	1.56
359	PNKRDM49	PNKRDM48	1	1	C		25.00		190.00	4.046	4.049	3.15	23.96	2.25	0.624	0.000	0.624	29	200	200	DWC	-8333	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	2.49		2.43	1.56	1.62
360	PNKRDM42	PNKRDM43	0	1	H		30.00		30.00	4.730	4.950	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-136	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.63		3.46	1.10	1.49
361	PNKRDM43	PNKRDM43A	1	1	C		20.00		50.00	4.950	4.869	2.52	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	247	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.46		3.35	1.49	1.52
362	PNKRDM43A	PNKRDM44	1	1	C		20.00		70.00	4.869	4.788	2.52	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	247	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.35		3.24	1.52	1.55
363	PNKRDM44	PNKRDM45	1	1	C		30.00		100.00	4.788	4.627	3.78	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	186	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.24		3.07	1.55	1.56
364	PNKRDM45	PNKRDM46	1	1	C		30.00		130.00	4.627	4.234	3.78	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	76	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.07		2.98	1.56	1.25
365	PNKRDM46	PNKRDM47	1	1	C		30.00		160.00	4.234	4.053	3.78	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	166	400	0.010	0.68	21.36	0.02	0.40	0.10	OK	0.27	Check	0.08	0.00	2.98		2.90	1.25	1.15
366	PNKRDM47	PNKRDM48	1	1	C		20.00		180.00	4.053	4.049	2.52	22.70	2.25	0.591	0.000	0.591	28	200	200	DWC	5000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	2.90		2.85	1.15	1.20
367	PNKRDM48	INBRDM15	2	1	J		19.00		389.00	4.049	4.322	2.40	49.05	2.25	1.277	0.000	1.277	41	200	200	DWC	-70	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	2.43	2.430	2.39	1.62	1.93
368	INBRDM15	INBRDM14	1	1	C		30.00		419.00	4.322	4.224	3.78	52.83	2.25	1.376	0.000	1.376	42	200	200	DWC	306	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.39		2.33	1.93	1.89
369	INBRDM14	INBRDM13	1	1	C		25.00		444.00	4.224	4.233	3.15	55.98	2.25	1.458	0.000	1.458	44	200	200	DWC	-2778	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	2.33		2.28	1.89	1.95
370	INBRDM13.1	INBRDM13	0	1	H		23.00		23.00	4.250	4.233	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	1353	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	3.15		3.02	1.10	1.21
371	INBRDM13	INBRDM12	2	1	J		7.00		474.00	4.233	4.222	0.88	59.76	2.25	1.556	0.000	1.556	45	200	200	DWC	636	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.01	0.00	2.28	2.280	2.27	1.95	1.95
372	INBRDM12	INBRDM11	1	1	C		15.00		489.00	4.222	4.255	1.89	61.66	2.25	1.606	0.000	1.606	46	200	200	DWC	-455	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	2.27		2.24	1.95	2.02
373	INBRDM11	INBRDM10	1	1	C		15.00		504.00	4.255	4.160	1.89	63.55	2.25	1.655	0.000	1.655	46	200	200	DWC	158	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	2.24		2.21	2.02	1.95
374	INBRDM10	INBRDM9	1	1	C		25.00		529.00	4.160	4.002	3.15	66.70	2.25	1.737	0.000	1.737	48	200	200	DWC	158	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	2.21		2.16	1.95	1.84
375	INBRDM9	INBRDM8	1	1	C		25.00		554.00	4.002	3.864	3.15	69.85	2.25	1.819	0.000	1.819	49	200	200	DWC	181	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.05	0.00	2.16		2.11	1.84	1.75
376	INBRDM8	INBRDM7	1	1	C		20.00		574.00	3.864	3.726	2.52	72.37	2.25	1.885	0.000	1.885	49	200	200	DWC	145	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	2.11		2.07	1.75	1.66
377	INBRDM2	INBRDM3	0	1	H		30.00		30.00	4.634	4.204	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	70	70	0.010	1.62	51.06	0.00	0.30	0.07	OK	0.49	OK	0.43	0.00	3.53		3.10	1.10	1.10
378	INBRDM3	INBRDM4	1	1	C		30.00		60.00	4.204	4.010	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	155	155	0.010	1.09	34.32	0.01	0.30	0.07	OK	0.33	OK	0.19	0.00	3.10		2.91	1.10	1.10
379	INBRDM4	INBRDM4.1	1	1	C		20.00		80.00	4.010	3.949	2.52	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	328	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.91		2.80	1.10	1.15
380	INBRDM4.1	INBRDM5	1	1	C		15.00		95.00	3.949	3.930	1.89	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	789	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.80		2.72	1.15	1.21
381	INBRDM5.2	INBRDM5.1	0	1	H		22.00		22.00	4.213	4.157	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	393	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.11		2.99	1.10	1.17
382	INBRDM5.1	INBRDM5	1	1	C		25.00		47.00	4.157	3.930	3.15	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	110	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.16	0.00	2.99		2.83	1.17	1.10
383	INBRDM5	INBRDM6	2	1	J		30.00		172.00	3.930	3.778	3.78	21.69	2.25	0.565	0.000	0.565	27	200	200	DWC	197	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	2.72	2.720	2.64	1.21	1.14
384	INBRDM6	INBRDM7	1	1	C		26.00		198.00	3.778	3.726	3.28	24.96	2.25	0.650	0.000	0.650	29	200	200	DWC	500	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	2.64		2.58	1.14	1.15
385	INBRDM7	INRDM20	2	1	J		10.00		782.00	3.726	3.722	1.26	98.60	2.25	2.568	0.000	2.568	58	200	200	DWC	2500	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.02	0.00	2.07	2.070	2.05	1.66	1.67
386	INRDM20	INRDM19	1	1	C		25.00		807.00	3.722	3.592	3.15	101.75	2.25	2.650	0.000	2.650	59	200	200	DWC	192	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.05	0.00	2.05		2.00	1.67	1.59
387	INRDM19	INRDM18	1	1	C		12.00		819.00	3.592	3.615	1.51	103.26	2.25	2.689	0.000	2.689	59	200	200	DWC	-522	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.02	0.00	2.00		1.98	1.59	1.64
388	INRDM18.9	INRDM18.8	0	1	H		15.00		15.00	4.291	4.278	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	1154	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.19		3.11	1.10	1.17

389	INRDM18.8	INRDM18.7	1	1	C		20.00		35.00	4.278	4.256	2.52	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	909	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.11		3.00	1.17	1.26
390	INRDM18.7	INRDM18.6.1	1	1	C		30.00		65.00	4.256	4.215	3.78	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	732	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.00		2.83	1.26	1.39
391	INRDM18.6.1	INRDM18.6	1	1	C		5.00		70.00	4.215	4.213	0.63	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	2500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.83		2.80	1.39	1.41
392	INRDM18.6	INRDM18.5	1	1	C		19.00		89.00	4.213	4.101	2.40	11.22	2.25	0.292	0.000	0.292	20	200	200	DWC	170	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.80		2.69	1.41	1.41
393	INRDM18.5	INRDM18.4	1	1	C		20.00		109.00	4.101	3.982	2.52	13.74	2.25	0.358	0.000	0.358	22	200	200	DWC	168	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.69		2.58	1.41	1.40
394	INRDM18.4.3	INRDM18.4.2	0	1	H		22.00		22.00	4.184	4.152	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	687	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.08		2.96	1.10	1.19
395	INRDM18.4.2	INRDM18.4.1	1	1	C		20.00		42.00	4.152	4.229	2.52	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	-260	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.96		2.85	1.19	1.38
396	INRDM18.4.1	INRDM18.4	1	1	C		30.00		72.00	4.229	3.982	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	121	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.85		2.68	1.38	1.30
397	INRDM18.4	INRDM18.3	2	1	J		9.00		190.00	3.982	3.981	1.13	23.96	2.25	0.624	0.000	0.624	29	200	200	DWC	9000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	2.58	2.580	2.56	1.40	1.42
398	INRDM18.3	INRDM18.2	1	1	C		15.00		205.00	3.981	3.960	1.89	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	714	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	2.56		2.53	1.42	1.43
399	INRDM18.2.3	INRDM18.2.2	0	1	H		14.00		14.00	3.960	3.991	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	-452	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.86		2.78	1.10	1.21
400	INRDM18.2.2	INRDM18.2.1	1	1	C		30.00		44.00	3.991	3.963	3.78	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	1071	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.78		2.61	1.21	1.35
401	INRDM18.2.1	INRDM18.2	1	1	C		5.00		49.00	3.963	3.960	0.63	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	1667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.61		2.58	1.35	1.38
402	INRDM18.2	INRDM18.1	2	1	J		25.00		279.00	3.960	3.859	3.15	35.18	2.25	0.916	0.000	0.916	35	200	200	DWC	248	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.53	2.530	2.48	1.43	1.38
403	INRDM18.1	INRDM18	1	1	C		25.00		304.00	3.859	3.615	3.15	38.33	2.25	0.998	0.000	0.998	36	200	200	DWC	102	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.48		2.43	1.38	1.19
404	INRDM18	INRDM17	2	1	J		33.00		1156.00	3.615	3.895	4.16	145.75	2.25	3.796	0.000	3.796	70	200	200	DWC	-118	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	1.98	1.980	1.92	1.64	1.98
405	INRDM17.4	INRDM17.3	0	1	H		13.00		13.00	4.832	4.693	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	94	94	0.010	1.40	44.06	0.00	0.30	0.07	OK	0.42	OK	0.14	0.00	3.73		3.59	1.10	1.10
406	INRDM17.3	INRDM17.2	1	1	C		20.00		33.00	4.693	4.552	2.52	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	142	145	0.010	1.13	35.48	0.00	0.30	0.07	OK	0.34	OK	0.14	0.00	3.59		3.45	1.10	1.10
407	INRDM17.2	INRDM17.1	1	1	C		30.00		63.00	4.552	4.140	3.78	7.94	2.25	0.207	0.000	0.207	17	200	200	DWC	73	73	0.010	1.59	50.00	0.00	0.30	0.07	OK	0.48	OK	0.41	0.00	3.45		3.04	1.10	1.10
408	INRDM17.1	INRDM17	1	1	C		25.00		88.00	4.140	3.895	3.15	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	102	102	0.010	1.34	42.30	0.01	0.30	0.07	OK	0.40	OK	0.25	0.00	3.04		2.79	1.10	1.11
409	INRDM17	INRDM16	2	1	J		20.00		1264.00	3.895	3.665	2.52	159.37	2.25	4.150	0.000	4.150	73	200	200	DWC	87	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.04	0.00	1.92	1.920	1.88	1.98	1.79
410	INRDM16	INRDM15	1	1	C		30.00		1294.00	3.665	3.632	3.78	163.15	2.25	4.249	0.000	4.249	74	200	200	DWC	909	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.06	0.00	1.88		1.82	1.79	1.81
411	INRDM15.5	INRDM15.4	0	1	H		30.00		30.00	4.731	4.311	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	71	71	0.010	1.61	50.70	0.00	0.30	0.07	OK	0.48	OK	0.42	0.00	3.63		3.21	1.10	1.10
412	INRDM15.4	INRDM15.3	1	1	C		30.00		60.00	4.311	4.287	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.21		3.04	1.10	1.25
413	INRDM15.3	INRDM15.2	1	1	C		25.00		85.00	4.287	4.054	3.15	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	107	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.04		2.90	1.25	1.15
414	INRDM15.2	INRDM15.1	1	1	C		30.00		115.00	4.054	3.834	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	136	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.90		2.73	1.15	1.10
415	INRDM15.1	INRDM15	1	1	C		30.00		145.00	3.834	3.632	3.78	18.28	2.25	0.476	0.000	0.476	25	200	200	DWC	149	150	0.010	1.11	34.88	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	2.73		2.53	1.10	1.10
416	INRDM15	INRDM14	2	1	J		15.00		1454.00	3.632	3.667	1.89	183.33	2.25	4.774	0.000	4.774	78	200	200	DWC	-429	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.03	0.00	1.82	1.820	1.79	1.81	1.88
417	INRDM14	INRDM13	1	1	C		30.00		1484.00	3.667	3.633	3.78	187.11	2.25	4.873	0.000	4.873	79	200	200	DWC	882	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	1.79		1.73	1.88	1.90
418	INRDM13	INRDM12	1	1	C		30.00		1514.00	3.633	3.545	3.78	190.89	2.25	4.971	0.000	4.971	80	200	200	DWC	341	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	1.73		1.67	1.90	1.88
419	INRDM12	INRDM11	1	1	C		15.00		1529.00	3.545	3.562	1.89	192.78	2.25	5.020	0.000	5.020	80	200	200	DWC	-882	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.03	0.00	1.67		1.64	1.88	1.92
420	INRDM11	INRDM10	1	1	C		30.00		1559.00	3.562	3.436	3.78	196.56	2.25	5.119	0.000	5.119	81	200	200	DWC	238	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	1.64		1.58	1.92	1.86
421	INRDM10	INRDM9	1	1	C		30.00		1589.00	3.436	3.569	3.78	200.35	2.25	5.217	0.000	5.217	82	200	200	DWC	-226	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.06	0.00	1.58		1.52	1.86	2.05
422	INRDM9	INRDM8	1	1	C		15.00		1604.00	3.569	3.590	1.89	202.24	2.25	5.267	0.000	5.267	82	200	200	DWC	-714	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.03	0.00	1.52		1.49	2.05	2.10
423	INRDM8	INRDM7	1	1	C		8.00		1612.00	3.590	3.626	1.01	203.25	2.25	5.293	0.000	5.293	83	200	200	DWC	-222	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.02	0.00	1.49		1.47	2.10	2.16
424	INRDM7	INRDM5	1	1	C		25.00		1637.00	3.626	3.486	3.15	206.40	2.25	5.375	0.000	5.375	83	200	200	DWC	179	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.05	0.00	1.47		1.42	2.16	2.07
425	INRDM5	INRDM4	1	1	C		10.00		1647.00	3.486	3.528	1.26	207.66	2.25	5.408	0.000	5.408	83	200	200	DWC	-238	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.02	0.00	1.42		1.40	2.07	2.13
426	INRDM4	INRDM1	1	1	C		10.00		1657.00	3.528	3.588	1.26	208.92	2.25	5.441	0.000	5.441	84	200	200	DWC	-167	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.02	0.00	1.40		1.38	2.13	2.21
427	INRDM1	MTRDM2	1	1	C		30.00		1687.00	3.588	3.627	3.78	212.70	2.25	5.539	0.000	5.539	85	200	200	DWC	-769	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.06	0.00	1.38		1.32	2.21	2.31
428	MTRDM2	MTRDM3	2	1	J		25.00		3096.00	3.627	3.570	3.15	390.36	2.25	10.166	0.000	10.166	114	200	200	DWC	439	520	0.010	0.60	18.73	0.54	1.02	0.53	OK	0.61	OK	0.05	0.00	1.32	1.320	1.27	2.31	2.30
429	MTRDM3	MTRDM4	1	1	C		20.00		3116.00	3.570	3.646	2.52	392.88	2.25	10.231	0.000	10.231	115	200	200	DWC	-263	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.04	0.00	1.27		1.23	2.30	2.42
430	MTRDM4	MTRDM5	1	1	C		20.00		3136.00	3.646	3.722	2.52	395.40	2.25	10.297	0.000	10.297	115	200	200	DWC	-263	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.04	0.00	1.23		1.19	2.42	2.53
431	MTRDM5	MTRDM6	1	1	C		30.00		3166.00	3.722	3.845	3.78	399.18	2.25	10.395	0.000	10.395	116	200	200	DWC	-244	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.06	0.00	1.19		1.13	2.53	2.72
432	MTRDM6	MTRDM7	1	1	C		20.00		3186.00	3.845	4.012	2.52	401.70	2.25	10.461	0.000	10.461	116	200	200	DWC	-120	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.04	0.00	1.13		1.09	2.72	2.92
433	MTRDM7	MTRDM8	1	1	C		11.00		3197.00	4.012	4.096	1.39	403.09	2.25	10.497	0.000	10.497	116	200	200	DWC	-131	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.02	0.00	1.09		1.07	2.92	3.03
434	MTRDM8	MTRDM9	2	1	J		9.00		10024.00	4.096	4.114	1.13	1263.87	2.25	32.913	0.000	32.913	205	300	300	DWC	-500	870	0.010	0.60	42.70	0.77	1.10	0.66	OK	0.66	OK	0.01	0.00	1.07	1.070	1.06	3.03	3.05
435	MTRDM9	MTRDM10	1	1	C		20.00		10044.00	4.114	4.164	2.52	1266.39	2.25	32.979	0.000	32.979	205	300	300	DWC	-400	870	0.010	0.60	42.70	0.77	1.10	0.66	OK	0.66	OK	0.02	0.00	1.06		1.04	3.05	3.12
436	MTRDM25	MTRDM24	0	1	H		22.00		22.00	2.284	2.160	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	177	177	0.010	1.02	32.11	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	1.18		1.06	1.10	1.10
437	MTRDM24	MTRDM23	1	1	C		20.00		42.00	2.160	2.029	2.52	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	153	153	0.010	1.10	34.54	0.00	0.30	0.07	OK	0.33	OK	0.13	0.00	1.06		0.93	1.10	1.10
438	MTRDM23	MTRDM22	1	1	C		30.00		72.00	2.029	2.209	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	-167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.93		0.76	1.10	1.45
439	MTRDM22	MTRDM21	1	1	C		5.00		77.00	2.209	2.307	0.63	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	-51	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	0.76		0.73	1.45	1.58
440	MTRDM21	MTRDM20	1	1	C		15.00		92.00	2.307	2.307	1.89	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	0	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.73		0.65	1.58	1.66
441	MTRDM20.2.7	MTRDM20.2.6	0	1	H		30.00		30.00	1.152	1.169	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-1765	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.05		-0.12	1.10	1.29
442	MTRDM20.2.6	MTRDM20.2.5	1	1	C		30.00		60.00	1.169	1.291	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-246	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.12		-0.29	1.29	1.58
443	MTRDM20.2.5	MTRDM20.2.4	1	1	C		30.00		90.00	1.291	1.342	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-588	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.29		-0.46	1.58	1.80
444	MTRDM20.2.4	MTRDM20.2.3	1	1	C		18.00		108.00	1.342	1.321	2.27	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	-0.46		-0.56	1.80	1.88
445	MTRDM20.2.3	MTRDM20.2.2	1	1	C		30.00		138.00	1.321	1.317	3.78	17.40	2.25	0.453	0.000	0.453	25	200	200	DWC	7500	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.56		-0.65	1.88	1.97
446	MTRDM20.2.2	MTRDM20.2.1	1	1	C		22.00		160.00	1.317	1.878	2.77	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	-39	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	-0.65		-0.72	1.97	2.60
447	MTRDM20.2.1.1	MTRDM20.2.1	0	1	H		20.00		20.00	2.440	1.878	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	36	35	0.010	2.29	72.21	0.00	0.30	0.07	OK	0.69	OK	0.57	0.00	1.34		0.77	1.10	1.11
448	MTRDM20.2.1	MTRDM20.2	2	1	J		25.00		205.00	1.878	1.140	3.15	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	34	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.72	-0.720	-0.78	2.60	1.92
449	MTRDM20.5	MTRDM20.4	0	1	H		30.00		30.00	1.600	1.440	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.50		0.33	1.10	1.11
450	MTRDM20.4	MTRDM20.3	1	1	C		30.00		60.00	1.440	1.342	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	306	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.33		0.16	1.11	1.18
451	MTRDM20.3	MTRDM20.2	1	1	C		30.00		90.00	1.342	1.140	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.16		-0.01	1.18	1.15
452	MTRDM20.2	MTRDM20.1	2	1	J		20.00		315.00	1.140	1.533	2.52	39.72	2.25	1.034	0.000	1.034	37	200	200	DWC	-51	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	-0.78	-0.780	-0.82	1.92	2.35
453	MTRDM20.1	MTRDM20	1	1	C		15.00		330.00	1.533	2.307	1.89	41.61	2.25	1.084	0.000	1.084	38	200	200	DWC	-19	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	-0.82		-0.85	2.35	3.16
454	MTRDM20	MTRDM19	2	1	J		16.00		438.00	2.307	2.373	2.02	55.22	2.25	1.438	0.000	1.438	43	200	200	DWC	-242	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	-0.85	-0.850	-0.88	3.16	3.25
455	MTRDM19	MTRDM18	1	1	C		30.00		468.00	2.373	2.441	3.78	59.01	2.25	1.537	0.000	1.537	45	200	200	DWC	-441	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.88		-0.94	3.25	3.38
456	MTRDM18	MTRDM17	1	1	C		4.00		472.00	2.441	2.440	0.50	59.51	2.25	1.550	0.000	1.550	45	200	200	DWC	4000	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.01	0.00	-0.94		-0.95	3.38	3.39
457	MTRDM17	MT-NTRDM16	1	1	C		18.00		490.00	2.440	2.874	2.27	61.78	2.25	1.609	0.000	1.609	46	200	200	DWC	-41	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	-0.95		-0.98	3.39	3.85
458	MTRDM16.1	MT-NTRDM16	0	1	H		36.00		36.00	2.803	2.874	4.54	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	-507	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.20	0.00	1.70		1.50	1.10	1.37
459	NTRDM1	NTRDM2	0	1	H		9.00		9.00	3.051	2.908	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	63	62	0.010	1.72	54.26	0.00	0.30	0.07	OK	0.52	OK	0.15	0.00	1.95		1.80	1.10	1.11
460	NTRDM2	NTRDM3	1	1	C		20.00		29.00	2.908	2.623	2.52	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	70	70	0.010	1.62	51.06	0.00	0.30	0.07	OK	0.49	OK	0.29	0.00	1.80		1.51	1.11	1.11
461	NTRDM3	NTRDM4	1	1	C		6.00		35.00	2.623	2.575	0.76	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	125	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.04	0.00	1.51		1.47	1.11	1.11
462	NTRDM4	NTRDM5	1	1	C		5.00		40.00	2.575	2.592	0.63	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	-294	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	1.47		1.44	1.11	1.15
463	NTRDM5	NTRDM6	1	1	C		8.00		48.00	2.592	2.582	1.01	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	800	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	1.44		1.40	1.15	1.18
464	NTRDM6	NTRDM7	1	1	C		30.00		78.00	2.582	2.721	3.78	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	-216	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.40		1.23	1.18	1.49
465	NTRDM7	NTRDM8	1	1	C		20.00		98.00	2.721	2.841	2.52	12.36	2.25	0.322	0.000	0.322	21	200	200	DWC	-167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.23		1.12	1.49	1.72
466	NTRDM8	NTRDM9	1	1	C		10.00		108.00	2.841	2.855	1.26	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	-714	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	1.12		1.06	1.72	1.80
467	NTRDM9	MT-NTRDM16	1	1	C		5.00		113.00	2.855	2.874	0.63	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	-263	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	1.06		1.04	1.80	1.83

468	MT-NTRDM16	MTRDM15	3	1	J		17.00		656.00	2.874	3.084	2.14	82.71	2.25	2.154	0.000	2.154	53	200	200	DWC	-81	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	-0.98	-0.980	-1.01	3.85	4.09
469	MTRDM15	MTRDM14	1	1	C		20.00		676.00	3.084	3.918	2.52	85.23	2.25	2.220	0.000	2.220	54	200	200	DWC	-24	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.04	0.00	-1.01		-1.05	4.09	4.97
470	MTRDM14	MTRDM13	1	1	C		20.00		696.00	3.918	3.984	2.52	87.75	2.25	2.285	0.000	2.285	54	200	200	DWC	-303	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.04	0.00	-1.05		-1.09	4.97	5.07
471	MTRDM13	MTRDM12	1	1	C		15.00		711.00	3.984	4.051	1.89	89.65	2.25	2.335	0.000	2.335	55	200	200	DWC	-224	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.03	0.00	-1.09		-1.12	5.07	5.17
472	MTRDM12	MTRDM11	1	1	C		30.00		741.00	4.051	4.022	3.78	93.43	2.25	2.433	0.000	2.433	56	200	200	DWC	1034	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	-1.12		-1.18	5.17	5.20
473	MTRDM11	MTRDM10.1	1	1	C		20.00		761.00	4.022	4.132	2.52	95.95	2.25	2.499	0.000	2.499	57	200	200	DWC	-182	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	-1.18		-1.22	5.20	5.35
474	MTRDM10.1	MTRDM10	1	1	C		5.00		766.00	4.132	4.164	0.63	96.58	2.25	2.515	0.000	2.515	57	200	200	DWC	-156	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.01	0.00	-1.22		-1.23	5.35	5.39
475	MTRDM10	MPLRDM5.5	2	1	J		34.00		10844.00	4.164	4.220	4.29	1367.25	2.25	35.606	0.000	35.606	213	342	400	HDPE	-607	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.03	0.00	1.04	1.040	1.01	3.12	3.21
476	MPLRDM5.5	MPLRDM5.4	1	1	C		30.00		10874.00	4.220	4.480	3.78	1371.04	2.25	35.704	0.000	35.704	214	342	400	HDPE	-115	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.03	0.00	1.01		0.98	3.21	3.50
477	MPLRDM5.4	MPLRDM5.3	1	1	C		5.00		10879.00	4.480	4.484	0.63	1371.67	2.25	35.721	0.000	35.721	214	342	400	HDPE	-1250	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.01	0.00	0.98		0.97	3.50	3.51
478	MPLRDM5.3.6	MPLRDM5.3.5	0	1	H		20.00		20.00	2.943	3.328	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-52	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	1.84		1.73	1.10	1.60
479	MPLRDM5.3.5.2	MPLRDM5.3.5.1	0	1	H		11.00		11.00	3.313	3.328	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	-733	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	2.21		2.15	1.10	1.18
480	MPLRDM5.3.5.1	MPLRDM5.3.5	1	1	C		5.00		16.00	3.328	3.328	0.63	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	0	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.03	0.00	2.15		2.12	1.18	1.21
481	MPLRDM5.3.5	MPLRDM5.3.4	2	1	J		10.00		46.00	3.328	3.462	1.26	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	-75	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	1.73	1.730	1.67	1.60	1.79
482	MPLRDM5.3.4	MPLRDM5.3.3	1	1	C		30.00		76.00	3.462	3.863	3.78	9.58	2.25	0.250	0.000	0.250	18	200	200	DWC	-75	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	1.67		1.50	1.79	2.36
483	MPLRDM5.3.3	MPLRDM5.3.2	1	1	C		30.00		106.00	3.863	4.216	3.78	13.36	2.25	0.348	0.000	0.348	22	200	200	DWC	-85	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.10	0.00	1.50		1.40	2.36	2.82
484	MPLRDM5.3.2	MPLRDM5.3.1	1	1	C		30.00		136.00	4.216	4.566	3.78	17.15	2.25	0.447	0.000	0.447	24	200	200	DWC	-86	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	1.40		1.30	2.82	3.27
485	MPLRDM5.3.1	MPLRDM5.3	1	1	C		5.00		141.00	4.556	4.484	0.63	17.78	2.25	0.463	0.000	0.463	25	200	200	DWC	69	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.02	0.00	1.30		1.28	3.26	3.20
486	MPLRDM5.3	MPLRDM5.2	2	1	J		10.00		11030.00	4.484	4.524	1.26	1390.71	2.25	36.216	0.000	36.216	215	342	400	HDPE	-250	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.01	0.00	0.97	0.970	0.96	3.51	3.56
487	MPLRDM5.2	MPLRDM5.1	1	1	C		25.00		11055.00	4.524	4.188	3.15	1393.86	2.25	36.298	0.000	36.298	216	342	400	HDPE	74	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.03	0.00	0.96		0.93	3.56	3.26
488	MPLRDM5.1	MPLRDM5	1	1	C		30.00		11085.00	4.188	3.834	3.78	1397.64	2.25	36.397	0.000	36.397	216	342	400	HDPE	85	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.03	0.00	0.93		0.90	3.26	2.93
489	MPLRDM13	MPLRDM12	0	1	H		20.00		20.00	3.732	3.641	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	220	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.63		2.52	1.10	1.12
490	MPLRDM12	MPLRDM11	1	1	C		30.00		50.00	3.641	3.712	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-423	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.52		2.35	1.12	1.36
491	MPLRDM11	MPLRDM10	1	1	C		30.00		80.00	3.712	3.815	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-291	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.35		2.18	1.36	1.64
492	MPLRDM10	MPLRDM9	1	1	C		15.00		95.00	3.815	3.721	1.89	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	160	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.18		2.10	1.64	1.62
493	MPLRDM9	MPLRDM8	1	1	C		20.00		115.00	3.721	3.610	2.52	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	180	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	2.10		2.04	1.62	1.57
494	MPLRDM8	MPLRDM7	1	1	C		7.00		122.00	3.610	3.610	0.88	15.38	2.25	0.401	0.000	0.401	23	200	200	DWC	0	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	2.04		2.02	1.57	1.59
495	MPLRDM7	MPLRDM6	1	1	C		25.00		147.00	3.610	3.703	3.15	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	-269	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.02		1.94	1.59	1.76
496	MPLRDM6	MPLRDM5	1	1	C		30.00		177.00	3.703	3.834	3.78	22.32	2.25	0.581	0.000	0.581	28	200	200	DWC	-229	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.94		1.87	1.76	1.96
497	MPLRDM5	MPLRDM4	2	1	J		20.00		11282.00	3.834	3.731	2.52	1422.48	2.25	37.044	0.000	37.044	218	342	400	HDPE	194	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.02	0.00	0.90	0.900	0.88	2.93	2.85
498	MPLRDM4	MPLRDM3	1	1	C		30.00		11312.00	3.731	3.492	3.78	1426.26	2.25	37.142	0.000	37.142	218	342	400	HDPE	126	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.03	0.00	0.88		0.85	2.85	2.64
499	MPLRDM3	MPLRDM2	1	1	C		30.00		11342.00	3.492	2.985	3.78	1430.04	2.25	37.241	0.000	37.241	218	342	400	HDPE	59	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.03	0.00	0.85		0.82	2.64	2.17
500	MPLRDM2	MPLRDM1	1	1	C		30.00		11372.00	2.985	2.874	3.78	1433.83	2.25	37.339	0.000	37.339	219	342	400	HDPE	270	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.03	0.00	0.82		0.79	2.17	2.08
501	MPLRDM1	MPLRDM1.1	1	1	C		30.00		11402.00	2.874	2.615	3.78	1437.61	2.25	37.438	0.000	37.438	219	342	400	HDPE	116	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.03	0.00	0.79		0.76	2.08	1.86
502	MPLRDM1.1	MPMPLRDM13	1	1	C		10.00		11412.00	2.615	2.467	1.26	1438.87	2.25	37.471	0.000	37.471	219	342	400	HDPE	68	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.01	0.00	0.76		0.75	1.86	1.72
503	PRMRDM1	PRMRDM2	0	1	H		22.00		22.00	2.513	2.532	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	-1158	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.41		1.29	1.10	1.24
504	PRMRDM2	PRMRDM3	1	1	C		19.00		41.00	2.532	2.535	2.40	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	-6333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.29		1.18	1.24	1.36
505	PRMRDM3	PRMRDM4	1	1	C		20.00		61.00	2.535	2.539	2.52	7.69	2.25	0.200	0.000	0.200	16	200	200	DWC	-5000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.18		1.07	1.36	1.47
506	PRMRDM4	PRMRDM5	1	1	C		30.00		91.00	2.539	2.551	3.78	11.47	2.25	0.299	0.000	0.299	20	200	200	DWC	-2500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.07		0.90	1.47	1.65
507	PRMRDM5	PRMRDM6	1	1	C		30.00		121.00	2.551	2.563	3.78	15.26	2.25	0.397	0.000	0.397	23	200	200	DWC	-2500	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.90		0.81	1.65	1.75
508	PRMRDM6	PRMRDM7	1	1	C		30.00		151.00	2.563	2.516	3.78	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	638	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.81		0.72	1.75	1.80
509	PRMRDM7	PRMRDM8	1	1	C		30.00		181.00	2.516	2.483	3.78	22.82	2.25	0.594	0.000	0.594	28	200	200	DWC	909	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.72		0.65	1.80	1.83
510	PRMRDM8	PRMRDM9	1	1	C		30.00		211.00	2.483	2.358	3.78	26.60	2.25	0.693	0.000	0.693	30	200	200	DWC	240	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.65		0.59	1.83	1.77
511	PRMRDM9	PRMRDM10	1	1	C		30.00		241.00	2.358	2.199	3.78	30.39	2.25	0.791	0.000	0.791	32	200	200	DWC	189	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.59		0.53	1.77	1.67
512	PRMRDM10	PRLPRMRDM11	1	1	C		15.00		256.00	2.199	2.142	1.89	32.28	2.25	0.841	0.000	0.841	33	200	200	DWC	263	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	0.53		0.50	1.67	1.64
513	PRLRDM13	PRLRDM12	0	1	H		5.00		5.00	5.252	5.227	0.63	0.63	2.25	0.016	0.000	0.016	5	200	200	DWC	200	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	4.15		4.12	1.10	1.11
514	PRLRDM12	PRLRDM11	1	1	C		10.00		15.00	5.227	5.138	1.26	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	112	115	0.010	1.27	39.84	0.00	0.30	0.07	OK	0.38	OK	0.09	0.00	4.12		4.03	1.11	1.11
515	PRLRDM11	PRLRDM10	1	1	C		15.00		30.00	5.138	4.460	1.89	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	22	22	0.010	2.89	91.08	0.00	0.30	0.07	OK	0.87	OK	0.68	0.00	4.03		3.35	1.11	1.11
516	PRLRDM10	PRLRDM9	1	1	C		30.00		60.00	4.460	3.630	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	36	36	0.010	2.26	71.20	0.00	0.30	0.07	OK	0.68	OK	0.83	0.00	3.35		2.52	1.11	1.11
517	PRLRDM9	PRLRDM8	1	1	C		30.00		90.00	3.630	3.594	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.52		2.35	1.11	1.24
518	PRLRDM8	PRLRDM7	1	1	C		30.00		120.00	3.594	3.460	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	224	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.35		2.26	1.24	1.20
519	PRLRDM7	PRLRDM6	1	1	C		30.00		150.00	3.460	3.410	3.78	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	600	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.26		2.17	1.20	1.24
520	PRLRDM6	PRLRDM5	1	1	C		10.00		160.00	3.410	3.456	1.26	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	-217	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	2.17		2.14	1.24	1.32
521	PRLRDM5	PRLRDM4	1	1	C		10.00		170.00	3.456	3.580	1.26	21.43	2.25	0.558	0.000	0.558	27	200	200	DWC	-81	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	2.14		2.12	1.32	1.46
522	PRLRDM4	PRLRDM3	1	1	C		5.00		175.00	3.580	3.570	0.63	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	500	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.01	0.00	2.12		2.11	1.46	1.46
523	PRLRDM3	PRLRDM2	1	1	C		30.00		205.00	3.570	3.020	3.78	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	55	160	0.010	1.07	33.77	0.02	0.40	0.10	OK	0.43	OK	0.19	0.00	2.11		1.92	1.46	1.10
524	PRLRDM2	PRLRDM1	1	1	C		30.00		235.00	3.020	2.730	3.78	29.63	2.25	0.772	0.000	0.772	32	200	200	DWC	103	105	0.010	1.32	41.69	0.02	0.40	0.10	OK	0.53	OK	0.29	0.00	1.92		1.63	1.10	1.10
525	PRLRDM1	PRLPRMRDM11	1	1	C		23.00		258.00	2.730	2.142	2.90	32.53	2.25	0.847	0.000	0.847	33	200	200	DWC	39	39	0.010	2.17	68.41	0.01	0.30	0.07	OK	0.65	OK	0.59	0.00	1.63		1.04	1.10	1.10
526	PRLPRMRDM11	PRMRNRDM12	2	1	J		30.00		544.00	2.142	2.031	3.78	68.59	2.25	1.786	0.000	1.786	48	200	200	DWC	270	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.50	0.500	0.44	1.64	1.59
527	PRMRNRDM12	PRMRDM13	1	1	C		30.00		574.00	2.031	2.074	3.78	72.37	2.25	1.885	0.000	1.885	49	200	200	DWC	-698	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.44		0.38	1.59	1.69
528	PRMRDM13	PRMRDM14	1	1	C		12.00		586.00	2.074	2.336	1.51	73.89	2.25	1.924	0.000	1.924	50	200	200	DWC	-46	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.02	0.00	0.38		0.36	1.69	1.98
529	PRMRDM14.2	PRMRDM14.1	0	1	H		24.00		24.00	2.493	2.290	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	118	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.20	0.00	1.39		1.19	1.10	1.10
530	PRMRDM14.1	PRMRDM14	1	1	C		10.00		34.00	2.290	2.336	1.26	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	-217	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.19		1.13	1.10	1.21
531	PRMRDM14	PRMRDM15	2	1	J		20.00		640.00	2.336	2.158	2.52	80.69	2.25	2.101	0.000	2.101	52	200	200	DWC	112	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	0.36	0.360	0.32	1.98	1.84
532	PRMRDM15	PRMRDM16	1	1	C		5.00		645.00	2.158	2.194	0.63	81.32	2.25	2.118	0.000	2.118	52	200	200	DWC	-139	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.01	0.00	0.32		0.31	1.84	1.88
533	PRMRDM16	PRMRDM17	1	1	C		30.00		675.00	2.194	2.184	3.78	85.11	2.25	2.216	0.000	2.216	54	200	200	DWC	3000	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.31		0.25	1.88	1.93
534	PRMRDM17	PRMRDM18	1	1	C		30.00		705.00	2.184	2.213	3.78	88.89	2.25	2.315	0.000	2.315	55	200	200	DWC	-1034	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.25		0.19	1.93	2.02
535	PRMRDM18	MNPRMRDM2	1	1	C		30.00		735.00	2.213	2.246	3.78	92.67	2.25	2.413	0.000	2.413	56	200	200	DWC	-909	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	0.19		0.13	2.02	2.12
536	MNRDM34	MNRDM33	0	1	H		24.00		24.00	1.171	1.265	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-255	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.07		-0.06	1.10	1.33
537	MNRDM33	MNRDM32	1	1	C		15.00		39.00	1.265	1.270	1.89	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-3000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	-0.06		-0.14	1.33	1.41
538	MNRDM32	MNRDM31	1	1	C		20.00		59.00	1.270	1.479	2.52	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	-96	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.14		-0.25	1.41	1.73
539	MNRDM31	MNRDM30	1	1	C		20.00		79.00	1.479	1.422	2.52	9.96	2.25	0.259	0.000	0.259	19	200	200	DWC	351	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.25		-0.36	1.73	1.78
540	MNRDM30	MNRDM29	1	1	C		30.00		109.00	1.422	1.453	3.78	13.74	2.25	0.358	0.000	0.358	22	200	200	DWC	-968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.36		-0.53	1.78	1.98
541	MNRDM29	MNRDM28	1	1	C		30.00		139.00	1.453	1.350	3.78	17.53	2.25	0.456	0.000	0.456	25	200	200	DWC	291	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.53		-0.62	1.98	1.97
542	2RNRDM30	2RNRDM29	0	1	H		23.00		23.00	1.702	1.683	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	1211	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.60		0.47	1.10	1.21
543	2RNRDM29	2RNRDM28	1	1	C		10.00		33.00	1.683	1.675	1.26	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	0.47		0.41	1.21	1.27
544	2RNRDM28	2RNRDM27	1	1	C		14.00		47.00	1.675	1.664	1.77	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	1273	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.41		0.33	1.27	1.33
545	2RNRDM27	2RNRDM26	1	1	C		20.00		67.00	1.664	1.648	2.52	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.33		0.22	1.33	1.43
546	2RNRDM26	2RNRDM25	1	1	C		18.00		85.00	1.648	1.633	2.27	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	1200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.22		0.12	1.43	1.51

547	2RNRDM25	2RNRDM24	1	1	C		12.00		97.00	1.633	1.623	1.51	12.23	2.25	0.318	0.000	0.318	21	200	200	DWC	1200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.12		0.05	1.51	1.57
548	2RNRDM24	2RNRDM23	1	1	C		14.00		111.00	1.623	1.612	1.77	14.00	2.25	0.364	0.000	0.364	22	200	200	DWC	1273	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.05		-0.03	1.57	1.64
549	2RNRDM23	2RNRDM22	1	1	C		5.00		116.00	1.612	1.627	0.63	14.63	2.25	0.381	0.000	0.381	23	200	200	DWC	-333	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.02	0.00	-0.03		-0.05	1.64	1.68
550	2RNRDM1	2RNRDM2	0	1	H		30.00		30.00	1.962	1.899	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	476	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.86		0.69	1.10	1.21
551	2RNRDM2	2RNRDM3	1	1	C		30.00		60.00	1.899	1.834	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	462	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.69		0.52	1.21	1.31
552	2RNRDM3	2RNRDM4	1	1	C		25.00		85.00	1.834	1.780	3.15	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	463	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.52		0.38	1.31	1.40
553	2RNRDM4	2RNRDM5	1	1	C		10.00		95.00	1.780	1.758	1.26	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	455	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.38		0.32	1.40	1.44
554	2RNRDM5	2RNRDM6	1	1	C		10.00		105.00	1.758	1.733	1.26	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.32		0.26	1.44	1.47
555	2RNRDM6	2RNRDM7	1	1	C		9.00		114.00	1.733	1.718	1.13	14.37	2.25	0.374	0.000	0.374	22	200	200	DWC	600	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	0.26		0.23	1.47	1.49
556	2RNRDM7	2RNRDM8	1	1	C		17.00		131.00	1.718	1.681	2.14	16.52	2.25	0.430	0.000	0.430	24	200	200	DWC	459	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	0.23		0.18	1.49	1.50
557	2RNRDM8	2RNRDM9	1	1	C		20.00		151.00	1.681	1.638	2.52	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	465	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.18		0.12	1.50	1.52
558	2RNRDM9	2RNRDM10	1	1	C		25.00		176.00	1.638	1.583	3.15	22.19	2.25	0.578	0.000	0.578	28	200	200	DWC	455	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	0.12		0.06	1.52	1.52
559	2RNRDM10	2RNRDM11	1	1	C		15.00		191.00	1.583	1.551	1.89	24.08	2.25	0.627	0.000	0.627	29	200	200	DWC	469	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.06		0.02	1.52	1.53
560	2RNRDM11	2RNRDM12	1	1	C		13.00		204.00	1.551	1.522	1.64	25.72	2.25	0.670	0.000	0.670	30	200	200	DWC	448	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	0.02		-0.01	1.53	1.53
561	2RNRDM12	2RNRDM13	1	1	C		7.00		211.00	1.522	1.503	0.88	26.60	2.25	0.693	0.000	0.693	30	200	200	DWC	368	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.01	0.00	-0.01		-0.02	1.53	1.52
562	2RNRDM13	2RNRDM14	1	1	C		20.00		231.00	1.503	1.464	2.52	29.13	2.25	0.758	0.000	0.758	32	200	200	DWC	513	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	-0.02		-0.06	1.52	1.52
563	2RNRDM14	2RNRDM15	1	1	C		20.00		251.00	1.464	1.420	2.52	31.65	2.25	0.824	0.000	0.824	33	200	200	DWC	455	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	-0.06		-0.10	1.52	1.52
564	2RNRDM15	2RNRDM16	1	1	C		15.00		266.00	1.420	1.414	1.89	33.54	2.25	0.873	0.000	0.873	34	200	200	DWC	2500	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	-0.10		-0.13	1.52	1.54
565	2RNRDM16	2RNRDM17	1	1	C		30.00		296.00	1.414	1.840	3.78	37.32	2.25	0.972	0.000	0.972	36	200	200	DWC	-70	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.13		-0.19	1.54	2.03
566	2RNRDM17	2RNRDM18	1	1	C		30.00		326.00	1.840	1.878	3.78	41.10	2.25	1.070	0.000	1.070	37	200	200	DWC	-789	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.19		-0.25	2.03	2.13
567	2RNRDM18	2RNRDM19	1	1	C		15.00		341.00	1.878	1.444	1.89	42.99	2.25	1.120	0.000	1.120	38	200	200	DWC	35	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	-0.25		-0.28	2.13	1.72
568	2RNRDM19	2RNRDM20	1	1	C		18.00		359.00	1.444	1.294	2.27	45.26	2.25	1.179	0.000	1.179	39	200	200	DWC	120	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	-0.28		-0.31	1.72	1.60
569	2RNRDM20	2RNRDM21	1	1	C		10.00		369.00	1.294	1.326	1.26	46.52	2.25	1.212	0.000	1.212	40	200	200	DWC	-313	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	-0.31		-0.33	1.60	1.66
570	2RNRDM21.3	2RNRDM21.2	0	1	H		10.00		10.00	1.520	1.598	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	-128	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	0.42		0.36	1.10	1.24
571	2RNRDM21.2.1	2RNRDM21.2	0	1	H		20.00		20.00	1.474	1.598	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-161	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.37		0.26	1.10	1.34
572	2RNRDM21.2	2RNRDM21.1	2	1	J		15.00		45.00	1.598	1.637	1.89	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-385	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.26	0.260	0.18	1.34	1.46
573	2RNRDM21.1	2RNRDM21	1	1	C		20.00		65.00	1.637	1.326	2.52	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	64	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.18		0.07	1.46	1.26
574	2RNRDM21	2RNRDM22	2	1	J		30.00		464.00	1.326	1.627	3.78	58.50	2.25	1.524	0.000	1.524	45	200	200	DWC	-100	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.33	-0.330	-0.39	1.66	2.02
575	2RNRDM22	2RNRDM22.1	2	1	J		10.00		590.00	1.627	1.470	1.26	74.39	2.25	1.937	0.000	1.937	50	200	200	DWC	64	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.02	0.00	-0.39	-0.390	-0.41	2.02	1.88
576	2RNRDM22.1	2RNRDM22.2	1	1	C		20.00		610.00	1.470	1.304	2.52	76.91	2.25	2.003	0.000	2.003	51	200	200	DWC	120	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	-0.41		-0.45	1.88	1.75
577	2RNRDM22.2	MNRDM28	1	1	C		20.00		630.00	1.304	1.346	2.52	79.43	2.25	2.069	0.000	2.069	52	200	200	DWC	-476	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	-0.45		-0.49	1.75	1.84
578	MNRDM28	MNRDM27	2	1	J		30.00		799.00	1.346	1.457	3.78	100.74	2.25	2.623	0.000	2.623	58	200	200	DWC	-270	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	-0.62	-0.620	-0.68	1.97	2.14
579	MNRDM27	MNRDM26	1	1	C		30.00		829.00	1.457	1.555	3.78	104.52	2.25	2.722	0.000	2.722	59	200	200	DWC	-306	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	-0.68		-0.74	2.14	2.30
580	MNRDM26	MNRDM25	1	1	C		30.00		859.00	1.555	1.653	3.78	108.31	2.25	2.820	0.000	2.820	60	200	200	DWC	-306	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	-0.74		-0.80	2.30	2.45
581	MNRDM25	MNRDM24	1	1	C		30.00		889.00	1.653	1.752	3.78	112.09	2.25	2.919	0.000	2.919	61	200	200	DWC	-303	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	-0.80		-0.86	2.45	2.61
582	MNRDM24	MNRDM23	1	1	C		5.00		894.00	1.752	1.768	0.63	112.72	2.25	2.935	0.000	2.935	62	200	200	DWC	-313	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.01	0.00	-0.86		-0.87	2.61	2.64
583	MNRDM23.2	MNRDM23.1	0	1	H		30.00		30.00	1.303	1.207	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	313	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.20		0.03	1.10	1.18
584	MNRDM23.1	MNRDM23	1	1	C		30.00		60.00	1.207	1.768	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-53	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.03		-0.14	1.18	1.91
585	MNRDM23	MNRDM22	2	1	J		20.00		974.00	1.768	1.834	2.52	122.81	2.25	3.198	0.000	3.198	64	200	200	DWC	-303	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.04	0.00	-0.87	-0.870	-0.91	2.64	2.74
586	MNRDM22	MNRDM21	1	1	C		25.00		999.00	1.834	1.916	3.15	125.96	2.25	3.280	0.000	3.280	65	200	200	DWC	-305	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.05	0.00	-0.91		-0.96	2.74	2.88
587	MNRDM21.5.1	MNRDM21.5	0	1	H		30.00		30.00	1.693	1.519	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	172	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.59		0.42	1.10	1.10
588	MNRDM21.5.2	MNRDM21.5	0	1	H		25.00		25.00	1.492	1.519	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-926	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.39		0.25	1.10	1.27
589	MNRDM21.5	MNRDM21.4	2	1	J		30.00		85.00	1.519	1.572	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	-566	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.25	0.250	0.08	1.27	1.49
590	MNRDM21.4.1	MNRDM21.4	0	1	H		30.00		30.00	1.563	1.572	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-3333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.46		0.29	1.10	1.28
591	MNRDM21.4	MNRDM21.3	2	1	J		12.00		127.00	1.572	1.576	1.51	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	-3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.08	0.080	0.01	1.49	1.57
592	MNRDM21.3	MNRDM21.2	1	1	C		18.00		145.00	1.576	1.262	2.27	18.28	2.25	0.476	0.000	0.476	25	200	200	DWC	57	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.01		-0.05	1.57	1.31
593	MNRDM21.2	MNRDM21.1	1	1	C		20.00		165.00	1.262	1.363	2.52	20.80	2.25	0.542	0.000	0.542	27	200	200	DWC	-198	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.05		-0.10	1.31	1.46
594	MNRDM21.1	MNRDM21	1	1	C		32.00		197.00	1.363	1.916	4.03	24.84	2.25	0.647	0.000	0.647	29	200	200	DWC	-58	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.08	0.00	-0.10		-0.18	1.46	2.10
595	MNRDM21.9	MNRDM21.8	0	1	H		25.00		25.00	2.024	2.126	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-245	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.92		0.78	1.10	1.35
596	MNRDM21.8	MNRDM21.7	1	1	C		30.00		55.00	2.045	2.126	3.78	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	-370	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.78		0.61	1.27	1.52
597	MNRDM21.7	MNRDM21.6	1	1	C		25.00		80.00	2.048	2.123	3.15	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.61		0.47	1.44	1.65
598	MNRDM21.6	MNRDM21	1	1	C		30.00		110.00	2.123	1.916	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	145	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.47		0.30	1.65	1.62
599	MNRDM21	MNRDM20	3	1	J		30.00		1336.00	1.916	1.332	3.78	168.45	2.25	4.387	0.000	4.387	75	200	200	DWC	51	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.06	0.00	-0.18	-0.180	-0.24	2.10	1.57
600	MNRDM20	MNRDM19	1	1	C		30.00		1366.00	1.332	1.142	3.78	172.23	2.25	4.485	0.000	4.485	76	200	200	DWC	158	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	-0.24		-0.30	1.57	1.44
601	MNRDM19	MNRDM1	1	1	C		30.00		1396.00	1.142	2.234	3.78	176.01	2.25	4.584	0.000	4.584	77	200	200	DWC	-27	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	-0.30		-0.36	1.44	2.59
602	MNRDM1	MNPRMRDM2	1	1	C		4.00		1400.00	2.234	2.246	0.50	176.52	2.25	4.597	0.000	4.597	77	200	200	DWC	-333	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.01	0.00	-0.36		-0.37	2.59	2.62
603	MNPRMRDM2	MNRDM3	2	1	J		7.00		2142.00	2.246	2.256	0.88	270.07	2.25	7.033	0.000	7.033	95	200	200	DWC	-700	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.01	0.00	-0.37	-0.37	-0.38	2.62	2.64
604	MNRDM18	MNRDM17	0	1	H		25.00		25.00	5.152	5.256	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-240	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	4.05		3.91	1.10	1.35
605	MNRDM17	MNRDM16	1	1	C		20.00		45.00	5.256	4.750	2.52	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	40	77	0.010	1.55	48.69	0.00	0.30	0.07	OK	0.46	OK	0.26	0.00	3.91		3.65	1.35	1.10
606	MNRDM16	MNRDM15	1	1	C		15.00		60.00	4.750	4.075	1.89	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	22	22	0.010	2.89	91.08	0.00	0.30	0.07	OK	0.87	OK	0.68	0.00	3.65		2.97	1.10	1.11
607	MNRDM15	MNRDM14	1	1	C		30.00		90.00	4.075	3.320	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	40	40	0.010	2.15	67.55	0.00	0.30	0.07	OK	0.64	OK	0.75	0.00	2.97		2.22	1.11	1.10
608	MNRDM14	MNRDM13	1	1	C		30.00		120.00	3.320	2.790	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	57	57	0.010	1.80	56.59	0.01	0.30	0.07	OK	0.54	OK	0.53	0.00	2.22		1.69	1.10	1.10
609	MNRDM13	MNRDM12	1	1	C		15.00		135.00	2.790	3.815	1.89	17.02	2.25	0.443	0.000	0.443	24	200	200	DWC	-15	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	1.69		1.64	1.10	2.18
610	MNRDM12	MNRDM11	1	1	C		20.00		155.00	3.815	2.990	2.52	19.54	2.25	0.509	0.000	0.509	26	200	200	DWC	24	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.64		1.58	2.18	1.41
611	MNRDM11	MNRDM10	1	1	C		15.00		170.00	2.990	2.166	1.89	21.43	2.25	0.558	0.000	0.558	27	200	200	DWC	18	29	0.010	2.52	79.33	0.01	0.30	0.07	OK	0.76	OK	0.52	0.00	1.58		1.06	1.41	1.11
612	PNKRDM17.1	PNKRDM17.2	0	1	H		25.00		25.00	3.411	3.590	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-140	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.31		2.17	1.10	1.42
613	PNKRDM17.2	PNKRDM17.3	1	1	C		15.00		40.00	3.590	3.534	1.89	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	268	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.17		2.09	1.42	1.44
614	PNKRDM17.3	PNKRDM17.3A	1	1	C		15.00		55.00	3.534	3.006	1.89	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	28	80	0.010	1.52	47.76	0.00	0.30	0.07	OK	0.46	OK	0.19	0.00	2.09		1.90	1.44	1.11
615	PNKRDM17.3A	PNKRDM17.4	1	1	C		30.00		85.00	3.006	2.830	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	170	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	1.90		1.72	1.11	1.11
616	PNKRDM17.4	PNKRDM17.5	1	1	C		30.00		115.00	2.830	2.590	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	125	125	0.010	1.21	38.21	0.01	0.30	0.07	OK	0.36	OK	0.24	0.00	1.72		1.48	1.11	1.11
617	PNKRDM17.5	PNKRDM17.6	1	1	C		30.00		145.00	2.590	2.468	3.78	18.28	2.25	0.476	0.000	0.476	25	200	200	DWC	246	246	0.010	0.87	27.24	0.02	0.40	0.10	OK	0.35	OK	0.12	0.00	1.48		1.36	1.11	1.11
618	PNKRDM17.6	PNKRDM17.7	1	1	C		10.00		155.00	2.468	2.445	1.26	19.54	2.25	0.509	0.000	0.509	26	200	200	DWC	435	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	1.36		1.33	1.11	1.12
619	PNKRDM17.7	PNKRDM17.8	1	1	C		20.00		175.00	2.445	2.352	2.52	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	215	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.11	0.00	1.33		1.22	1.12	1.13
620	PNKRDM17.8	PNKRDM17.9	1	1	C		15.00		190.00	2.352	2.290	1.89	23.96	2.25	0.624	0.000	0.624	29	200	200	DWC	242	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.08	0.00	1.22		1.14	1.13	1.15
621	PNKRDM17.9	PNKRDM17.10	1	1	C		30.00		220.00	2.290	2.453	3.78	27.74	2.25	0.722	0.000	0.722	31	200	200	DWC	-184	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	1.14		0.97	1.15	1.48
622	PNKRDM17.10	PNKRDM17.11	1	1	C		30.00		250.00	2.453	2.187	3.78	31.52	2.25	0.821	0.000	0.821	33	200	200	DWC	113	180	0.010	1.01	31.84	0.03	0.46	0.13	OK	0.47	OK	0.17	0.00	0.97		0.80	1.48	1.39
623	PNKRDM17.11	PNKRDM17.12	1	1	C		30.00		280.00	2.187	2.212	3.78	35.30	2.25	0.919	0.000	0.919	35	200	200	DWC	-1200	180	0.010	1.01	31.84	0.03	0.46	0.13	OK	0.47	OK	0.17	0.00	0.80		0.63	1.39	1.58
624	PNKRDM17.12	MNRDM10	1	1	C		25.00		305.00	2.212	2.166	3.15	38.46	2.25	1.001	0.000	1.001	36	200	200	DWC	543	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.63		0.58	1.58	1.59
625	MNRDM10	MNRDM9	2	1	J		14.00		489.00	2.166	2.166	1.77	61.66	2.25	1.606	0.000	1.606	46	200	200	DWC	0	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	0.58	0.58	0.55	1.59	1.62

626	MNRDM9	MNRDM8	1	1	C		25.00		514.00	2.166	2.165	3.15	64.81	2.25	1.688	0.000	1.688	47	200	200	DWC	25000	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	0.55		0.50	1.62	1.67
627	MNRDM8	MNRDM7	1	1	C		20.00		534.00	2.165	2.219	2.52	67.33	2.25	1.753	0.000	1.753	48	200	200	DWC	-370	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	0.50		0.46	1.67	1.76
628	MNRDM7	MNRDM6	1	1	C		30.00		564.00	2.219	2.206	3.78	71.11	2.25	1.852	0.000	1.852	49	200	200	DWC	2308	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.46		0.40	1.76	1.81
629	MNRDM6	MNRDM5	1	1	C		10.00		574.00	2.206	2.250	1.26	72.37	2.25	1.885	0.000	1.885	49	200	200	DWC	-227	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.02	0.00	0.40		0.38	1.81	1.87
630	MNRDM5	MNRDM4	1	1	C		30.00		604.00	2.250	2.250	3.78	76.15	2.25	1.983	0.000	1.983	51	200	200	DWC	0	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.38		0.32	1.87	1.93
631	MNRDM4	MNRDM3	1	1	C		28.00		632.00	2.250	2.256	3.53	79.69	2.25	2.075	0.000	2.075	52	200	200	DWC	-4667	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.05	0.00	0.32		0.27	1.93	1.99
632	MNRDM3	MPRDM2	2	1	J		35.00		2809.00	2.256	2.284	4.41	354.17	2.25	9.223	0.000	9.223	109	200	200	DWC	-1250	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.07	0.00	-0.38	-0.38	-0.45	2.64	2.73
633	MPRDM2	MPRDM3	1	1	C		30.00		2839.00	2.284	2.217	3.78	357.95	2.25	9.322	0.000	9.322	109	200	200	DWC	448	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.06	0.00	-0.45		-0.51	2.73	2.73
634	MPRDM3	MPRDM4	1	1	C		20.00		2859.00	2.217	2.165	2.52	360.47	2.25	9.387	0.000	9.387	110	200	200	DWC	385	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.04	0.00	-0.51		-0.55	2.73	2.72
635	MPRDM4.3	MPRDM4.2	0	1	H		18.00		18.00	2.204	2.260	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-321	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	1.10		1.00	1.10	1.26
636	MPRDM4.2	MPRDM4.1	1	1	C		30.00		48.00	2.260	2.224	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.00		0.83	1.26	1.39
637	MPRDM4.1	MPRDM4	1	1	C		5.00		53.00	2.224	2.165	0.63	6.68	2.25	0.174	0.000	0.174	15	200	200	DWC	85	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	0.83		0.80	1.39	1.37
638	MPRDM4	MPRDM5	2	1	J		20.00		2932.00	4.825	4.713	2.52	369.68	2.25	9.627	0.000	9.627	111	200	200	DWC	179	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.04	0.00	-0.55	-0.55	-0.59	5.38	5.30
639	MPRDM5	MPRDM6	1	1	C		13.00		2945.00	4.713	4.429	1.64	371.32	2.25	9.670	0.000	9.670	111	200	200	DWC	46	520	0.010	0.60	18.73	0.52	1.01	0.52	OK	0.60	OK	0.03	0.00	-0.59		-0.62	5.30	5.05
640	MPRDM6.2	MPRDM6.1	0	1	H		29.00		29.00	2.270	2.263	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	4143	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.17		1.01	1.10	1.25
641	MPRDM6.1	MPRDM6	1	1	C		30.00		59.00	2.263	2.264	3.78	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	-30000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.01		0.84	1.25	1.42
642	MPRDM6	MPRDM7	2	1	J		15.00		3019.00	2.264	2.210	1.89	380.65	2.25	9.913	0.000	9.913	113	200	200	DWC	278	520	0.010	0.60	18.73	0.53	1.02	0.52	OK	0.61	OK	0.03	0.00	-0.62	-0.62	-0.65	2.88	2.86
643	MPRDM7	MPRDM8	1	1	C		18.00		3037.00	2.210	2.267	2.27	382.92	2.25	9.972	0.000	9.972	113	200	200	DWC	-316	520	0.010	0.60	18.73	0.53	1.02	0.52	OK	0.61	OK	0.03	0.00	-0.65		-0.68	2.86	2.95
644	MPRDM8.9	MPRDM8.10	0	1	H		7.00		7.00	1.583	1.402	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	39	40	0.010	2.15	67.55	0.00	0.30	0.07	OK	0.64	OK	0.18	0.00	0.48		0.30	1.10	1.10
645	MPRDM8.10	MPRDM8.11	1	1	C		30.00		37.00	1.402	1.479	3.78	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	-390	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.30		0.13	1.10	1.35
646	MPRDM8.11	MPRDM8.12	1	1	C		20.00		57.00	1.479	1.379	2.52	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.13		0.02	1.35	1.36
647	MPRDM8.12	MPRDM8.13	1	1	C		28.00		85.00	1.379	1.453	3.53	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	-378	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.02		-0.14	1.36	1.59
648	MPRDM8.13	MPRDM8.3	1	1	C		25.00		110.00	1.453	2.183	3.15	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	-34	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	-0.14		-0.28	1.59	2.46
649	MPRDM8.8	MPRDM8.7	0	1	H		10.00		10.00	1.253	1.184	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	145	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.07	0.00	0.15		0.08	1.10	1.10
650	MPRDM8.7	MPRDM8.6	1	1	C		10.00		20.00	1.184	1.329	1.26	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-69	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	0.08		0.02	1.10	1.31
651	MPRDM8.6	MPRDM8.5	1	1	C		20.00		40.00	1.329	1.132	2.52	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	102	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.02		-0.09	1.31	1.22
652	MPRDM8.5	MPRDM8.4	1	1	C		30.00		70.00	1.132	1.750	3.78	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	-49	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.09		-0.26	1.22	2.01
653	MPRDM8.4	MPRDM8.3	1	1	C		30.00		100.00	1.750	2.183	3.78	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	-69	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.26		-0.43	2.01	2.61
654	MPRDM8.3	MPRDM8.2	2	1	J		26.00		236.00	2.183	2.101	3.28	29.76	2.25	0.775	0.000	0.775	32	200	200	DWC	317	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.43	-0.430	-0.48	2.61	2.58
655	MPRDM8.2	MPRDM8.1	1	1	C		30.00		266.00	2.101	2.256	3.78	33.54	2.25	0.873	0.000	0.873	34	200	200	DWC	-194	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.48		-0.54	2.58	2.80
656	MPRDM8.1	MPRDM8	1	1	C		30.00		296.00	2.256	2.267	3.78	37.32	2.25	0.972	0.000	0.972	36	200	200	DWC	-2727	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.54		-0.60	2.80	2.87
657	MPRDM8	MPRDM9	2	1	J		20.00		3353.00	2.267	2.287	2.52	422.76	2.25	11.009	0.000	11.009	119	200	200	DWC	-1000	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.04	0.00	-0.68	-0.68	-0.72	2.95	3.01
658	MPRDM9	MPRDM10	1	1	C		30.00		3383.00	2.287	2.288	3.78	426.54	2.25	11.108	0.000	11.108	119	200	200	DWC	-30000	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.06	0.00	-0.72		-0.78	3.01	3.07
659	MPRDM10	MPMPLRDM11	1	1	C		18.00		3401.00	2.288	2.333	2.27	428.81	2.25	11.167	0.000	11.167	120	200	200	DWC	-400	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.03	0.00	-0.78		-0.81	3.07	3.14
660	MPLRDM2.1	MPLRDM2.2	0	1	H		30.00		30.00	2.794	2.659	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	222	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.69		1.52	1.10	1.14
661	MPLRDM2.2	MPLRDM2.3	1	1	C		5.00		35.00	2.659	2.659	0.63	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	1.52		1.49	1.14	1.17
662	MPLRDM2.3	MPLRDM2.4	1	1	C		30.00		65.00	2.659	2.611	3.78	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.49		1.32	1.17	1.29
663	MPLRDM2.4	MPMPLRDM11	1	1	C		30.00		95.00	2.611	2.333	3.78	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	108	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.32		1.15	1.29	1.18
664	MPMPLRDM11	MPRDM12	2	1	J		30.00		3526.00	2.333	2.529	3.78	444.57	2.25	11.577	0.000	11.577	122	200	200	DWC	-153	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.06	0.00	-0.81	-0.81	-0.87	3.14	3.40
665	MPRDM12	MPMPLRDM13	1	1	C		10.00		3536.00	2.529	2.467	1.26	445.83	2.25	11.610	0.000	11.610	122	200	200	DWC	161	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.02	0.00	-0.87		-0.89	3.40	3.36
666	MPMPLRDM13	MPRDM14	2	1	J		20.00		14968.00	2.467	2.268	2.52	1887.23	2.25	49.146	0.000	49.146	251	342	400	HDPE	101	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.02	0.00	-0.89	-0.89	-0.91	3.36	3.18
667	MPRDM14	MPRDM15	1	1	C		5.00		14973.00	2.268	2.241	0.63	1887.86	2.25	49.163	0.000	49.163	251	342	400	HDPE	185	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.01	0.00	-0.91		-0.92	3.18	3.16
668	MPRDM15	MPRDM16	1	1	C		11.00		14984.00	2.241	2.239	1.39	1889.24	2.25	49.199	0.000	49.199	251	342	400	HDPE	5500	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.01	0.00	-0.92		-0.93	3.16	3.17
669	MPRDM16	MPRDM17	1	1	C		30.00		15014.00	2.239	1.450	3.78	1893.03	2.25	49.298	0.000	49.298	251	342	400	HDPE	38	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.03	0.00	-0.93		-0.96	3.17	2.41
670	MPRDM17.5	MPRDM17.4	0	1	H		30.00		30.00	2.120	1.681	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	68	68	0.010	1.65	51.81	0.00	0.30	0.07	OK	0.49	OK	0.44	0.00	1.02		0.58	1.10	1.10
671	MPRDM17.4	MPRDM17.3	1	1	C		30.00		60.00	1.681	1.370	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	96	96	0.010	1.39	43.60	0.00	0.30	0.07	OK	0.42	OK	0.31	0.00	0.58		0.27	1.10	1.10
672	MPRDM17.3	MPRDM17.2	1	1	C		30.00		90.00	1.370	1.760	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-77	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.27		0.10	1.10	1.66
673	MPRDM17.2	MPRDM17.1	1	1	C		30.00		120.00	1.760	1.756	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	7500	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.10		0.01	1.66	1.75
674	MPRDM17.1	MPRDM17	1	1	C		30.00		150.00	1.756	1.450	3.78	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	98	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.01		-0.08	1.75	1.53
675	MPRDM17	MPRDM18	2	1	J		30.00		15194.00	1.450	1.280	3.78	1915.72	2.25	49.889	0.000	49.889	253	342	400	HDPE	176	1000	0.010	0.61	56.49	0.88	1.13	0.73	OK	0.69	OK	0.03	0.00	-0.96	-0.960	-0.99	2.41	2.27
676	MPRDM18	MPRDM19	1	1	C		30.00		15224.00	1.280	1.490	3.78	1919.50	2.25	49.987	0.000	49.987	253	342	400	HDPE	-143	1000	0.010	0.61	56.49	0.88	1.13	0.73	OK	0.69	OK	0.03	0.00	-0.99		-1.02	2.27	2.51
677	MPRDM19	MPRDM20	1	1	C		30.00		15254.00	1.490	1.345	3.78	1923.29	2.25	50.086	0.000	50.086	253	342	400	HDPE	207	1000	0.010	0.61	56.49	0.89	1.13	0.74	OK	0.69	OK	0.03	0.00	-1.02		-1.05	2.51	2.40
678	MPRDM20	MPRDM21	1	1	C		20.00		15274.00	1.345	1.325	2.52	1925.81	2.25	50.151	0.000	50.151	253	342	400	HDPE	1000	1000	0.010	0.61	56.49	0.89	1.13	0.74	OK	0.69	OK	0.02	0.00	-1.05		-1.07	2.40	2.40
679	PTRDM43.5.3	PTRDM43.5.2	0	1	H		25.00		25.00	2.092	2.158	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-379	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.99		0.85	1.10	1.31
680	PTRDM43.5.2	PTRDM43.5.1	1	1	C		30.00		55.00	2.158	2.221	3.78	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	-476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.85		0.68	1.31	1.54
681	PTRDM43.5.1.1	PTRDM43.5.1	0	1	H		30.00		30.00	2.270	2.221	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	612	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.17		1.00	1.10	1.22
682	PTRDM43.5.1	PTRDM43.5	2	1	J		40.00		125.00	2.221	2.325	5.04	15.76	2.25	0.410	0.000	0.410	23	200	200	DWC	-385	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.22	0.00	0.68	0.68	0.46	1.54	1.87
683	PTRDM43.7	PTRDM43.6	0	1	H		17.00		17.00	2.284	2.299	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	-1133	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.18		1.09	1.10	1.21
684	PTRDM43.6	PTRDM43.5	1	1	C		30.00		47.00	2.299	2.325	3.78	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	-1154	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.09		0.92	1.21	1.41
685	PTRDM43.5	PTRDM43.4	2	1	J		9.00		181.00	2.325	2.406	1.13	22.82	2.25	0.594	0.000	0.594	28	200	200	DWC	-111	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.02	0.00	0.46	0.46	0.44	1.87	1.97
686	PTRDM43.4.3	PTRDM43.4.2	0	1	H		11.00		11.00	2.140	2.372	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	-47	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.04		0.98	1.10	1.39
687	PTRDM43.4.2	PTRDM43.4.1	1	1	C		30.00		41.00	2.372	2.348	3.78	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.98		0.81	1.39	1.54
688	PTRDM43.4.1	PTRDM43.4	1	1	C		30.00		71.00	2.348	2.406	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	-517	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.81		0.64	1.54	1.77
689	PTRDM43.4	PTRDM43.3	2	1	J		18.00		270.00	2.406	2.485	2.27	34.04	2.25	0.887	0.000	0.887	34	200	200	DWC	-228	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	0.44	0.44	0.41	1.97	2.08
690	PTRDM43.3	PTRDM43.2	1	1	C		15.00		285.00	2.485	2.564	1.89	35.93	2.25	0.936	0.000	0.936	35	200	200	DWC	-190	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	0.41		0.38	2.08	2.18
691	PTRDM43.2	PTRDM43.1	1	1	C		30.00		315.00	2.564	2.489	3.78	39.72	2.25	1.034	0.000	1.034	37	200	200	DWC	400	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.38		0.32	2.18	2.17
692	PTRDM49	PTRDM48	0	1	H		30.00		30.00	2.344	2.349	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-6000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.24		1.07	1.10	1.28
693	PTRDM48	PTRDM47	1	1	C		9.00		39.00	2.349	2.349	1.13	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.05	0.00	1.07		1.02	1.28	1.33
694	PTRDM47	PTRDM46	1	1	C		20.00		59.00	2.349	2.263	2.52	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	233	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.02		0.91	1.33	1.35
695	PTRDM46.2	PTRDM46.1	0	1	H		27.00		27.00	2.140	2.201	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-443	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	1.04		0.89	1.10	1.31
696	PTRDM46.1	PTRDM46	1	1	C		30.00		57.00	2.201	2.263	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	-484	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.31	1.54
697	PTRDM46	PTRDM45	2	1	J		18.00		134.00	2.263	2.140	2.27	16.90	2.25	0.440	0.000	0.440	24	200	200	DWC	146	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.72	0.72	0.62	1.54	1.52
698	PTRDM45	PTRDM44.1	1	1	C		19.00		153.00	2.140	2.196	2.40	19.29	2.25	0.502	0.000	0.502	26	200	200	DWC	-339	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.62		0.56	1.52	1.64
699	PTRDM44.1A	PTRDM44.1	0	1	H		30.00		30.00	2.193	2.596	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-74	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.09		0.92	1.10	1.68
700	PTRDM44.1	PTRDM44	2	1	J		11.00		194.00	2.196	2.243	1.39	24.46	2.25	0.637	0.000	0.637	29	200	200	DWC	-234	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	0.56	0.56	0.53	1.64	1.71
701	PTRDM44	PTRDM43.1	1	1	C		30.00		224.00	2.243	2.489	3.78	28.24	2.25	0.735	0.000	0.735	31	200	200	DWC	-122	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.53		0.47	1.71	2.02
702	PTRDM43.1	PTRDM43	2	1	J		4.00		543.00	2.489	2.403	0.50	68.46	2.25	1.783	0.000	1.783	48	200	200	DWC	47	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.01	0.00	-0.42	-0.42	-0.43	2.91	2.83
703	PTRDM43.10	PTRDM43.9	0	1	H		12.00		12.00	2.773	2.792	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	-632	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.67		1.60	1.10	1.19
704	PTRDM43.9	PTRDM43.8	1	1	C		30.00		42.00	2.792	2.806	3.78	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	-2143	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.60		1.43	1.19	1.38
705	PTRDM43.8	PTRDM43	1	1	C		30.00		72.00	2.806	2.403	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	74	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.43		1.26	1.38	1.14

706	PTRDM43	PTRDM42	2	1	J		17.00		632.00	2.403	2.771	2.14	79.69	2.25	2.075	0.000	2.075	52	200	200	DWC	-46	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	-0.43	-0.43	-0.46	2.83	3.23
707	PTRDM42.3	PTRDM42.2	0	1	H		7.00		7.00	2.893	2.881	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	583	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	1.79		1.75	1.10	1.13
708	PTRDM42.2	PTRDM42.1	1	1	C		24.00		31.00	2.881	2.837	3.03	3.91	2.25	0.102	0.000	0.102	12	200	200	DWC	545	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.75		1.62	1.13	1.22
709	PTRDM42.1	PTRDM42	1	1	C		30.00		61.00	2.837	2.771	3.78	7.69	2.25	0.200	0.000	0.200	16	200	200	DWC	455	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.62		1.45	1.22	1.32
710	PTRDM42	PTRDM41	2	1	J		23.00		716.00	2.771	3.166	2.90	90.28	2.25	2.351	0.000	2.351	55	200	200	DWC	-58	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	-0.46	-0.46	-0.50	3.23	3.67
711	PTRDM41	PTRDM40	1	1	C		21.00		737.00	3.166	3.252	2.65	92.92	2.25	2.420	0.000	2.420	56	200	200	DWC	-244	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	-0.50		-0.54	3.67	3.79
712	PTRDM40.1	PTRDM40.2	0	1	H		27.00		27.00	2.424	2.616	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-141	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	1.32		1.17	1.10	1.45
713	PTRDM40.2	PTRDM40.3	1	1	C		18.00		45.00	2.616	2.626	2.27	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-1895	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	1.17		1.07	1.45	1.56
714	PTRDM40.3	PTRDM40.4	1	1	C		19.00		64.00	2.626	2.673	2.40	8.07	2.25	0.210	0.000	0.210	17	200	200	DWC	-400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.07		0.96	1.56	1.71
715	PTRDM40.4	PTRDM40.5	1	1	C		23.00		87.00	2.673	2.920	2.90	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	-93	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	0.96		0.83	1.71	2.09
716	PTRDM40.5	PTRDM40	1	1	C		13.00		100.00	2.920	3.252	1.64	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	-39	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.83		0.76	2.09	2.49
717	PTRDM40	PTRDM39	2	1	J		10.00		847.00	3.252	3.293	1.26	106.79	2.25	2.781	0.000	2.781	60	200	200	DWC	-244	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.02	0.00	-0.54	-0.54	-0.56	3.79	3.85
718	PTRDM39.1	PTRDM39.2	0	1	H		9.00		9.00	2.613	2.510	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	87	87	0.010	1.46	45.80	0.00	0.30	0.07	OK	0.44	OK	0.10	0.00	1.51		1.41	1.10	1.10
719	PTRDM39.2	PTRDM39.3	1	1	C		24.00		33.00	2.510	2.488	3.03	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	1091	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.41		1.28	1.10	1.21
720	PTRDM39.3	PTRDM39.4	1	1	C		27.00		60.00	2.488	2.466	3.40	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	1227	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	1.28		1.13	1.21	1.34
721	PTRDM39.4	PTRDM39.5	1	1	C		26.00		86.00	2.466	2.467	3.28	10.84	2.25	0.282	0.000	0.282	19	200	200	DWC	-26000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.13		0.99	1.34	1.48
722	PTRDM39.5A	PTRDM39.5	0	1	H		29.00		29.00	2.453	2.467	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	-2071	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.35		1.19	1.10	1.28
723	PTRDM39.5.1	PTRDM39.5	0	1	H		16.00		16.00	2.354	2.467	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	-142	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.25		1.16	1.10	1.31
724	PTRDM39.5	PTRDM39.6	3	1	J		24.00		155.00	2.463	2.683	3.03	19.54	2.25	0.509	0.000	0.509	26	200	200	DWC	-109	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.99	0.99	0.91	1.47	1.77
725	PTRDM39.6.1	PTRDM39.6	0	1	H		30.00		30.00	2.751	2.683	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	441	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.65		1.48	1.10	1.20
726	PTRDM39.6	PTRDM39.7	2	1	J		25.00		210.00	2.683	2.905	3.15	26.48	2.25	0.690	0.000	0.690	30	200	200	DWC	-113	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	0.84	0.84	0.78	1.84	2.13
727	PTRDM39.7	PTRDM39.8	1	1	C		32.00		242.00	2.905	3.028	4.03	30.51	2.25	0.795	0.000	0.795	32	200	200	DWC	-260	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.78		0.72	2.13	2.31
728	PTRDM39.8.1	PTRDM39.8	0	1	H		24.00		24.00	3.244	3.030	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	112	112	0.010	1.28	40.37	0.00	0.30	0.07	OK	0.38	OK	0.21	0.00	2.14		1.93	1.10	1.10
729	PTRDM39.8	PTRDM39	2	1	J		21.00		287.00	3.030	3.293	2.65	36.19	2.25	0.942	0.000	0.942	35	200	200	DWC	-80	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.61	0.61	0.57	2.42	2.72
730	PTRDM39	PTRDM38	2	1	J		37.00		1171.00	3.293	3.413	4.67	147.64	2.25	3.845	0.000	3.845	70	200	200	DWC	-308	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.07	0.00	-0.72	-0.72	-0.79	4.01	4.20
731	PTRDM38	PTRDM37	1	1	C		30.00		1201.00	3.413	3.442	3.78	151.43	2.25	3.943	0.000	3.943	71	200	200	DWC	-1034	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.06	0.00	-0.79		-0.85	4.20	4.29
732	PTRDM37	PTRDM36.1	1	1	C		10.00		1211.00	3.442	3.472	1.26	152.69	2.25	3.976	0.000	3.976	72	200	200	DWC	-333	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.02	0.00	-0.85		-0.87	4.29	4.34
733	PTRDM36.1A	PTRDM36.1	0	1	H		30.00		30.00	3.200	3.472	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-110	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.10		1.93	1.10	1.54
734	PTRDM36.1	PTRDM36	2	1	J		20.00		1261.00	3.472	3.563	2.52	158.99	2.25	4.140	0.000	4.140	73	200	200	DWC	-220	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.04	0.00	-0.87	-0.87	-0.91	4.34	4.47
735	PTRDM36	PTRDM35	1	1	C		30.00		1291.00	3.563	3.679	3.78	162.77	2.25	4.239	0.000	4.239	74	200	200	DWC	-259	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.06	0.00	-0.91		-0.97	4.47	4.65
736	PTRDM35	PTRDM34	1	1	C		11.00		1302.00	3.679	3.788	1.39	164.16	2.25	4.275	0.000	4.275	74	200	200	DWC	-101	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.02	0.00	-0.97		-0.99	4.65	4.78
737	PTRDM34.7.3	PTRDM34.7.2	0	1	H		23.00		23.00	3.242	3.404	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	-142	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.14		2.01	1.10	1.39
738	PTRDM34.7.2	PTRDM34.7.1	1	1	C		22.00		45.00	3.404	3.483	2.77	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-278	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.01		1.89	1.39	1.59
739	PTRDM34.7.1	PTRDM34.7	1	1	C		25.00		70.00	3.483	3.546	3.15	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	-397	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.89		1.75	1.59	1.80
740	PTRDM34.7	PTRDM34.8	1	1	C		6.00		76.00	3.546	3.566	0.76	9.58	2.25	0.250	0.000	0.250	18	200	200	DWC	-300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	1.75		1.72	1.80	1.85
741	PTRDM34.8.4	PTRDM34.8.3	0	1	H		19.00		19.00	3.501	3.525	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	-792	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.40		2.29	1.10	1.24
742	PTRDM34.8.3	PTRDM34.8.2	1	1	C		16.00		35.00	3.525	3.519	2.02	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	2667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.29		2.20	1.24	1.32
743	PTRDM34.8.2	PTRDM34.8.1	1	1	C		11.00		46.00	3.519	3.542	1.39	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	-478	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.20		2.14	1.32	1.40
744	PTRDM34.8.1	PTRDM34.8	1	1	C		16.00		62.00	3.542	3.566	2.02	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	-667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.14		2.05	1.40	1.52
745	PTRDM34.8	PTRDM34.9	2	1	J		28.00		166.00	3.566	3.624	3.53	20.93	2.25	0.545	0.000	0.545	27	200	200	DWC	-483	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.72	1.72	1.65	1.85	1.97
746	PTRDM34.9	PTRDM34.10	1	1	C		17.00		183.00	3.624	3.294	2.14	23.07	2.25	0.601	0.000	0.601	28	200	200	DWC	52	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	1.65		1.61	1.97	1.68
747	PTRDM34.10	PTRDM34.11	1	1	C		15.00		198.00	3.294	3.294	1.89	24.96	2.25	0.650	0.000	0.650	29	200	200	DWC	0	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	1.61		1.57	1.68	1.72
748	PTRDM34.11.4	PTRDM34.11.3	0	1	H		26.00		26.00	2.730	3.041	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-84	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.63		1.49	1.10	1.55
749	PTRDM34.11.3	PTRDM34.11.2	1	1	C		22.00		48.00	3.041	3.269	2.77	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-96	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.49		1.37	1.55	1.90
750	PTRDM34.11.2	PTRDM34.11.1	1	1	C		24.00		72.00	3.269	2.994	3.03	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	87	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	1.37		1.24	1.90	1.75
751	PTRDM34.11.1	PTRDM34.11	1	1	C		22.00		94.00	2.994	3.294	2.77	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	-73	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	1.24		1.12	1.75	2.17
752	PTRDM34.11	PTRDM34.12	2	1	J		25.00		317.00	3.294	3.542	3.15	39.97	2.25	1.041	0.000	1.041	37	200	200	DWC	-101	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	1.12	1.12	1.07	2.17	2.47
753	PTRDM34.12	PTRDM34.13	1	1	C		23.00		340.00	3.542	3.982	2.90	42.87	2.25	1.116	0.000	1.116	38	200	200	DWC	-52	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.07		1.03	2.47	2.95
754	PTRDM34.13	PTRDM34.14	1	1	C		26.00		366.00	3.982	3.079	3.28	46.15	2.25	1.202	0.000	1.202	40	200	200	DWC	29	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	1.03		0.98	2.95	2.10
755	PTRDM34.14	PTRDM34.15	1	1	C		31.00		397.00	3.079	2.628	3.91	50.06	2.25	1.304	0.000	1.304	41	200	200	DWC	69	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.98		0.92	2.10	1.71
756	PTRDM34.15.1	PTRDM34.15	0	1	H		22.00		22.00	2.491	2.628	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	-161	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.39		1.27	1.10	1.36
757	PTRDM34.15	PTRDM34.16	2	1	J		23.00		442.00	2.628	2.722	2.90	55.73	2.25	1.451	0.000	1.451	43	200	200	DWC	-245	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	0.92	0.92	0.88	1.71	1.84
758	PTRDM34.16	PTRDM34.17	1	1	C		18.00		460.00	2.722	2.846	2.27	58.00	2.25	1.510	0.000	1.510	44	200	200	DWC	-145	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	0.88		0.85	1.84	2.00
759	PTRDM34.17	PTRDM34.18	1	1	C		28.00		488.00	2.846	3.031	3.53	61.53	2.25	1.602	0.000	1.602	46	200	200	DWC	-151	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	0.85		0.80	2.00	2.23
760	PTRDM34.18.1	PTRDM34.18	0	1	H		26.00		26.00	2.622	3.031	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-64	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.52		1.38	1.10	1.65
761	PTRDM34.18	PTRDM34.19	2	1	J		12.00		526.00	3.031	2.998	1.51	66.32	2.25	1.727	0.000	1.727	47	200	200	DWC	364	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.02	0.00	0.80	0.80	0.78	2.23	2.22
762	PTRDM34.19.1	PTRDM34.19	0	1	H		23.00		23.00	2.813	2.998	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	-124	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.71		1.58	1.10	1.42
763	PTRDM34.19	PTRDM34.20	2	1	J		18.00		567.00	2.998	3.156	2.27	71.49	2.25	1.862	0.000	1.862	49	200	200	DWC	-114	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.03	0.00	0.78	0.78	0.75	2.22	2.41
764	PTRDM34.20	PTRDM34.21	1	1	C		13.00		580.00	3.156	3.402	1.64	73.13	2.25	1.904	0.000	1.904	50	200	200	DWC	-53	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.03	0.00	0.75		0.72	2.41	2.68
765	PTRDM34.21	PTRDM34.22	1	1	C		22.00		602.00	3.402	3.830	2.77	75.90	2.25	1.977	0.000	1.977	51	200	200	DWC	-51	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	0.72		0.68	2.68	3.15
766	PTRDM34.22	PTRDM34	1	1	C		17.00		619.00	3.830	3.788	2.14	78.05	2.25	2.032	0.000	2.032	51	200	200	DWC	405	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	0.68		0.65	3.15	3.14
767	PTRDM34	PTRDM33	2	1	J		18.00		1939.00	3.788	3.677	2.27	244.48	2.25	6.367	0.000	6.367	91	200	200	DWC	162	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.03	0.00	-0.99	-0.99	-1.02	4.78	4.70
768	PTRDM33	PTRDM32	1	1	C		16.00		1955.00	3.677	3.782	2.02	246.49	2.25	6.419	0.000	6.419	91	200	200	DWC	-152	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.03	0.00	-1.02		-1.05	4.70	4.83
769	PTRDM32	PTRDM31	1	1	C		23.00		1978.00	3.782	3.947	2.90	249.39	2.25	6.495	0.000	6.495	91	200	200	DWC	-139	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.04	0.00	-1.05		-1.09	4.83	5.04
770	PTRDM31	PTRDM30	1	1	C		37.00		2015.00	3.947	3.951	4.67	254.06	2.25	6.616	0.000	6.616	92	200	200	DWC	-9250	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.07	0.00	-1.09		-1.16	5.04	5.11
771	PTRDM30	PTRDM29	1	1	C		30.00		2045.00	3.951	3.901	3.78	257.84	2.25	6.715	0.000	6.715	93	200	200	DWC	600	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	-1.16		-1.22	5.11	5.12
772	ERRDM68.7	ERRDM68.6	0	1	H		25.00		25.00	4.610	4.562	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	521	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.51		3.37	1.10	1.19
773	ERRDM68.6	ERRDM68.5	1	1	C		17.00		42.00	4.562	4.496	2.14	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	258	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	3.37		3.28	1.19	1.22
774	ERRDM68.5	ERRDM68.4	1	1	C		16.00		58.00	4.496	4.431	2.02	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	246	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.28		3.19	1.22	1.24
775	ERRDM68.4	ERRDM68.3	1	1	C		20.00		78.00	4.431	4.402	2.52	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	690	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.19		3.08	1.24	1.32
776	ERRDM68.3	ERRDM68.2	1	1	C		20.00		98.00	4.402	4.373	2.52	12.36	2.25	0.322	0.000	0.322	21	200	200	DWC	690	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.08		2.97	1.32	1.40
777	ERRDM68.2	ERRDM68.1	1	1	C		22.00		120.00	4.373	4.160	2.77	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	103	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.97		2.85	1.40	1.31
778	ERRDM68.1	ERRDM68	1	1	C		12.00		132.00	4.160	4.030	1.51	16.64	2.25	0.433	0.000	0.433	24	200	200	DWC	92	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.85		2.78	1.31	1.25
779	ERRDM68	ERRDM67	1	1	C		23.00		155.00	4.030	4.129	2.90	19.54	2.25	0.509	0.000	0.509	26	200	200	DWC	-232	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.78		2.71	1.25	1.42
780	ERRDM67	ERRDM66	1	1	C		30.00		185.00	4.129	4.424	3.78	23.33	2.25	0.607	0.000	0.607	28	200	200	DWC	-102	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.71		2.64	1.42	1.78
781	ERRDM66	ER-PTRDM65	1	1	C		30.00		215.00	4.424	4.720	3.78	27.11	2.25	0.706	0.000	0.706	30	200	200	DWC	-101	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.64		2.57	1.78	2.15
782	DERDM88	DERDM89	0	1	H		28.00		28.00	5.240	5.255	3.53	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	-1867	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	4.14		3.98	1.10	1.28
783	DERDM89	DERDM90	1	1	C		18.00		46.00	5.255	5.073	2.27	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	99	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	3.98		3.88	1.28	1.19
784	DERDM90.1	DERDM90	0	1	H		30.00		30.00	4.723	5.073	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-86	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.62		3.45	1.10	1.62
785	DERDM90	DERDM91	2	1	J		30.00		106.00	5.073	5.033	3.78	13.36	2.25	0.348	0.000	0.348	22	200	200	DWC	750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.45	3.45	3.28	1.62	1.75

786	DERDM91	ER-PTRDM65	1	1	C		20.00		126.00	5.033	4.720	2.52	15.89	2.25	0.414	0.000	0.414	23	200	200	DWC	64	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.28		3.17	1.75	1.55
787	ER-PTRDM65	PTRDM1	2	1	J		20.00		361.00	4.720	4.839	2.52	45.52	2.25	1.185	0.000	1.185	39	200	200	DWC	-168	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	2.57	2.570	2.53	2.15	2.31
788	PTRDM1	PTRDM2	1	1	C		30.00		391.00	4.839	4.857	3.78	49.30	2.25	1.284	0.000	1.284	41	200	200	DWC	-1667	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.53		2.47	2.31	2.39
789	PTRDM2	PTRDM3	1	1	C		30.00		421.00	4.857	4.876	3.78	53.08	2.25	1.382	0.000	1.382	42	200	200	DWC	-1579	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.47		2.41	2.39	2.47
790	PTRDM3.6	PTRDM3.5	0	1	H		17.00		17.00	3.510	3.532	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	-773	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.41		2.32	1.10	1.21
791	PTRDM3.5	PTRDM3.4	1	1	C		17.00		34.00	3.532	3.556	2.14	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	-708	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.32		2.23	1.21	1.33
792	PTRDM3.4	PTRDM3.3	1	1	C		30.00		64.00	3.556	3.579	3.78	8.07	2.25	0.210	0.000	0.210	17	200	200	DWC	-1304	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.23		2.06	1.33	1.52
793	PTRDM3.3	PTRDM3.2	1	1	C		26.00		90.00	3.579	3.933	3.28	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-73	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.06		1.92	1.52	2.01
794	PTRDM3.2	PTRDM3.1	1	1	C		15.00		105.00	3.933	4.286	1.89	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-42	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	1.92		1.84	2.01	2.45
795	PTRDM3.1	PTRDM3	1	1	C		30.00		135.00	4.286	4.876	3.78	17.02	2.25	0.443	0.000	0.443	24	200	200	DWC	-51	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.84		1.67	2.45	3.21
796	PTRDM3	PTRDM4	2	1	J		30.00		586.00	4.876	4.837	3.78	73.89	2.25	1.924	0.000	1.924	50	200	200	DWC	769	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	1.67	1.67	1.61	3.21	3.23
797	PTRDM4	PTRDM5	1	1	C		15.00		601.00	4.837	4.821	1.89	75.78	2.25	1.973	0.000	1.973	51	200	200	DWC	937	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	1.61		1.58	3.23	3.24
798	PTRDM5	PTRDM6	1	1	C		21.00		622.00	4.821	4.667	2.65	78.42	2.25	2.042	0.000	2.042	52	200	200	DWC	136	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	1.58		1.54	3.24	3.13
799	KLRDM7A	KLRDM6A	0	1	H		15.00		15.00	4.820	4.859	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-385	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.72		3.64	1.10	1.22
800	KLRDM6A	KLRDM5A	1	1	C		12.00		27.00	4.859	4.857	1.51	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	6000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	3.64		3.57	1.22	1.29
801	KLRDM5A	KLRDM4A	1	1	C		10.00		37.00	4.857	4.854	1.26	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	3333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.57		3.51	1.29	1.34
802	KLRDM4A	KLRDM3A	1	1	C		21.00		58.00	4.854	4.862	2.65	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	-2625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	3.51		3.39	1.34	1.47
803	KLRDM3A	KLRDM2.1A	1	1	C		15.00		73.00	4.862	4.892	1.89	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	-500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.39		3.31	1.47	1.58
804	KLRDM2.1B	KLRDM2.1A	0	1	H		30.00		30.00	4.911	4.892	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1579	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.81		3.64	1.10	1.25
805	KLRDM2.1A	KLRDM2A	2	1	J		16.00		119.00	4.892	4.992	2.02	15.00	2.25	0.391	0.000	0.391	23	200	200	DWC	-160	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.31	3.310	3.22	1.58	1.77
806	KLRDM2A	KLRDM1A	1	1	C		30.00		149.00	4.992	4.820	3.78	18.79	2.25	0.489	0.000	0.489	25	200	200	DWC	174	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.06	0.00	3.22		3.16	1.77	1.66
807	KLRDM1A	PTRDM6	1	1	C		30.00		179.00	4.820	4.667	3.78	22.57	2.25	0.588	0.000	0.588	28	200	200	DWC	196	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.06	0.00	3.16		3.10	1.66	1.57
808	PTRDM6	PTRDM7	2	1	J		18.00		819.00	4.667	4.597	2.27	103.26	2.25	2.689	0.000	2.689	59	200	200	DWC	257	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	1.54	1.54	1.51	3.13	3.09
809	PTRDM7	PT-KRRDM8	1	1	C		30.00		849.00	4.597	4.521	3.78	107.05	2.25	2.788	0.000	2.788	60	200	200	DWC	395	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	1.51		1.45	3.09	3.07
810	KRRDM16	KRRDM15	0	1	H		30.00		30.00	2.200	2.171	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1034	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.10		0.93	1.10	1.24
811	KRRDM15	KRRDM14	1	1	C		16.00		46.00	2.171	2.088	2.02	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	193	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.93		0.84	1.24	1.25
812	KRRDM14	KRRDM13	1	1	C		9.00		55.00	2.088	2.180	1.13	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	-98	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	0.84		0.79	1.25	1.39
813	KRRDM13	KRRDM12	1	1	C		20.00		75.00	2.180	2.385	2.52	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	-98	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.79		0.68	1.39	1.71
814	KRRDM12	KR-SRRDM11	1	1	C		30.00		105.00	2.380	2.683	3.78	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-99	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.68		0.51	1.70	2.17
815	SRRDM6	SRRDM5	0	1	H		15.00		15.00	3.330	3.270	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.23		2.15	1.10	1.12
816	SRRDM5	SRRDM4	1	1	C		13.00		28.00	3.270	3.257	1.64	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.15		2.08	1.12	1.18
817	SRRDM4	SRRDM3	1	1	C		16.00		44.00	3.257	3.188	2.02	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	232	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.08		1.99	1.18	1.20
818	SRRDM3	SRRDM2	1	1	C		16.00		60.00	3.188	2.910	2.02	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	58	58	0.010	1.78	56.10	0.00	0.30	0.07	OK	0.53	OK	0.28	0.00	1.99		1.71	1.20	1.20
819	SRRDM2	SRRDM1	1	1	C		30.00		90.00	2.910	2.907	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	10000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.71		1.54	1.20	1.37
820	SRRDM1	KR-SRRDM11	1	1	C		30.00		120.00	2.907	2.683	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	134	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.54		1.37	1.37	1.31
821	KR-SRRDM11	KRRDM10	2	1	J		23.00		248.00	2.683	2.772	2.90	31.27	2.25	0.814	0.000	0.814	33	200	200	DWC	-258	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.51	0.510	0.47	2.17	2.30
822	KRRDM10	KRRDM9	1	1	C		30.00		278.00	2.772	3.042	3.78	35.05	2.25	0.913	0.000	0.913	35	200	200	DWC	-111	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.47		0.41	2.30	2.63
823	KRRDM9	KRRDM8	1	1	C		19.00		297.00	3.042	3.213	2.40	37.45	2.25	0.975	0.000	0.975	36	200	200	DWC	-111	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.41		0.37	2.63	2.84
824	KRRDM8.4	KRRDM8.3	0	1	H		25.00		25.00	3.190	3.121	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	362	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.09		1.95	1.10	1.17
825	KRRDM8.3	KRRDM8.2	1	1	C		10.00		35.00	3.121	3.097	1.26	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	417	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.95		1.89	1.17	1.21
826	KRRDM8.2	KRRDM8.1	1	1	C		21.00		56.00	3.097	3.105	2.65	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	-2625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	1.89		1.77	1.21	1.34
827	KRRDM8.1	KRRDM8	1	1	C		30.00		86.00	3.105	3.213	3.78	10.84	2.25	0.282	0.000	0.282	19	200	200	DWC	-278	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.77		1.60	1.34	1.61
828	KRRDM8	KR-MTRDM7	2	1	J		26.00		409.00	3.213	3.481	3.28	51.57	2.25	1.343	0.000	1.343	42	200	200	DWC	-97	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.05	0.00	0.37	0.370	0.32	2.84	3.16
829	MTRDM4A	MTRDM3A	0	1	H		21.00		21.00	3.480	3.681	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	-104	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.38		2.26	1.10	1.42
830	MTRDM3A	MTRDM2A	1	1	C		30.00		51.00	3.681	3.628	3.78	6.43	2.25	0.167	0.000	0.167	15	200	200	DWC	566	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.26		2.09	1.42	1.54
831	MTRDM2A	MTRDM1A	1	1	C		30.00		81.00	3.628	3.525	3.78	10.21	2.25	0.266	0.000	0.266	19	200	200	DWC	291	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.09		1.92	1.54	1.61
832	MTRDM1A	KR-MTRDM7	1	1	C		13.00		94.00	3.525	3.481	1.64	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	295	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	1.92		1.85	1.61	1.63
833	2NJRDM6	2NJRDM5	0	1	H		22.00		22.00	3.852	3.816	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	611	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.75		2.63	1.10	1.19
834	2NJRDM5	2NJRDM4	1	1	C		19.00		41.00	3.816	3.709	2.40	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	178	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.63		2.52	1.19	1.19
835	2NJRDM4.3	2NJRDM4.2	0	1	H		17.00		17.00	3.920	3.790	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	131	131	0.010	1.19	37.33	0.00	0.30	0.07	OK	0.36	OK	0.13	0.00	2.82		2.69	1.10	1.10
836	2NJRDM4.2	2NJRDM4.1	1	1	C		7.00		24.00	3.790	3.773	0.88	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	412	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	2.69		2.65	1.10	1.12
837	2NJRDM4.1	2NJRDM4	1	1	C		30.00		54.00	3.773	3.709	3.78	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	469	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.65		2.48	1.12	1.23
838	2NJRDM4	2NJRDM3	2	1	J		5.00		100.00	3.709	3.648	0.63	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	82	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.48	2.480	2.45	1.23	1.20
839	2NJRDM3	2NJRDM2	1	1	C		13.00		113.00	3.648	3.583	1.64	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.45		2.38	1.20	1.20
840	2NJRDM2	2NJRDM1	1	1	C		12.00		125.00	3.583	3.563	1.51	15.76	2.25	0.410	0.000	0.410	23	200	200	DWC	600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.38		2.31	1.20	1.25
841	2NJRDM1	KR-MTRDM7	1	1	C		30.00		155.00	3.563	3.481	3.78	19.54	2.25	0.509	0.000	0.509	26	200	200	DWC	366	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.06	0.00	2.31		2.25	1.25	1.23
842	KR-MTRDM7	KRRDM6	3	1	J		20.00		678.00	3.481	3.368	2.52	85.48	2.25	2.226	0.000	2.226	54	200	200	DWC	177	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.04	0.00	0.32	0.320	0.28	3.16	3.09
843	KRRDM6.2	KRRDM6.1	0	1	H		21.00		21.00	3.870	3.710	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	131	131	0.010	1.19	37.33	0.00	0.30	0.07	OK	0.36	OK	0.16	0.00	2.77		2.61	1.10	1.10
844	KRRDM6.1	KRRDM6	1	1	C		24.00		45.00	3.710	3.370	3.03	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	71	71	0.010	1.61	50.70	0.00	0.30	0.07	OK	0.48	OK	0.34	0.00	2.61		2.27	1.10	1.10
845	KRRDM6	KRRDM5	2	1	J		25.00		748.00	3.370	3.680	3.15	94.31	2.25	2.456	0.000	2.456	56	200	200	DWC	-81	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	0.28	0.280	0.23	3.09	3.45
846	KRRDM5.4	KRRDM5.3	0	1	H		11.00		11.00	4.110	4.097	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	846	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.01		2.95	1.10	1.15
847	KRRDM5.3	KRRDM5.2	1	1	C		30.00		41.00	4.097	4.063	3.78	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	882	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.95		2.78	1.15	1.28
848	KRRDM5.2	KRRDM5.1	1	1	C		30.00		71.00	4.063	4.046	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	1765	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.78		2.61	1.28	1.44
849	KRRDM5.1	KRRDM5	1	1	C		30.00		101.00	4.046	3.680	3.78	12.73	2.25	0.332	0.000	0.332	21	200	200	DWC	82	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.61		2.44	1.44	1.24
850	KRRDM5	KRRDM4	2	1	J		30.00		879.00	3.680	3.779	3.78	110.83	2.25	2.886	0.000	2.886	61	200	200	DWC	-303	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	0.23	0.230	0.17	3.45	3.61
851	KRRDM4.3	KRRDM4.2	0	1	H		27.00		27.00	4.732	4.510	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	122	122	0.010	1.23	38.68	0.00	0.30	0.07	OK	0.37	OK	0.22	0.00	3.63		3.41	1.10	1.10
852	KRRDM4.2	KRRDM4.1	1	1	C		8.00		35.00	4.510	4.260	1.01	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	32	32	0.010	2.40	75.52	0.00	0.30	0.07	OK	0.72	OK	0.25	0.00	3.41		3.16	1.10	1.10
853	KRRDM4.1	KRRDM4	1	1	C		20.00		55.00	4.260	3.780	2.52	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	42	42	0.010	2.09	65.92	0.00	0.30	0.07	OK	0.63	OK	0.48	0.00	3.16		2.68	1.10	1.10
854	KRRDM4	KRRDM3	2	1	J		20.00		954.00	3.780	4.046	2.52	120.28	2.25	3.132	0.000	3.132	64	200	200	DWC	-75	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.04	0.00	0.17	0.170	0.13	3.61	3.92
855	KRRDM3.2	KRRDM3.1	0	1	H		22.00		22.00	4.434	4.203	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	95	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.23	0.00	3.33		3.10	1.10	1.10
856	KRRDM3.1	KRRDM3	1	1	C		15.00		37.00	4.203	4.050	1.89	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	98	98	0.010	1.37	43.16	0.00	0.30	0.07	OK	0.41	OK	0.15	0.00	3.10		2.95	1.10	1.10
857	KRRDM3	KRRDM2.1	2	1	J		13.00		1004.00	4.050	4.024	1.64	126.59	2.25	3.297	0.000	3.297	65	200	200	DWC	500	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.03	0.00	0.13	0.130	0.10	3.92	3.92
858	KRRDM2.1A	KRRDM2.1	0	1	H		40.00		40.00	4.540	4.024	5.04	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	78	77	0.010	1.55	48.69	0.00	0.30	0.07	OK	0.46	OK	0.52	0.00	3.44		2.92	1.10	1.10
859	KRRDM2.1	KRRDM2	2	1	J		27.00		1071.00	4.024	4.140	3.40	135.04	2.25	3.517	0.000	3.517	67	200	200	DWC	-233	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.05	0.00	0.10	0.100	0.05	3.92	4.09
860	KRRDM2A	KRRDM2	0	1	H		26.00		26.00	4.000	4.140	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-186	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.90		2.76	1.10	1.38
861	KRRDM2	KRRDM1	2	1	J		17.00		1114.00	4.140	4.270	2.14	140.46	2.25	3.658	0.000	3.658	69	200	200	DWC	-131	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.03	0.00	0.05	0.050	0.02	4.09	4.25
862	KRRDM1	PT-KRRDM8	1	1	C		30.00		1144.00	4.270	4.450	3.78	144.24	2.25	3.756	0.000	3.756	70	200	200	DWC	-167	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	0.02		-0.04	4.25	4.49
863	PT-KRRDM8	PTRDM9	2	1	J		30.00		2023.00	4.450	4.617	3.78	255.07	2.25	6.642	0.000	6.642	92	200	200	DWC	-180	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	-0.04	-0.04	-0.10	4.49	4.72
864	PTRDM9	PTRDM10	1	1	C		30.00		2053.00	4.617	4.865	3.78	258.85	2.25	6.741	0.000	6.741	93	200	200	DWC	-121	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	-0.10		-0.16	4.72	5.03

865	PTRDM10	PTRDM10.1	1	1	C		14.00		2067.00	4.865	4.906	1.77	260.62	2.25	6.787	0.000	6.787	93	200	200	DWC	-341	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.03	0.00	-0.16		-0.19	5.03	5.10
866	PTRDM10.1A	PTRDM10.1	0	1	H		40.00		40.00	4.478	4.906	5.04	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	-93	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	3.38		3.16	1.10	1.75
867	PTRDM10.2A	PTRDM10.1	0	1	H		30.00		30.00	4.506	4.906	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-75	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.41		3.24	1.10	1.67
868	PTRDM10.1	PTRDM11	3	1	J		16.00		2153.00	4.906	4.948	2.02	271.46	2.25	7.069	0.000	7.069	95	200	200	DWC	-381	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.03	0.00	-0.19	-0.19	-0.22	5.10	5.17
869	PTRDM11	PTRDM12	1	1	C		20.00		2173.00	4.948	4.990	2.52	273.98	2.25	7.135	0.000	7.135	96	200	200	DWC	-476	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.04	0.00	-0.22		-0.26	5.17	5.25
870	PTRDM12	PTRDM13	1	1	C		30.00		2203.00	4.990	5.032	3.78	277.76	2.25	7.233	0.000	7.233	96	200	200	DWC	-714	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.06	0.00	-0.26		-0.32	5.25	5.35
871	PTRDM13	PTRDM14A	1	1	C		40.00		2243.00	5.032	4.970	5.04	282.81	2.25	7.365	0.000	7.365	97	200	200	DWC	645	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.08	0.00	-0.32		-0.40	5.35	5.37
872	PTRDM14A	PTRDM14	1	1	C		36.00		2279.00	4.970	4.877	4.54	287.35	2.25	7.483	0.000	7.483	98	200	200	DWC	387	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.07	0.00	-0.40		-0.47	5.37	5.35
873	1KNRDM7	1KNRDM6.1	0	1	H		18.00		18.00	3.503	3.640	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-131	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.40		2.30	1.10	1.34
874	1KNRDM6.1A	1KNRDM6.1	0	1	H		25.00		25.00	3.672	3.640	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	781	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.57		2.43	1.10	1.21
875	1KNRDM6.1	1KNRDM6	2	1	J		5.00		48.00	3.640	3.671	0.63	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-161	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	2.30	2.300	2.27	1.34	1.40
876	1KNRDM6A	1KNRDM6	0	1	H		30.00		30.00	3.893	3.671	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	135	135	0.010	1.17	36.77	0.00	0.30	0.07	OK	0.35	OK	0.22	0.00	2.79		2.57	1.10	1.10
877	1KNRDM6	1KNRDM5.1	2	1	J		27.00		105.00	3.671	3.901	3.40	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-117	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	2.27	2.270	2.12	1.40	1.78
878	1KNRDM5.1A	1KNRDM5.1	0	1	H		25.00		25.00	3.911	3.901	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	2500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.81		2.67	1.10	1.23
879	1KNRDM5.1	1KNRDM5	2	1	J		21.00		151.00	3.901	4.043	2.65	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	-148	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	2.12	2.120	2.05	1.78	1.99
880	1KNRDM1	1KNRDM2	0	1	H		30.00		30.00	4.604	4.413	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	157	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.19	0.00	3.50		3.31	1.10	1.10
881	1KNRDM2	1KNRDM3	1	1	C		17.00		47.00	4.413	4.260	2.14	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	111	115	0.010	1.27	39.84	0.00	0.30	0.07	OK	0.38	OK	0.15	0.00	3.31		3.16	1.10	1.10
882	1KNRDM3	1KNRDM4	1	1	C		14.00		61.00	4.260	4.259	1.77	7.69	2.25	0.200	0.000	0.200	16	200	200	DWC	14000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.16		3.08	1.10	1.18
883	1KNRDM4	1KNRDM5	1	1	C		28.00		89.00	4.259	4.043	3.53	11.22	2.25	0.292	0.000	0.292	20	200	200	DWC	130	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	3.08		2.92	1.18	1.12
884	1KNRDM5	1KNRDM5A	2	1	J		23.00		263.00	4.043	4.132	2.90	33.16	2.25	0.864	0.000	0.864	34	200	200	DWC	-258	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	2.05	2.050	2.01	1.99	2.12
885	1KNRDM5B	1KNRDM5A	0	1	H		35.00		35.00	4.193	4.132	4.41	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	574	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	3.09		2.90	1.10	1.23
886	1KNRDM5A	1KNRDM5C	2	1	J		32.00		330.00	4.132	4.464	4.03	41.61	2.25	1.084	0.000	1.084	38	200	200	DWC	-96	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.01	2.010	1.95	2.12	2.51
887	1KNRDM5C	PTRDM14	1	1	C		30.00		360.00	4.464	4.877	3.78	45.39	2.25	1.182	0.000	1.182	39	200	200	DWC	-73	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	1.95		1.89	2.51	2.99
888	PTRDM14	PTRDM15	2	1	J		30.00		2669.00	4.877	4.951	3.78	336.52	2.25	8.763	0.000	8.763	106	200	200	DWC	-405	520	0.010	0.60	18.73	0.47	0.99	0.48	OK	0.59	OK	0.06	0.00	-0.47	-0.47	-0.53	5.35	5.48
889	PTRDM15	PTRDM16	1	1	C		26.00		2695.00	4.951	4.793	3.28	339.80	2.25	8.849	0.000	8.849	107	200	200	DWC	165	520	0.010	0.60	18.73	0.47	0.99	0.48	OK	0.59	OK	0.05	0.00	-0.53		-0.58	5.48	5.37
890	PTRDM16	PT-PLRDM17	1	1	C		27.00		2722.00	4.793	4.701	3.40	343.20	2.25	8.938	0.000	8.938	107	200	200	DWC	293	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.05	0.00	-0.58		-0.63	5.37	5.33
891	PT-PLRDM17	PTRDM18	1	1	C		30.00		2752.00	4.701	4.609	3.78	346.98	2.25	9.036	0.000	9.036	108	200	200	DWC	326	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.06	0.00	-0.63		-0.69	5.33	5.30
892	PTRDM18	PT-RNRDM19	1	1	C		19.00		2771.00	4.609	4.554	2.40	349.38	2.25	9.098	0.000	9.098	108	200	200	DWC	345	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.04	0.00	-0.69		-0.73	5.30	5.28
893	RNRDM13.8	RNRDM13.7	0	1	H		27.00		27.00	1.982	2.028	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-587	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	0.88		0.73	1.10	1.30
894	RNRDM13.7	RNRDM13.6	1	1	C		30.00		57.00	2.028	2.124	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	-313	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.73		0.56	1.30	1.56
895	RNRDM13.6	RNRDM13.4	1	1	C		43.00		100.00	2.124	2.317	5.42	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	-223	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.24	0.00	0.56		0.32	1.56	2.00
896	RNRDM13.4	RNRDM13.2	1	1	C		50.00		150.00	2.317	2.401	6.30	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	-595	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.16	0.00	0.32		0.16	2.00	2.24
897	RNRDM13.2.1	RNRDM13.2.2	0	1	H		26.00		26.00	1.744	1.460	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	92	92	0.010	1.41	44.54	0.00	0.30	0.07	OK	0.42	OK	0.28	0.00	0.64		0.36	1.10	1.10
898	RNRDM13.2.2	RNRDM13.2.3	1	1	C		28.00		54.00	1.460	2.562	3.53	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	-25	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.36		0.20	1.10	2.36
899	RNRDM13.2.3	RNRDM13.2	1	1	C		40.00		94.00	2.562	2.401	5.04	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	248	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.22	0.00	0.20		-0.02	2.36	2.42
900	RNRDM13.1.1	RNRDM13.1.2	0	1	H		28.00		28.00	1.550	2.222	3.53	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	-42	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.45		0.29	1.10	1.93
901	RNRDM13.1.2	RNRDM13.1	1	1	C		40.00		68.00	2.222	2.183	5.04	8.57	2.25	0.223	0.000	0.223	17	200	200	DWC	1026	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.22	0.00	0.29		0.07	1.93	2.11
902	RNRDM13.1	RNRDM13.2	1	1	C		34.00		102.00	2.183	2.401	4.29	12.86	2.25	0.335	0.000	0.335	21	200	200	DWC	-156	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.07		-0.12	2.11	2.52
903	RNRDM13.2	R2RDM2	3	1	J		46.00		392.00	2.401	3.052	5.80	49.42	2.25	1.287	0.000	1.287	41	200	200	DWC	-71	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.09	0.00	-0.02	-0.020	-0.11	2.42	3.16
904	R2RDM2	R2RDM1	1	1	C		48.00		440.00	3.052	2.892	6.05	55.48	2.25	1.445	0.000	1.445	43	200	200	DWC	300	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.09	0.00	-0.11		-0.20	3.16	3.09
905	R2RDM1	RNR2RDM11	1	1	C		30.00		470.00	2.892	2.816	3.78	59.26	2.25	1.543	0.000	1.543	45	200	200	DWC	395	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.20		-0.26	3.09	3.08
906	RNRDM15	RNRDM14	0	1	H		30.00		30.00	1.790	1.581	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	144	144	0.010	1.13	35.60	0.00	0.30	0.07	OK	0.34	OK	0.21	0.00	0.69		0.48	1.10	1.10
907	RNRDM14	RNRDM13	1	1	C		30.00		60.00	1.581	1.974	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-76	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.48		0.31	1.10	1.66
908	RNRDM13	RNRDM12	1	1	C		18.00		78.00	1.974	2.220	2.27	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	-73	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.31		0.21	1.66	2.01
909	RNRDM12	RNR2RDM11	1	1	C		30.00		108.00	2.220	2.816	3.78	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	-50	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.21		0.04	2.01	2.78
910	RNR2RDM11	RNRDM10	2	1	J		30.00		608.00	2.816	3.423	3.78	76.66	2.25	1.996	0.000	1.996	51	200	200	DWC	-49	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.26	-0.26	-0.32	3.08	3.74
911	RNRDM10.1	RNRDM10.2	0	1	H		19.00		19.00	3.781	3.740	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	463	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.68		2.57	1.10	1.17
912	RNRDM10.2	RNRDM10.3	1	1	C		20.00		39.00	3.740	3.696	2.52	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	455	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.57		2.46	1.17	1.24
913	RNRDM10.3	RNRDM10.4	1	1	C		42.00		81.00	3.696	3.604	5.30	10.21	2.25	0.266	0.000	0.266	19	200	200	DWC	457	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.23	0.00	2.46		2.23	1.24	1.37
914	RNRDM10.4	RNRDM10.5	1	1	C		42.00		123.00	3.604	3.511	5.30	15.51	2.25	0.404	0.000	0.404	23	200	200	DWC	452	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.23	0.00	2.23		2.00	1.37	1.51
915	RNRDM10.5	RNRDM10	1	1	C		40.00		163.00	3.511	3.423	5.04	20.55	2.25	0.535	0.000	0.535	27	200	200	DWC	455	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.10	0.00	2.00		1.90	1.51	1.52
916	RNRDM10	RNRDM9	2	1	J		39.00		810.00	3.423	3.992	4.92	102.13	2.25	2.660	0.000	2.660	59	200	200	DWC	-69	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.08	0.00	-0.32	-0.320	-0.40	3.74	4.39
917	RNRDM9	RNRDM8	1	1	C		30.00		840.00	3.992	3.930	3.78	105.91	2.25	2.758	0.000	2.758	60	200	200	DWC	484	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	-0.40		-0.46	4.39	4.39
918	RNRDM8	RNRDM7	1	1	C		20.00		860.00	3.930	3.846	2.52	108.43	2.25	2.824	0.000	2.824	60	200	200	DWC	238	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	-0.46		-0.50	4.39	4.35
919	RNRDM7	RNRDM6.1A	1	1	C		20.00		880.00	3.846	3.824	2.52	110.95	2.25	2.889	0.000	2.889	61	200	200	DWC	909	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	-0.50		-0.54	4.35	4.36
920	RNRDM6.1B	RNRDM6.1A	0	1	H		40.00		40.00	3.882	3.824	5.04	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	690	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	2.78		2.56	1.10	1.26
921	RNRDM6.1A	RNRDM6	2	1	J		10.00		930.00	3.824	3.817	1.26	117.26	2.25	3.054	0.000	3.054	63	200	200	DWC	1429	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.02	0.00	-0.54	-0.54	-0.56	4.36	4.38
922	RNRDM6.2	RNRDM6.1	0	1	H		12.00		12.00	3.913	3.876	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	324	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.81		2.74	1.10	1.14
923	RNRDM6.1	RNRDM6	1	1	C		30.00		42.00	3.876	3.817	3.78	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	508	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.74		2.57	1.14	1.25
924	RNRDM6	RNRDM5	2	1	J		19.00		991.00	3.817	3.783	2.40	124.95	2.25	3.254	0.000	3.254	65	200	200	DWC	559	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.04	0.00	-0.56	-0.56	-0.60	4.38	4.38
925	RNRDM5	RNRDM4	1	1	C		15.00		1006.00	3.783	3.750	1.89	126.84	2.25	3.303	0.000	3.303	65	200	200	DWC	455	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.03	0.00	-0.60		-0.63	4.38	4.38
926	RNRDM4.3	RNRDM4.2	0	1	H		18.00		18.00	3.762	3.754	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	2250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.66		2.56	1.10	1.19
927	RNRDM4.2	RNRDM4.1	1	1	C		15.00		33.00	3.754	3.746	1.89	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	1875	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.56		2.48	1.19	1.27
928	RNRDM4.1	RNRDM4	1	1	C		30.00		63.00	3.746	3.750	3.78	7.94	2.25	0.207	0.000	0.207	17	200	200	DWC	-7500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.48		2.31	1.27	1.44
929	RNRDM4	RNRDM3	2	1	J		11.00		1080.00	3.750	3.857	1.39	136.17	2.25	3.546	0.000	3.546	68	200	200	DWC	-103	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.02	0.00	-0.63	-0.63	-0.65	4.38	4.51
930	RNRDM3	RNRDM2	1	1	C		30.00		1110.00	3.857	4.118	3.78	139.95	2.25	3.645	0.000	3.645	69	200	200	DWC	-115	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	-0.65		-0.71	4.51	4.83
931	RNRDM2	RNRDM1	1	1	C		30.00		1140.00	4.118	4.379	3.78	143.74	2.25	3.743	0.000	3.743	70	200	200	DWC	-115	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	-0.71		-0.77	4.83	5.15

932	RNRDM1	PT-RNRDM19	1	1	C		34.00		1174.00	4.379	4.554	4.29	148.02	2.25	3.855	0.000	3.855	71	200	200	DWC	-194	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.07	0.00	-0.77		-0.84	5.15	5.39
933	PT-RNRDM19	PTGVRDM20	2	1	J		16.00		3961.00	4.554	4.562	2.02	499.42	2.25	13.006	0.000	13.006	129	200	200	DWC	-2000	520	0.010	0.60	18.73	0.69	1.08	0.61	OK	0.64	OK	0.03	0.00	-0.84	-0.84	-0.87	5.39	5.43
934	GVLM9	GVLM10	0	1	H		13.00		13.00	3.982	3.984	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	-6500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.88		2.81	1.10	1.17
935	GVLM10	GVLM11	1	1	C		26.00		39.00	3.984	4.034	3.28	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-520	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.81		2.67	1.17	1.36
936	GVLM11	PTGVRDM20	1	1	C		30.00		69.00	4.034	4.562	3.78	8.70	2.25	0.227	0.000	0.227	17	200	200	DWC	-57	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.67		2.50	1.36	2.06
937	PTGVRDM20	PTRDM21	2	1	J		30.00		4060.00	4.562	4.540	3.78	511.90	2.25	13.331	0.000	13.331	131	200	200	DWC	1364	520	0.010	0.60	18.73	0.71	1.08	0.63	OK	0.64	OK	0.06	0.00	-0.87	-0.87	-0.93	5.43	5.47
938	PTRDM21	PTGVLRDM22	1	1	C		26.00		4086.00	4.540	4.346	3.28	515.18	2.25	13.416	0.000	13.416	131	200	200	DWC	134	520	0.010	0.60	18.73	0.72	1.09	0.63	OK	0.65	OK	0.05	0.00	-0.93		-0.98	5.47	5.33
939	GVLM6	GVLM7	0	1	H		30.00		30.00	4.000	4.085	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-353	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.90		2.73	1.10	1.36
940	GVLM7	GVLM8	1	1	C		30.00		60.00	4.085	4.212	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-236	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.73		2.56	1.36	1.65
941	GVLM8	PTGVLRDM22	1	1	C		30.00		90.00	4.212	4.346	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-224	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.56		2.39	1.65	1.96
942	PTGVLRDM22	PTRDM34.1	2	1	J		33.00		4209.00	4.346	4.280	4.16	530.69	2.25	13.820	0.000	13.820	133	200	200	DWC	500	520	0.010	0.60	18.73	0.74	1.09	0.64	OK	0.65	OK	0.06	0.00	-0.98	-0.98	-1.04	5.33	5.32
943	PTRDM34.1.7	PTRDM34.1.6	0	1	H		24.00		24.00	4.023	4.183	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-150	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.92		2.79	1.10	1.39
944	PTRDM34.1.6	PTRDM34.1.5	1	1	C		30.00		54.00	4.183	4.116	3.78	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	448	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.79		2.62	1.39	1.50
945	PTRDM34.1.5	PTRDM34.1.4	1	1	C		30.00		84.00	4.116	4.062	3.78	10.59	2.25	0.276	0.000	0.276	19	200	200	DWC	556	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.62		2.45	1.50	1.61
946	PTRDM34.1.4	PTRDM34.1.3	1	1	C		30.00		114.00	4.062	4.014	3.78	14.37	2.25	0.374	0.000	0.374	22	200	200	DWC	625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.45		2.28	1.61	1.73
947	PTRDM34.1.3	PTRDM34.1.2	1	1	C		13.00		127.00	4.014	4.048	1.64	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	-382	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.28		2.21	1.73	1.84
948	PTRDM34.1.2	PTRDM34.1.1	1	1	C		25.00		152.00	4.048	4.100	3.15	19.16	2.25	0.499	0.000	0.499	26	200	200	DWC	-481	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.21		2.13	1.84	1.97
949	PTRDM34.1.1	PTRDM34.1	1	1	C		33.00		185.00	4.100	4.280	4.16	23.33	2.25	0.607	0.000	0.607	28	200	200	DWC	-183	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.08	0.00	2.13		2.05	1.97	2.23
950	PTRDM34.1	PTRDM23	2	1	J		15.00		4409.00	4.280	4.202	1.89	555.90	2.25	14.477	0.000	14.477	136	200	200	DWC	192	520	0.010	0.60	18.73	0.77	1.10	0.66	OK	0.65	OK	0.03	0.00	-1.04	-1.04	-1.07	5.32	5.27
951	PTRDM23	PTRDM24	1	1	C		15.00		4424.00	4.202	4.080	1.89	557.80	2.25	14.526	0.000	14.526	137	200	200	DWC	123	520	0.010	0.60	18.73	0.78	1.10	0.67	OK	0.65	OK	0.03	0.00	-1.07		-1.10	5.27	5.18
952	PTRDM24	PTRDM25	1	1	C		20.00		4444.00	4.080	3.959	2.52	560.32	2.25	14.592	0.000	14.592	137	200	200	DWC	165	520	0.010	0.60	18.73	0.78	1.10	0.67	OK	0.65	OK	0.04	0.00	-1.10		-1.14	5.18	5.10
953	PTRDM25	PTRDM26	1	1	C		30.00		4474.00	3.959	3.826	3.78	564.10	2.25	14.690	0.000	14.690	137	200	200	DWC	226	520	0.010	0.60	18.73	0.78	1.10	0.67	OK	0.65	OK	0.06	0.00	-1.14		-1.20	5.10	5.03
954	PTRDM26	PTRDM27	1	1	C		30.00		4504.00	3.826	3.910	3.78	567.88	2.25	14.789	0.000	14.789	138	200	200	DWC	-357	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.06	0.00	-1.20		-1.26	5.03	5.17
955	PTRDM27	PTRDM28	1	1	C		25.00		4529.00	3.910	3.995	3.15	571.03	2.25	14.871	0.000	14.871	138	200	200	DWC	-294	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.05	0.00	-1.26		-1.31	5.17	5.31
956	PTRDM28	PTRDM29	1	1	C		30.00		4559.00	3.995	3.901	3.78	574.82	2.25	14.969	0.000	14.969	139	200	200	DWC	319	520	0.010	0.60	18.73	0.80	1.11	0.68	OK	0.66	OK	0.06	0.00	-1.31		-1.37	5.31	5.27
957	PTRDM29	PTRDM29.1A	2	1	J		30.00		6634.00	3.901	3.911	3.91	836.44	2.25	21.782	0.000	21.782	167	250	250	DWC	-3000	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.04	0.00	-1.37	-1.37	-1.41	5.27	5.32
958	PTRDM29.1A	PTRDM29.1B	1	1	C		24.00		6658.00	3.911	3.910	3.03	839.47	2.25	21.861	0.000	21.861	167	250	250	DWC	24000	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.03	0.00	-1.41		-1.44	5.32	5.35
959	PTRDM29.1B	MLRDM3	1	1	C		29.00		6687.00	3.910	3.909	3.66	843.12	2.25	21.956	0.000	21.956	168	250	250	DWC	29000	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.04	0.00	-1.44		-1.48	5.35	5.39
960	MLRDM3	MLRDM3.1A	1	1	C		19.00		6706.00	3.909	3.904	2.40	845.52	2.25	22.019	0.000	22.019	168	250	250	DWC	3800	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.03	0.00	-1.48		-1.51	5.39	5.41
961	MLRDM3.1A	MLRDM7.7	1	1	C		42.00		6748.00	3.904	3.835	5.30	850.81	2.25	22.157	0.000	22.157	169	250	250	DWC	609	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.06	0.00	-1.51		-1.57	5.41	5.41
962	MLRDM7.7	MLRDM7.6	1	1	C		10.00		6758.00	3.835	3.818	1.26	852.08	2.25	22.189	0.000	22.189	169	250	250	DWC	588	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.01	0.00	-1.57		-1.58	5.41	5.40
963	MLRDM7.6	MLRDM7.5	1	1	C		37.00		6795.00	3.818	3.754	4.67	856.74	2.25	22.311	0.000	22.311	169	250	250	DWC	578	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.05	0.00	-1.58		-1.63	5.40	5.38
964	MLRDM7.5	MLRDM7.4	1	1	C		22.00		6817.00	3.754	3.092	2.77	859.51	2.25	22.383	0.000	22.383	169	250	250	DWC	33	700	0.010	0.60	29.28	0.76	1.10	0.65	OK	0.65	OK	0.03	0.00	-1.63		-1.66	5.38	4.75
965	MLRDM7.4	MLRDM7.3	1	1	C		19.00		6836.00	3.092	2.840	2.40	861.91	2.25	22.446	0.000	22.446	170	250	250	DWC	75	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.03	0.00	-1.66		-1.69	4.75	4.53
966	MLRDM7.3	MLRDM7.2	1	1	C		25.00		6861.00	2.840	2.670	3.15	865.06	2.25	22.528	0.000	22.528	170	250	250	DWC	147	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.04	0.00	-1.69		-1.73	4.53	4.40
967	MLRDM7.2	MLRDM7.1	1	1	C		30.00		6891.00	2.670	2.660	3.78	868.84	2.25	22.626	0.000	22.626	170	250	250	DWC	3000	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.04	0.00	-1.73		-1.77	4.40	4.43
968	MLRDM7.1	MLRDM7	1	1	C		30.00		6921.00	2.660	2.764	3.78	872.63	2.25	22.725	0.000	22.725	171	250	250	DWC	-288	700	0.010	0.60	29.28	0.78	1.10	0.67	OK	0.65	OK	0.04	0.00	-1.77		-1.81	4.43	4.57
969	MLRDM1	MLRDM2	0	1	H		30.00		30.00	4.470	4.450	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.37		3.20	1.10	1.25
970	MLRDM2	MLRDM3A	1	1	C		30.00		60.00	4.450	4.138	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	96	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.20		3.03	1.25	1.11
971	MLRDM3A	MLRDM3.1	1	1	C		17.00		77.00	4.138	3.961	2.14	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	96	96	0.010	1.39	43.60	0.01	0.30	0.07	OK	0.42	OK	0.18	0.00	3.03		2.85	1.11	1.11
972	MLRDM3.1	MLRDM4	1	1	C		13.00		90.00	3.961	3.785	1.64	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	74	74	0.010	1.58	49.66	0.01	0.30	0.07	OK	0.47	OK	0.18	0.00	2.85		2.67	1.11	1.12
973	MLRDM4	MLRDM5	1	1	C		28.00		118.00	3.785	3.442	3.53	14.88	2.25	0.387	0.000	0.387	23	200	200	DWC	82	82	0.010	1.50	47.18	0.01	0.30	0.07	OK	0.45	OK	0.34	0.00	2.67		2.33	1.12	1.11
974	MLRDM5	MLRDM6	1	1	C		32.00		150.00	3.442	3.103	4.03	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	94	94	0.010	1.40	44.06	0.01	0.30	0.07	OK	0.42	OK	0.34	0.00	2.33		1.99	1.11	1.11
975	MLRDM6	MLRDM7	1	1	C		18.00		168.00	3.103	2.764	2.27	21.18	2.25	0.552	0.000	0.552	27	200	200	DWC	53	53	0.010	1.86	58.68	0.01	0.30	0.07	OK	0.56	OK	0.34	0.00	1.99		1.65	1.11	1.11
976	MLRDM7	MLRDM8	2	1	J		20.00		7109.00	2.764	2.358	2.52	896.33	2.25	23.342	0.000	23.342	173	250	250	DWC	49	700	0.010	0.60	29.28	0.80	1.11	0.68	OK	0.66	OK	0.03	0.00	-1.81	-1.81	-1.84	4.57	4.20
977	MLRDM8	MLRDM9	1	1	C		10.00		7119.00	2.358	2.248	1.26	897.59	2.25	23.375	0.000	23.375	173	250	250	DWC	91	700	0.010	0.60	29.28	0.80	1.11	0.68	OK	0.66	OK	0.01	0.00	-1.84		-1.85	4.20	4.10
978	PTRDM35.1	PTRDM35.2	0	1	H		30.00		30.00	3.392	3.030	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	83	83	0.010	1.49	46.89	0.00	0.30	0.07	OK	0.45	OK	0.36	0.00	2.29		1.93	1.10	1.10
979	PTRDM35.2	PTRDM35.2A	1	1	C		12.00		42.00	3.030	2.940	1.51	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	133	133	0.010	1.18	37.04	0.00	0.30	0.07	OK	0.35	OK	0.09	0.00	1.93		1.84	1.10	1.10
980	PTRDM35.6	PTRDM35.5	0	1	H		15.00		15.00	2.264	2.401	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-109	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.16		1.08	1.10	1.32
981	PTRDM35.5	PTRDM35.4	1	1	C		30.00		45.00	2.401	2.666	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-113	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.08		0.91	1.32	1.76
982	PTRDM35.4	PTRDM35.3	1	1	C		20.00		65.00	2.666	2.843	2.52	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-113	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.91		0.80	1.76	2.04
983	PTRDM35.3.2	PTRDM35.3.1	0	1	H		19.00		19.00	2.594	2.661	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	-284	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.49		1.38	1.10	1.28
984	PTRDM35.3.1	PTRDM35.3	1	1	C		30.00		49.00	2.661	2.843	3.78	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	-165	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.38		1.21	1.28	1.63
985	PTRDM35.3	PTRDM35.2A	2	1	J		18.00		132.00	2.843	2.936	2.27	16.64	2.25	0.433	0.000	0.433	24	200	200	DWC	-194	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.80	0.80	0.70	2.04	2.24
986	PTRDM35.2A	KLRDM3	2	1	J		33.00		207.00	2.936	3.348	4.16	26.10	2.25	0.680	0.000	0.680	30	200	200	DWC	-80	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.08	0.00	0.80	0.80	0.72	2.14	2.63
987	CKRDM1	KLRDM1.1A	0	1	H		18.00		18.00	3.774	3.670	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	173	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.67		2.57	1.10	1.10
988	KLRDM1.1A	KLRDM1.1	1	1	C		40.00		58.00	3.670	3.439	5.04	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	173	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.24	0.00	2.57		2.33	1.10	1.11
989	KLRDM1	KLRDM1.1	0	1	H		10.00		10.00	3.464	3.439	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.36		2.30	1.10	1.14
990	KLRDM1.1	KLRDM2	2	1	J		21.00		89.00	3.439	3.369	2.65	11.22	2.25	0.292	0.000	0.292	20	200	200	DWC	300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.30	2.30	2.18	1.14	1.19
991	KLRDM2	KLRDM3	1	1	C		22.00		111.00	3.369	3.348	2.77	14.00	2.25	0.364	0.000	0.364	22	200	200	DWC	1048	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	2.18		2.06	1.19	1.29
992	KLRDM3	KLRDM4	2	1	J		38.00		356.00	3.348	3.199	4.79	44.89	2.25	1.169	0.000	1.169	39	200	200	DWC	255	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.07	0.00	0.72	0.72	0.65	2.63	2.55
993	KLRDM4	KLRDM5	1	1	C		30.00		386.00	3.199	2.677	3.78	48.67	2.25	1.267	0.000	1.267	41	200	200	DWC	57	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.65		0.59	2.55	2.09
994	KLRDM5	KLRDM6	1	1	C		14.00		400.00	2.677	2.571	1.77	50.43	2.25	1.313	0.000	1.313	41	200	200	DWC	132	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	0.59		0.56	2.09	2.01
995	KLRDM6	KLRDM7	1	1	C		10.00		410.00	2.571	2.494	1.26	51.69	2.25	1.346	0.000	1.346	42	200	200	DWC	130	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	0.56		0.54	2.01	1.95
996	KLRDM7	KLRDM8	1	1	C		9.00		419.00	2.494	2.424	1.13	52.83	2.25	1.376	0.000	1.376	42	200	200	DWC	129	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	0.54		0.52	1.95	1.90
997	KLRDM8	KLRDM9	1	1	C		31.00		450.00	2.424	2.186	3.91	56.74	2.25	1.478	0.000	1.478	44	200	200	DWC	130	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.52		0.46	1.90	1.73
998	KLRDM9	KLRDM10	1	1	C		26.00		476.00	2.186	2.243	3.28	60.02	2.25	1.563	0.000	1.563	45	200	200	DWC	-456	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	0.46		0.41	1.73	1.83
999	KLRDM10	MLKLRDM11	1	1	C		30.00		506.00	2.243	2.272	3.78	63.80	2.25	1.661	0.000	1.661	47	200	200	DWC	-1034	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.41		0.35	1.83	1.92
1000	MLKLRDM11	MLRDM10	1	1	C		13.00		519.00	2.272	2.262	1.64	65.44	2.25	1.704	0.000	1.704	47	200	200	DWC	1300	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	0.35		0.32	1.92	1.94
1001	MLRDM10	MLRDM9	1	1	C		20.00		539.00	2.262	2.248	2.52	67.96	2.25	1.770	0.000	1.770	48	200	200	DWC	1429	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	0.32		0.28	1.94	1.97
1002	MLRDM9	MLRDM9.1	2	1	J		30.00		7688.00	2.248	2.226	3.78	969.33	2.25	25.243	0.000	25.243	180	250	250	DWC	1364	700	0.010	0.60	29.28	0.86	1.12	0.72	OK	0.67	OK	0.04	0.00	0.28	0.28	0.24	1.97	1.99
1003	MLRDM9.1	MLRDM9.2	1	1	C		30.00		7718.00	2.226	2.205	3.78	973.12	2.25	25.342	0.000	25.342	180	250	250	DWC	1429	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.04	0.00	0.24		0.20	1.99	2.01
1004	MLRDM9.2	MLRDM9.3	1	1	C		18.00		7736.00	2.205	2.123	2.27	975.39	2.25	25.401	0.000	25.401	180	250	250	DWC	220	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.03	0.00	0.20		0.17	2.01	1.95
1005	MLRDM9.3	MLRDM9.4	1	1	C		15.00		7751.00	2.123	2.103	1.89	977.28	2.25	25.450	0.000	25.450	181	250	250	DWC	750	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.02	0.00	0.17		0.15	1.95	1.95
1006	MLRDM9.4	MLRDM9.5	1	1	C		21.00		7772.00	2.103	2.170	2.65	979.92	2.25	25.519	0.000	25.519	181	250	250	DWC	-313	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.03	0.00	0.15		0.12	1.95	2.05
1007	MLRDM9.7	MLRDM9.6	0	1	H		30.00		30.00	2.224	2.199	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1200	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.12		0.95	1.10	1.25
1008	MLRDM9.6	MLRDM9.5	1	1	C		30.00		60.00	2.199	2.170	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	1034	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.95		0.78	1.25	1.39
1009	MLRDM9.5	MPRDM21	2	1	J		40.00		7872.00	2.170	1.325	5.04	992.53	2.25	25.847	0.000	25.847	182	200	200	DWC	47	165	0.010	1.06	33.26	0.78	1.10	0.67	OK	1.16	OK	0.24	0.00	0.00		-0.24	2.17	1.57
1010	MPRDM21	WW2	2	0	J	L	20.00		23166.00	1.325	1.300	2.52	2920.86	2.25	76.064	0.000	76.064	312	384	450	HDPE	800	1000	0.010	0.66	76.93	0.99	1.14	0.81	Check	0.76	OK	0.02	0.00	-2.26	-2.260	-2.28	3.59	3.58
							23166.00																																

SEWER NETWORK DESIGN _ Block 3B_Muttar STP_

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
1	2	3	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1			NJRDM38	NJRDM37	0	1	H		30.00		30.00	3.760	3.640	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.66		2.49	1.10	1.15
2			NJRDM37	NJRDM36	1	1	C		30.00		60.00	3.640	3.481	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	189	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.49		2.32	1.15	1.16
3			NJRDM36	NJRDM35	1	1	C		30.00		90.00	3.481	3.491	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.32		2.15	1.16	1.34
4			NJRDM35	NJRDM34	1	1	C		30.00		120.00	3.491	3.501	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	-3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.15		1.98	1.34	1.52
5			1PTRDM13	1PTRDM12	0	1	H		10.00		10.00	5.000	5.051	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	-196	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.90		3.84	1.10	1.21
6			1PTRDM12	1PTRDM11	1	1	C		10.00		20.00	5.051	5.104	1.26	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-189	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.84		3.78	1.21	1.32
7			1PTRDM11	1PTRDM10	1	1	C		30.00		50.00	5.104	4.896	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	144	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.78		3.61	1.32	1.29
8			1PTRDM10	1PTRDM9	1	1	C		30.00		80.00	4.896	4.688	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	144	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.61		3.44	1.29	1.25
9			1PTRDM9	1PTRDM8	1	1	C		30.00		110.00	4.688	4.552	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	221	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.44		3.27	1.25	1.28
10			1PTRDM8	1PTRDM7	1	1	C		30.00		140.00	4.552	4.133	3.78	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	72	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.25	0.00	3.27		3.02	1.28	1.11
11			1PTRDM7	1PTRDM6	1	1	C		20.00		160.00	4.133	3.870	2.52	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	76	76	0.010	1.56	49.01	0.01	0.30	0.07	OK	0.47	OK	0.26	0.00	3.02		2.76	1.11	1.11
12			1PTRDM6	1PTRDM5	1	1	C		30.00		190.00	3.870	3.449	3.78	23.96	2.25	0.624	0.000	0.624	29	200	200	DWC	71	72	0.010	1.60	50.35	0.01	0.30	0.07	OK	0.48	OK	0.42	0.00	2.76		2.34	1.11	1.11
13			1PTRDM5	1PTRDM4	1	1	C		25.00		215.00	3.449	3.561	3.15	27.11	2.25	0.706	0.000	0.706	30	200	200	DWC	-223	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.34		2.29	1.11	1.27
14			1PTRDM4	1PTRDM3	1	1	C		20.00		235.00	3.561	3.785	2.52	29.63	2.25	0.772	0.000	0.772	32	200	200	DWC	-89	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.29		2.25	1.27	1.54
15			1PTRDM3	1PTRDM2	1	1	C		25.00		260.00	3.790	4.010	3.15	32.78	2.25	0.854	0.000	0.854	33	200	200	DWC	-114	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.25		2.20	1.54	1.81
16			1PTRDM2	1PTRDM1	1	1	C		20.00		280.00	4.010	3.628	2.52	35.30	2.25	0.919	0.000	0.919	35	200	200	DWC	52	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	2.20		2.16	1.81	1.47
17			1PTRDM1	NJRDM34	1	1	C		10.00		290.00	3.628	3.501	1.26	36.56	2.25	0.952	0.000	0.952	35	200	200	DWC	79	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	2.16		2.14	1.47	1.36
18			NJRDM34	NJRDM33	2	1	J		10.00		420.00	3.501	3.431	1.26	52.96	2.25	1.379	0.000	1.379	42	200	200	DWC	143	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	1.98	1.980	1.96	1.52	1.47
19			NJRDM33	NJRDM32	1	1	C		30.00		450.00	3.431	3.223	3.78	56.74	2.25	1.478	0.000	1.478	44	200	200	DWC	144	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.96		1.90	1.47	1.32
20			NJRDM32	NJRDM31	1	1	C		30.00		480.00	3.223	3.053	3.78	60.52	2.25	1.576	0.000	1.576	45	200	200	DWC	176	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.90		1.84	1.32	1.21
21			NJRDM31	NJPWDRDM30	1	1	C		30.00		510.00	3.053	3.081	3.78	64.30	2.25	1.675	0.000	1.675	47	200	200	DWC	-1071	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.84		1.78	1.21	1.30
22			1VNRDM8	1VNRDM7	0	1	H		27.00		27.00	2.310	2.939	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-43	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	1.21		1.06	1.10	1.88
23			1VNRDM7	1VNRDM6	1	1	C		30.00		57.00	2.939	2.558	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	79	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.06		0.89	1.88	1.67
24			1VNRDM6	1VNRDM5	1	1	C		30.00		87.00	2.558	2.117	3.78	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	68	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.67	1.40
25			1VNRDM5	1VNRDM4	1	1	C		30.00		117.00	2.120	2.118	3.78	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	15000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.40	1.57
26			1VNRDM4	1VNRDM3	1	1	C		30.00		147.00	2.120	2.095	3.78	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	1200	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.55		0.46	1.57	1.64
27			1VNRDM3	1VNRDM2	1	1	C		15.00		162.00	2.095	3.443	1.89	20.43	2.25	0.532	0.000	0.532	27	200	200	DWC	-11	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	0.46		0.41	1.64	3.03
28			1VNRDM2.1	1VNRDM2.2	0	1	H		20.00		20.00	3.443	3.664	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-90	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.34		2.23	1.10	1.43
29			1VNRDM2.2	1VNRDM2.3	1	1	C		25.00		45.00	3.664	3.891	3.15	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-110	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.23		2.09	1.43	1.80
30			1VNRDM2.3	1VNRDM2.4	1	1	C		25.00		70.00	3.891	3.827	3.15	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	391	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.09		1.95	1.80	1.88
31			1VNRDM2.4	1VNRDM2.5	1	1	C		30.00		100.00	3.830	3.698	3.78	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	227	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.95		1.78	1.88	1.92
32			1VNRDM2.5	1VNRDM2.6	1	1	C		30.00		130.00	3.698	3.435	3.78	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	114	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.78		1.69	1.92	1.75
33			1VNRDM2.6	1VNRDM2.7	1	1	C		30.00		160.00	3.435	3.105	3.78	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	91	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.69		1.60	1.75	1.51
34			1VNRDM2.7	1VNRDM2.8	1	1	C		30.00		190.00	3.105	2.776	3.78	23.96	2.25	0.624	0.000	0.624	29	200	200	DWC	91	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.60		1.53	1.51	1.25
35			1VNRDM2.8	1VNRDM2.9	1	1	C		30.00		220.00	2.776	2.389	3.78	27.74	2.25	0.722	0.000	0.722	31	200	200	DWC	78	120	0.010	1.24	39.00	0.02	0.40	0.10	OK	0.50	OK	0.25	0.00	1.53		1.28	1.25	1.11
36			1VNRDM2.9	1VNRDM2	1	1	C		30.00		250.00	2.390	2.038	3.78	31.52	2.25	0.821	0.000	0.821	33	200	200	DWC	85	85	0.010	1.47	46.34	0.02	0.40	0.10	OK	0.59	OK	0.35	0.00	1.28		0.93	1.11	1.11
37			1VNRDM2	1VNRDM1	2	1	J		34.00		446.00	2.038	2.046	4.29	56.23	2.25	1.464	0.000	1.464	44	200	200	DWC	-4250	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.07	0.00	0.41	0.410	0.34	1.63	1.71
38			1VNRDM1	EVVNRDM11	1	1	C		26.00		472.00	2.046	2.054	3.28	59.51	2.25	1.550	0.000	1.550	45	200	200	DWC	-3250	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	0.34		0.29	1.71	1.76
39			EVRDM20	EVRDM19	0	1	H		20.00		20.00	3.600	3.513	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	230	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.50		2.39	1.10	1.12
40			EVRDM19	EVRDM18	1	1	C		30.00		50.00	3.513	2.808	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	43	44	0.010	2.06	64.78	0.00	0.30	0.07	OK	0.62	OK	0.69	0.00	2.39		1.70	1.12	1.11
41			EVRDM18	EVRDM17	1	1	C		30.00		80.00	2.808	2.104	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	43	43	0.010	2.07	65.15	0.00	0.30	0.07	OK	0.62	OK	0.70	0.00	1.70		1.00	1.11	1.10
42			EVRDM17	EVRDM16	1	1	C		30.00		110.00	2.104	2.094	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.00		0.83	1.10	1.26
43			EVRDM16	EVRDM15	1	1	C		10.00		120.00	2.094	2.091	1.26	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	3333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.83		0.77	1.26	1.32
44			EVRDM15.2	EVRDM15.1	0	1	H		12.00		12.00	1.990	1.981	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	1333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.89		0.82	1.10	1.16
45			EVRDM15.1	EVRDM15	1	1	C		20.00		32.00	1.981	2.091	2.52	4.03	2.25	0.105	0.000	0.105	12	200	200	DWC	-182	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.82		0.71	1.16	1.38
46			EVRDM15	EVRDM14	2	1	J		20.00		172.00	2.091	2.106	2.52	21.69	2.25	0.565	0.000	0.565	27	200	200	DWC	-1333	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.71	0.710	0.65	1.38	1.46
47			EVRDM14	EVRDM13	1	1	C		15.00		187.00	2.106	2.046	1.89	23.58	2.25	0.614	0.000	0.614	28	200	200	DWC	250	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.65		0.61	1.46	1.44
48			EVRDM13	EVRDM12	1	1	C		20.00		207.00	2.050	2.356	2.52	26.10	2.25	0.680	0.000	0.680	30	200	200	DWC	-65	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.61		0.56	1.44	1.80
49			EVRDM12	EVVNRDM11	1	1	C		15.00		222.00	2.356	2.054	1.89	27.99	2.25	0.729	0.000	0.729	31	200	200	DWC	50	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.56		0.52	1.80	1.53
50			EVVNRDM11	EVRDM10	2	1	J		30.00		724.00	2.054	2.344	3.78	91.28	2.25	2.377	0.000	2.377	56	200	200	DWC	-103	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	0.29	0.290	0.23	1.76	2.11
51			EVRDM10	EVRDM9	1	1	C		20.00		744.00	2.344	2.285	2.52	93.81	2.25	2.443	0.000	2.443	56	200	200	DWC	339	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	0.23		0.19	2.11	2.10
52			EVRDM9	EVRDM8	1	1	C		25.00		769.00	2.285	2.288	3.15	96.96	2.25	2.525	0.000	2.525	57	200	200	DWC	-8333	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	0.19		0.14	2.10	2.15
53			EVRDM8	EVRDM7	1	1	C		5.00		774.00	2.288	2.387	0.63	97.59	2.25	2.541	0.000	2.541	57	200	200	DWC	-51	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.01	0.00	0.14		0.13	2.15	2.26
54			EVRDM7	EVRDM6	1	1	C		30.00		804.00	2.387	2.489	3.78	101.37	2.25	2.640	0.000	2.640	58	200	200	DWC	-294	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	0.13		0.07	2.26	2.42
55			EVRDM6	EVRDM5.1	1	1	C		30.00		834.00	2.489	2.633	3.78	105.15	2.25	2.738	0.000	2.738	60	200	200	DWC	-208	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	0.07		0.01	2.42	2.62
56			EVRDM5.1	EVRDM5	1	1	C		9.00		843.00	2.633	2.682	1.13	106.29	2.25	2.768	0.000	2.768	60	200	200	DWC	-184	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.02	0.00	0.01		-0.01	2.62	2.69
57			EVRDM22	EVRDM23	0	1	H		20.00		20.00	3.231	3.211	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.13		2.02	1.10	1.19
58			EVRDM23	EVRDM24	1	1	C		30.00		50.00	3.211	2.901	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	97	130	0.010	1.19	37.47	0.00	0.30	0.07	OK	0.36	OK	0.23	0.00	2.02		1.79	1.19	1.11
59			EVRDM24	EVRDM5	1	1	C		30.00		80.00	2.901	2.682	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	137	137	0.010	1.16	36.50	0.01	0.30	0.07	OK	0.35	OK	0.22	0.00	1.79		1.57	1.11	1.11
60			EVRDM5	EVRDM4	2	1	J		18.00		941.00	2.682	2.723	2.27	118.65	2.25	3.090	0.000	3.090	63	200	200	DWC	-439	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	-0.01	-0.010	-0.04	2.69	2.76
61			EVRDM4	EVRDM3	1	1	C		30.00		971.00	2.682	2.764	3.78	122.43	2.25	3.188	0.000	3.188	64	200	200	DWC	-366	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	-0.04		-0.10	2.72	2.86
62			EVRDM3	EVRDM2	1	1	C		30.00		1001.00	2.682	2.881	3.78	126.21	2.25	3.287	0.000	3.287	65	200	200	DWC	-151	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	-0.10		-0.16	2.78	3.04
63			EVRDM2	EVRDM1L	1	0	C	L	30.00		1031.00	2.682	2.981	3.78	129.99	2.25	3.385	0.000	3.385	66	200	200	DWC	-100	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	-0.16		-0.22	2.84	3.20
64			EVRDM1	NJPWDRDM30	0	1	H		30.00	1031	1061.00	2.981	3.081	3.78	133.78	2.25	3.484	0.000	3.484	67	200	200	DWC	-300	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	1.88		1.82	1.10	1.26
65			PWRDM27	PWRDM26	0	1	H		19.00		19.00	4.724	4.686	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.62		3.51	1.10	1.18
66			PWRDM26	PWRDM25	1	1	C		20.00		39.00	4.686	4.648	2.52	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	526	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.51		3.40	1.18	1.25

Sl. No.	Road	Element	Man Holes				Man hole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
67			PWRDM25	PWRDM24	1	1	C		15.00		54.00	4.648	4.609	1.89	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	385	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.40		3.32	1.25	1.29
68			PWRDM24	PWRDM23	1	1	C		8.00		62.00	4.609	4.571	1.01	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	211	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	3.32		3.28	1.29	1.29
69			PWRDM23	PWRDM22	1	1	C		25.00		87.00	4.571	4.544	3.15	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	926	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.28		3.14	1.29	1.40
70			PWRDM22	PWRDM21	1	1	C		30.00		117.00	4.544	4.401	3.78	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	210	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.14		3.05	1.40	1.35
71			PWRDM21.3	PWRDM21.2	0	1	H		16.00		16.00	4.610	4.684	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	-216	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	3.51		3.42	1.10	1.26
72			PWRDM21.2	PWRDM21.1	1	1	C		20.00		36.00	4.684	4.758	2.52	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	-270	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.42		3.31	1.26	1.45
73			PWRDM21.1	PWRDM21	1	1	C		30.00		66.00	4.758	4.401	3.78	8.32	2.25	0.217	0.000	0.217	17	200	200	DWC	84	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.31		3.14	1.45	1.26
74			PWRDM21	PWRDM20	2	1	J		18.00		201.00	4.401	4.202	2.27	25.34	2.25	0.660	0.000	0.660	29	200	200	DWC	90	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	3.05	3.050	3.01	1.35	1.19
75			PWRDM20	PWRDM19	1	1	C		15.00		216.00	4.202	4.166	1.89	27.23	2.25	0.709	0.000	0.709	31	200	200	DWC	417	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	3.01		2.98	1.19	1.19
76			PWRDM19	PWRDM18	1	1	C		30.00		246.00	4.166	4.149	3.78	31.02	2.25	0.808	0.000	0.808	33	200	200	DWC	1765	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.98		2.92	1.19	1.23
77			PWRDM18.3	PWRDM18.2	0	1	H		6.00		6.00	4.740	4.676	0.76	0.76	2.25	0.020	0.000	0.020	6	200	200	DWC	94	92	0.010	1.41	44.54	0.00	0.30	0.07	OK	0.42	OK	0.07	0.00	3.64		3.57	1.10	1.11
78			PWRDM18.2	PWRDM18.1	1	1	C		30.00		36.00	4.676	4.455	3.78	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	136	137	0.010	1.16	36.50	0.00	0.30	0.07	OK	0.35	OK	0.22	0.00	3.57		3.35	1.11	1.11
79			PWRDM18.1	PWRDM18	1	1	C		30.00		66.00	4.455	4.149	3.78	8.32	2.25	0.217	0.000	0.217	17	200	200	DWC	98	98	0.010	1.37	43.16	0.01	0.30	0.07	OK	0.41	OK	0.31	0.00	3.35		3.04	1.11	1.11
80			PWRDM18	PWRDM17	2	1	J		24.00		336.00	4.149	4.039	3.03	42.36	2.25	1.103	0.000	1.103	38	200	200	DWC	218	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	2.92	2.920	2.87	1.23	1.17
81			PWRDM17	PWRDM16	1	1	C		25.00		361.00	4.040	3.968	3.15	45.52	2.25	1.185	0.000	1.185	39	200	200	DWC	347	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	2.87		2.82	1.17	1.15
82			ATRDM15.1	ATRDM15.2	0	1	H		30.00		30.00	5.140	5.129	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	2727	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.04		3.87	1.10	1.26
83			ATRDM15.2	ATRDM15.3	1	1	C		13.00		43.00	5.129	5.119	1.64	5.42	2.25	0.141	0.000	0.141	14	200	200	DWC	1300	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	3.87		3.80	1.26	1.32
84			ATRDM15.3.1	ATRDM15.3	0	1	H		11.00		11.00	5.100	5.119	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	-579	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	4.00		3.94	1.10	1.18
85			ATRDM15.3	ATRDM15.4	2	1	J		20.00		74.00	5.119	4.991	2.52	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	156	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.80	3.800	3.69	1.32	1.30
86			ATRDM15.4	ATRDM15.5	1	1	C		20.00		94.00	4.991	4.715	2.52	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	72	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.69		3.58	1.30	1.14
87			ATRDM15.5	ATRDM15.6	1	1	C		7.00		101.00	4.715	4.439	0.88	12.73	2.25	0.332	0.000	0.332	21	200	200	DWC	25	28	0.010	2.56	80.74	0.00	0.30	0.07	OK	0.77	OK	0.25	0.00	3.58		3.33	1.14	1.11
88			ATRDM12.1	ATRDM15.6	0	1	H		25.00		25.00	4.530	4.439	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	275	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.43		3.29	1.10	1.15
89			ATRDM15.6	ATRDM15.7	2	1	J		15.00		141.00	4.439	4.450	1.89	17.78	2.25	0.463	0.000	0.463	25	200	200	DWC	-1364	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	3.29	3.290	3.24	1.15	1.21
90			ATRDM15.7	ATRDM15.8	1	1	C		10.00		151.00	4.450	4.462	1.26	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	-833	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	3.24		3.21	1.21	1.25
91			ATRDM15.8	ATRDM15.9	1	1	C		21.00		172.00	4.462	4.295	2.65	21.69	2.25	0.565	0.000	0.565	27	200	200	DWC	126	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	3.21		3.16	1.25	1.14
92			ATRDM15.9.2	ATRDM15.9.1	0	1	H		21.00		21.00	4.330	4.284	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	457	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.23		3.11	1.10	1.17
93			ATRDM15.9.1	ATRDM15.9	1	1	C		25.00		46.00	4.284	4.295	3.15	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	-2273	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.11		2.97	1.17	1.33
94			ATRDM15.9	ATRDM15.10	2	1	J		27.00		245.00	4.295	4.235	3.40	30.89	2.25	0.804	0.000	0.804	33	200	200	DWC	450	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.97	2.970	2.92	1.33	1.32
95			ATRDM15.10	ATRDM15.11	1	1	C		6.00		251.00	4.235	4.192	0.76	31.65	2.25	0.824	0.000	0.824	33	200	200	DWC	140	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.01	0.00	2.92		2.91	1.32	1.28
96			ATRDM15.15	ATRDM15.14	0	1	H		15.00		15.00	3.760	3.875	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-130	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.66		2.58	1.10	1.30
97			ATRDM15.14	ATRDM15.13	1	1	C		20.00		35.00	3.875	3.995	2.52	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	-167	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.58		2.47	1.30	1.53
98			ATRDM15.13	ATRDM15.12	1	1	C		30.00		65.00	3.995	4.181	3.78	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-161	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.47		2.30	1.53	1.88
99			ATRDM15.12	ATRDM15.11	1	1	C		30.00		95.00	4.181	4.192	3.78	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	-2727	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.30		2.13	1.88	2.06
100			ATRDM15.11	PWRDM16.3	2	1	J		30.00		376.00	4.192	4.328	3.78	47.41	2.25	1.235	0.000	1.235	40	200	200	DWC	-221	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.13	2.130	2.07	2.06	2.26
101			PWRDM16.3	PWRDM16.2	1	1	C		23.00		399.00	4.330	4.368	2.90	50.31	2.25	1.310	0.000	1.310	41	200	200	DWC	-605	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	2.07		2.03	2.26	2.34
102			PWRDM16.2.4	PWRDM16.2.3	0	1	H		14.00		14.00	4.400	4.419	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	-737	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.30		3.22	1.10	1.20
103			PWRDM16.2.3	PWRDM16.2.2	1	1	C		4.00		18.00	4.419	4.436	0.50	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-235	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.02	0.00	3.22		3.20	1.20	1.24
104			PWRDM16.2.2	PWRDM16.2.1	1	1	C		30.00		48.00	4.436	4.428	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	3750	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.20		3.02	1.24	1.41
105			PWRDM16.2.1	PWRDM16.2	1	1	C		30.00		78.00	4.428	4.368	3.78	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	500	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.02		2.84	1.41	1.53
106			PWRDM16.2	PWRDM16.1	2	1	J		17.00		494.00	4.368	4.168	2.14	62.29	2.25	1.622	0.000	1.622	46	200	200	DWC	85	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	2.03	2.030	2.00	2.34	2.17
107			PWRDM16.1	PWRDM16	1	1	C		20.00		514.00	4.070	3.968	2.52	64.81	2.25	1.688	0.000	1.688	47	200	200	DWC	196	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	2.00		1.96	2.07	2.01
108			PWRDM16	PWRDM15	2	1	J		13.00		888.00	3.968	3.939	1.64	111.96	2.25	2.916	0.000	2.916	61	200	200	DWC	448	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	1.96	1.960	1.93	2.01	2.01
109			PWRDM15	PWRDM14	1	1	C		28.00		916.00	3.939	3.723	3.53	115.49	2.25	3.008	0.000	3.008	62	200	200	DWC	130	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.05	0.00	1.93		1.88	2.01	1.84
110			PWRDM14	PWRDM13	1	1	C		20.00		936.00	3.723	3.783	2.52	118.01	2.25	3.073	0.000	3.073	63	200	200	DWC	-333	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	1.88		1.84	1.84	1.94
111			PWRDM13	PWRDM12	1	1	C		7.00		943.00	3.783	3.785	0.88	118.90	2.25	3.096	0.000	3.096	63	200	200	DWC	-3500	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.01	0.00	1.84		1.83	1.94	1.96
112			PWRDM12	PWRDM11	1	1	C		15.00		958.00	3.785	3.687	1.89	120.79	2.25	3.146	0.000	3.146	64	200	200	DWC	153	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.03	0.00	1.83		1.80	1.96	1.89
113			PWRDM11	PWRDM10	1	1	C		10.00		968.00	3.687	3.589	1.26	122.05	2.25	3.178	0.000	3.178	64	200	200	DWC	102	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.02	0.00	1.80		1.78	1.89	1.81
114			PWRDM10	PWRDM9	1	1	C		12.00		980.00	3.590	3.454	1.51	123.56	2.25	3.218	0.000	3.218	65	200	200	DWC	88	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.02	0.00	1.78		1.76	1.81	1.69
115			PWRDM9	PWRDM8	1	1	C		5.00		985.00	3.454	3.447	0.63	124.19	2.25	3.234	0.000	3.234	65	200	200	DWC	714	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.01	0.00	1.76		1.75	1.69	1.70
116			PWRDM8	PWRDM7	1	1	C		20.00		1005.00	3.447	3.541	2.52	126.71	2.25	3.300	0.000	3.300	65	200	200	DWC	-213	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	1.75		1.71	1.70	1.83
117			PWRDM7	PWRDM6	1	1	C		15.00		1020.00	3.541	3.635	1.89	128.61	2.25	3.349	0.000	3.349	66	200	200	DWC	-160	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.03	0.00	1.71		1.68	1.83	1.96
118			PWRDM6	PWRDM5	1	1	C		5.00		1025.00	3.635	3.659	0.63	129.24	2.25	3.366	0.000	3.366	66	200	200	DWC	-208	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.01	0.00	1.68		1.67	1.96	1.99
119			PWRDM5	PWRDM4	1	1	C		15.00		1040.00	3.659	3.470	1.89	131.13	2.25	3.415	0.000	3.415	66	200	200	DWC	79	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.03	0.00	1.67		1.64	1.99	1.83
120			PWRDM4	PWRDM3	1	1	C		5.00		1045.00	3.470	3.405	0.63	131.76	2.25	3.431	0.000	3.431	67	200	200	DWC	77	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.01	0.00	1.64		1.63	1.83	1.78
121			PWRDM3	PWRDM2	1	1	C		30.00		1075.00	3.405	3.354	3.78	135.54	2.25	3.530	0.000	3.530	68	200	200	DWC	588	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	1.63		1.57	1.78	1.78
122			PWRDM2	PWRDM1	1	1	C		30.00		1105.00	3.354	3.300	3.78	139.32	2.25	3.628	0.000	3.628	68	200	200	DWC	556	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	1.57		1.51	1.78	1.79
123			PWRDM1	NJPWDRDM30	1	1	C		30.00		1135.00	3.300	3.081	3.78	143.11	2.25	3.727	0.000	3.727	69	200	200	DWC	137	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	1.51		1.45	1.79	1.63
124			NJPWDRDM30	NJRDM29	3	1	J		20.00		2726.00	3.050	2.987	2.52	343.70	2.25	8.951	0.000	8.951	107	200	200	DWC	317	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.04	0.00	1.45	1.450	1.41	1.60	1.58
125			NJRDM29	NJRDM28	1	1	C		25.00		2751.00	2.987	3.151	3.15	346.86	2.25	9.033	0.000	9.033	108	200	200	DWC	-152	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.05	0.00	1.41		1.36	1.58	1.79
126			NJRDM28	NJRDM27	1	1	C		30.00		2781.00	3.151	3.220	3.78	350.64	2.25	9.131	0.000	9.131	108	200	200	DWC	-435	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.06	0.00	1.36		1.30	1.79	1.92
127			NJRDM27	NJRDM26	1	1	C		30.00		2811.00	3.220	3.210	3.78	354.42	2.25	9.230	0.000	9.230	109	200	200	DWC	3000	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.06	0.00	1.30		1.24	1.92	1.97
128			NJRDM26	NJRDM25	1	1	C		30.00		2841.00	3.210	3.341	3.78	358.20	2.25	9.328	0.000	9.328	110	200	200	DWC	-229	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.06	0.00	1.24		1.18	1.97	2.16
129			NJRDM25	NJRDM24	1	1	C		13.00		2854.00	3.341	3.382	1.64	359.84	2.25	9.371	0.000	9.371	110	200	200	DWC	-317	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.03	0.00	1.18		1.15	2.16	2.23
130			NJRDM24	NJRDM23	1	1	C		12.00		2866.00	3.382	3.469	1.51	361.36	2.25	9.410	0.000	9.410	110	200	200	DWC	-138	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.02	0.00	1.15		1.13	2.23	2.34
131			NJRDM23	NJRDM22	1	1	C		30.00		2896.00	3.469	3.672	3.78	365.14	2.25	9.509	0.000	9.509	111	200	200	DWC	-148	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.06	0.00	1.13		1.07	2.34	2.60
132			NJRDM22.1	NJRDM22	0	1	H		25.00		25.00	3.700	3.672	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	893	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.60		2.46	1.10	1.21
133			NJRDM22	NJRDM21	2	1	J		11.00		2932.00	3.672	3.660	1.39	369.68	2.25	9.627	0.000	9.627	111	200	200	DWC	917	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.02	0.00	1.07	1.070	1.05	2.60	2.61
134			NJRDM21	NJRDM20	1	1	C		5.00		2937.00	3.657	3.642	0.63	370.31	2.25	9.643	0.000	9.643	111	250	250	DWC	333	520	0.010	0.69	33.97	0.28	0.86	0.37	OK	0.59	OK	0.01	0.00	1.05		1.04	2.61	2.60
135			NJRDM20	NJRDM19	1	1	C		9.00		2946.00	3.642	3.672	1.13	371.44	2.25	9.673	0.000	9.673	112	250	250	DWC	-300	520	0.010	0.69	33.97	0.28	0.86	0.37	OK	0.59	OK	0.02	0.00	1.04		1.02	2.60	2.65

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
136			NJRDM19	NJRDM18	1	1	C		10.00		2956.00	3.672	3.663	1.26	372.70	2.25	9.706	0.000	9.706	112	250	250	DWC	1111	520	0.010	0.69	33.97	0.29	0.87	0.38	OK	0.60	OK	0.02	0.00	1.02		1.00	2.65	2.66
137			PMRDM10.11	PMRDM10.12	0	1	H		30.00		30.00	3.877	3.970	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-323	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.78		2.61	1.10	1.36
138			PMRDM10.12	PMRDM10.13	1	1	C		30.00		60.00	3.970	3.670	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	100	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.61		2.44	1.36	1.23
139			PMRDM10.13.2	PMRDM10.13.1	0	1	H		26.00		26.00	2.944	3.307	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-72	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	1.84		1.69	1.10	1.62
140			PMRDM10.13.1	PMRDM10.13	1	1	C		15.00		41.00	3.307	3.670	1.89	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	-41	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	1.69		1.60	1.62	2.07
141			PMRDM10.13	PMRDM10.14	2	1	J		20.00		121.00	3.670	3.861	2.52	15.26	2.25	0.397	0.000	0.397	23	200	200	DWC	-105	520	0.010	0.60	18.73	0.02	0.40	0.10	OK	0.24	Check	0.04	0.00	1.60	1.60	1.56	2.07	2.30
142			PMRDM10.14	PMRDM10.15	1	1	C		25.00		146.00	3.861	3.851	3.15	18.41	2.25	0.479	0.000	0.479	25	200	200	DWC	2500	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.05	0.00	1.56		1.51	2.30	2.34
143			PMRDM10.15	PMRDM10.16	1	1	C		20.00		166.00	3.851	3.664	2.52	20.93	2.25	0.545	0.000	0.545	27	200	200	DWC	107	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.04	0.00	1.51		1.47	2.34	2.19
144			PMRDM10.16	PMRDM10.17	1	1	C		30.00		196.00	3.664	3.469	3.78	24.71	2.25	0.644	0.000	0.644	29	200	200	DWC	154	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.06	0.00	1.47		1.41	2.19	2.06
145			PMRDM10.17	PMRDM10.18	1	1	C		30.00		226.00	3.469	3.408	3.78	28.49	2.25	0.742	0.000	0.742	31	200	200	DWC	492	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.41		1.35	2.06	2.06
146			PMRDM10.18	YMPMRDM7	1	1	C		5.00		231.00	3.408	3.176	0.63	29.13	2.25	0.758	0.000	0.758	32	200	200	DWC	22	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.01	0.00	1.35		1.34	2.06	1.84
147			YMRDM7.3	YMRDM7.2	0	1	H		26.00		26.00	3.074	3.200	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-206	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.97		1.83	1.10	1.37
148			YMRDM7.2	YMRDM7.1	1	1	C		15.00		41.00	3.200	3.304	1.89	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	-144	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.83		1.75	1.37	1.55
149			YMRDM7.1	YMPMRDM7	1	1	C		15.00		56.00	3.304	3.176	1.89	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	117	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	1.75		1.67	1.55	1.51
150			YMPMRDM7	YMRDM6	2	1	J		30.00		317.00	3.176	3.960	3.78	39.97	2.25	1.041	0.000	1.041	37	200	200	DWC	-38	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	1.34	1.34	1.28	1.84	2.68
151			YMRDM6	YMRDM5	1	1	C		20.00		337.00	3.960	3.975	2.52	42.49	2.25	1.107	0.000	1.107	38	200	200	DWC	-1333	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	1.28		1.24	2.68	2.74
152			YMRDM5.3	YMRDM5.2	0	1	H		29.00		29.00	4.172	4.055	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	248	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	3.07		2.91	1.10	1.15
153			YMRDM5.2	YMRDM5.1	1	1	C		25.00		54.00	4.055	4.140	3.15	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	-294	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	2.91		2.77	1.15	1.37
154			YMRDM5.1	YMRDM5	1	1	C		20.00		74.00	4.140	3.975	2.52	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	121	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.77		2.66	1.37	1.32
155			YMRDM5	YMRDM4	2	1	J		30.00		441.00	3.975	3.895	3.78	55.60	2.25	1.448	0.000	1.448	43	200	200	DWC	375	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.24	1.240	1.18	2.74	2.72
156			YMRDM4	YMRDM3	1	1	C		30.00		471.00	3.900	3.816	3.78	59.39	2.25	1.546	0.000	1.546	45	200	200	DWC	357	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.18		1.12	2.72	2.70
157			YMRDM3	YMRDM2	1	1	C		30.00		501.00	3.816	3.735	3.78	63.17	2.25	1.645	0.000	1.645	46	200	200	DWC	370	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.12		1.06	2.70	2.68
158			YMRDM2	YMRDM1	1	1	C		15.00		516.00	3.735	3.766	1.89	65.06	2.25	1.694	0.000	1.694	47	200	200	DWC	-484	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	1.06		1.03	2.68	2.74
159			YMRDM1	NJRDM18	1	1	C		10.00		526.00	3.766	3.663	1.26	66.32	2.25	1.727	0.000	1.727	47	200	200	DWC	97	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.02	0.00	1.03		1.01	2.74	2.65
160			NJRDM18	NJRDM17	2	1	J		30.00		3512.00	3.663	3.710	3.78	442.81	2.25	11.531	0.000	11.531	122	200	200	DWC	-638	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.06	0.00	1.00	1.000	0.94	2.66	2.77
161			NJRDM17	NJRDM16	1	1	C		15.00		3527.00	3.710	4.110	1.89	444.70	2.25	11.581	0.000	11.581	122	200	200	DWC	-38	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.03	0.00	0.94		0.91	2.77	3.20
162			NJRDM16	NJRDM15	1	1	C		15.00		3542.00	4.108	4.174	1.89	446.59	2.25	11.630	0.000	11.630	122	200	200	DWC	-227	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.03	0.00	0.91		0.88	3.20	3.29
163			NJRDM15	NJRDM14	1	1	C		30.00		3572.00	4.174	4.330	3.78	450.37	2.25	11.728	0.000	11.728	123	200	200	DWC	-192	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.06	0.00	0.88		0.82	3.29	3.51
164			NJRDM14	NJRDM13	1	1	C		13.00		3585.00	4.325	4.399	1.64	452.01	2.25	11.771	0.000	11.771	123	200	200	DWC	-176	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.03	0.00	0.82		0.79	3.51	3.61
165			NJRDM13	NJRDM12	1	1	C		4.00		3589.00	4.399	4.324	0.50	452.52	2.25	11.784	0.000	11.784	123	200	200	DWC	53	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.01	0.00	0.79		0.78	3.61	3.54
166			ATRDM21	ATRDM20	0	1	H		29.00		29.00	4.870	5.116	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	-118	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	3.77		3.61	1.10	1.51
167			ATRDM20	ATRDM19	1	1	C		30.00		59.00	5.116	5.205	3.78	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	-337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.61		3.44	1.51	1.77
168			ATRDM19	ATRDM18	1	1	C		30.00		89.00	5.210	5.294	3.78	11.22	2.25	0.292	0.000	0.292	20	200	200	DWC	-357	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.44		3.27	1.77	2.02
169			ATRDM18	ATRDM17	1	1	C		5.00		94.00	5.294	5.321	0.63	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	-185	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	3.27		3.24	2.02	2.08
170			ATRDM17	ATRDM16	1	1	C		23.00		117.00	5.321	5.191	2.90	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	177	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	3.24		3.17	2.08	2.02
171			ATRDM16	ATRDM15	1	1	C		30.00		147.00	5.191	5.151	3.78	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	750	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.17		3.08	2.02	2.07
172			ATRDM15	ATRDM14	1	1	C		10.00		157.00	5.151	5.035	1.26	19.80	2.25	0.515	0.000	0.515	26	200	200	DWC	86	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	3.08		3.05	2.07	1.99
173			ATRDM14	ATRDM13	1	1	C		20.00		177.00	5.040	4.916	2.52	22.32	2.25	0.581	0.000	0.581	28	200	200	DWC	161	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	3.05		3.00	1.99	1.92
174			ATRDM13	ATRDM12	1	1	C		30.00		207.00	4.916	4.613	3.78	26.10	2.25	0.680	0.000	0.680	30	200	200	DWC	99	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	3.00		2.93	1.92	1.68
175			ATRDM12	ATRDM11	1	1	C		10.00		217.00	4.613	4.541	1.26	27.36	2.25	0.713	0.000	0.713	31	200	200	DWC	139	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.02	0.00	2.93		2.91	1.68	1.63
176			ATRDM11	ATRDM10	1	1	C		20.00		237.00	4.541	4.364	2.52	29.88	2.25	0.778	0.000	0.778	32	200	200	DWC	113	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.91		2.87	1.63	1.49
177			ATRDM4.4.3	ATRDM10.5	0	1	H		20.00		20.00	4.750	4.701	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	408	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.65		3.54	1.10	1.16
178			ATRDM10.5	ATRDM10.4	1	1	C		25.00		45.00	4.701	4.656	3.15	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	556	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.54		3.40	1.16	1.26
179			ATRDM10.4	ATRDM10.3	1	1	C		12.00		57.00	4.656	4.626	1.51	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	3.40		3.33	1.26	1.30
180			ATRDM10.3	ATRDM10.2	1	1	C		27.00		84.00	4.626	4.518	3.40	10.59	2.25	0.276	0.000	0.276	19	200	200	DWC	250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	3.33		3.18	1.30	1.34
181			ATRDM10.2	ATRDM10.1	1	1	C		30.00		114.00	4.520	4.305	3.78	14.37	2.25	0.374	0.000	0.374	22	200	200	DWC	140	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.18		3.09	1.34	1.22
182			ATRDM10.1	ATRDM10	1	1	C		20.00		134.00	4.305	4.364	2.52	16.90	2.25	0.440	0.000	0.440	24	200	200	DWC	-339	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.07	0.00	3.09		3.02	1.22	1.34
183			ATRDM10	ATRDM9	2	1	J		30.00		401.00	4.364	4.185	3.78	50.56	2.25	1.317	0.000	1.317	41	200	200	DWC	168	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.87	2.870	2.81	1.49	1.38
184			ATRDM9	ATRDM8	1	1	C		30.00		431.00	4.190	4.193	3.78	54.34	2.25	1.415	0.000	1.415	43	200	200	DWC	-10000	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	2.81		2.75	1.38	1.44
185			ATRDM8.3	ATRDM8.2	0	1	H		16.00		16.00	5.000	4.556	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	36	36	0.010	2.28	71.70	0.00	0.30	0.07	OK	0.68	OK	0.45	0.00	3.90		3.45	1.10	1.11
186			ATRDM8.2	ATRDM8.1	1	1	C		30.00		46.00	4.556	4.374	3.78	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	165	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.18	0.00	3.45		3.27	1.11	1.10
187			ATRDM8.1	ATRDM8	1	1	C		20.00		66.00	4.374	4.193	2.52	8.32	2.25	0.217	0.000	0.217	17	200	200	DWC	110	110	0.010	1.29	40.73	0.01	0.30	0.07	OK	0.39	OK	0.18	0.00	3.27		3.09	1.10	1.10
188			ATRDM8	ATRDM7	2	1	J		25.00		522.00	4.193	3.995	3.15	65.82	2.25	1.714	0.000	1.714	47	200	200	DWC	126	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	2.75	2.750	2.70	1.44	1.30
189			ATRDM7	ATRDM6	1	1	C		30.00		552.00	3.995	3.738	3.78	69.60	2.25	1.812	0.000	1.812	49	200	200	DWC	117	180	0.010	1.01	31.84	0.06	0.55	0.17	OK	0.56	OK	0.17	0.00	2.70		2.53	1.30	1.21
190			ATRDM6	ATRDM5	1	1	C		8.00		560.00	3.738	3.755	1.01	70.61	2.25	1.839	0.000	1.839	49	200	200	DWC	-471	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.02	0.00	2.53		2.51	1.21	1.25
191			ATRDM5	ATRDM4	1	1	C		25.00		585.00	3.760	3.857	3.15	73.76	2.25	1.921	0.000	1.921	50	200	200	DWC	-258	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.05	0.00	2.51		2.46	1.25	1.40
192			ATRDM4.7	ATRDM4.6	0	1	H		18.00		18.00	4.260	4.301	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-439	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	3.16		3.06	1.10	1.24
193			ATRDM4.6	ATRDM4.5	1	1	C		15.00		33.00	4.301	4.144	1.89	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	96	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.06		2.98	1.24	1.16
194			ATRDM4.5	ATRDM4.4	1	1	C		20.00		53.00	4.144	4.196	2.52	6.68	2.25	0.174	0.000	0.174	15	200	200	DWC	-385	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.98		2.87	1.16	1.33
195			ATRDM4.4.2	ATRDM4.4.1	0	1	H		30.00		30.00	4.563	4.380	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	164	164	0.010	1.06	33.36	0.00	0.30	0.07	OK	0.32	OK	0.18	0.00	3.46		3.28	1.10	1.10
196			ATRDM4.4.1	ATRDM4.4	1	1	C		30.00		60.00	4.380	4.196	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	163	162	0.010	1.07	33.57	0.01	0.30	0.07	OK	0.32	OK	0.19	0.00	3.28		3.09	1.10	1.11
197			ATRDM4.4	ATRDM4.3	2	1	J		15.00		128.00	4.196	4.164	1.89	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	469	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	2.87	2.870	2.82	1.33	1.34
198			ATRDM4.3	ATRDM4.2	1	1	C		30.00		158.00	4.164	4.132	3.78	19.92	2.25	0.519	0.000	0.519	26	200	200	DWC	937	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.82		2.73	1.34	1.40
199			ATRDM4.2	ATRDM4.1	1	1	C		30.00		188.00	4.132	4.022	3.78	23.70	2.25	0.617	0.000	0.617	29	200	200	DWC	273	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.73		2.66	1.40	1.36
200			ATRDM4.1	ATRDM4	1	1	C		7.00		195.00	4.022	3.857	0.88	24.59	2.25	0.640	0.000	0.640	29	200	200	DWC	42	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	2.66		2.64	1.36	1.22
201			ATRDM4	ATRDM3	2	1	J		30.00		810.00	3.857	4.459	3.78	102.13	2.25	2.660	0.000	2.660	59	200	200	DWC	-50	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	2.46	2.460	2.40	1.40	2.06
202			ATRDM3	ATRDM2	1	1	C		20.00		830.00	4.459	4.712	2.52	104.65	2.25	2.725	0.000	2.725	59	200	200	DWC	-79	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	2.40		2.36	2.06	2.35
203			ATRDM2	ATRDM2.1	1	1	C		30.00		860.00	4.712	4.581	3.78	108.43	2.25	2.824	0.000	2.824	60	200	200	DWC	229	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	2.36		2.30	2.35	2.28
204			ATRDM2.1	ATRDM1	1	1	C		15.00		875.00	4.581	4.450	1.89	110.32	2.25	2.873	0.000	2.873	61	200	200	DWC	115	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.03	0.00	2.30		2.27	2.28	2.18

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
205			ATRDM1	NJRDM12	1	1	C		15.00		890.00	4.450	4.324	1.89	112.21	2.25	2.922	0.000	2.922	62	200	200	DWC	119	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	2.27		2.24	2.18	2.08
206			NJRDM12	NJRDM11	2	1	J		13.00		4492.00	4.324	4.399	1.64	566.37	2.25	14.749	0.000	14.749	138	200	200	DWC	-173	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.03	0.00	0.78	0.780	0.75	3.54	3.65
207			NJRDM11	NJRDM10	1	1	C		30.00		4522.00	4.399	4.609	3.78	570.15	2.25	14.848	0.000	14.848	138	200	200	DWC	-143	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.06	0.00	0.75		0.69	3.65	3.92
208			NJRDM10.3	NJRDM10.2	0	1	H		13.00		13.00	3.611	3.747	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	-96	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.51		2.44	1.10	1.31
209			NJRDM10.2	NJRDM10.1	1	1	C		30.00		43.00	3.747	4.246	3.78	5.42	2.25	0.141	0.000	0.141	14	200	200	DWC	-60	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.44		2.27	1.31	1.98
210			NJRDM10.1	NJRDM10	1	1	C		30.00		73.00	4.250	4.609	3.78	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	-84	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.27		2.10	1.98	2.51
211			NJRDM10	NJRDM9	2	1	J		20.00		4615.00	4.609	4.501	2.52	581.88	2.25	15.153	0.000	15.153	139	200	200	DWC	185	520	0.010	0.60	18.73	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	0.69	0.690	0.65	3.92	3.85
212			NJRDM9	NJRDM8	1	1	C		30.00		4645.00	4.501	4.393	3.78	585.66	2.25	15.252	0.000	15.252	140	200	200	DWC	278	520	0.010	0.60	18.73	0.81	1.11	0.68	OK	0.66	OK	0.06	0.00	0.65		0.59	3.85	3.80
213			NJRDM8	NJRDM7	1	1	C		30.00		4675.00	4.393	4.528	3.78	589.44	2.25	15.350	0.000	15.350	140	200	200	DWC	-222	520	0.010	0.60	18.73	0.82	1.11	0.69	OK	0.66	OK	0.06	0.00	0.59		0.53	3.80	4.00
214			NJRDM7	NJRDM6	1	1	C		30.00		4705.00	4.528	4.650	3.78	593.23	2.25	15.449	0.000	15.449	141	200	200	DWC	-246	520	0.010	0.60	18.73	0.82	1.11	0.69	OK	0.66	OK	0.06	0.00	0.53		0.47	4.00	4.18
215			NJRDM6	NJRDM5	1	1	C		20.00		4725.00	4.648	4.778	2.52	595.75	2.25	15.514	0.000	15.514	141	200	200	DWC	-154	520	0.010	0.60	18.73	0.83	1.12	0.70	OK	0.67	OK	0.04	0.00	0.47		0.43	4.18	4.35
216			NJRDM5	NJRDM4	1	1	C		5.00		4730.00	4.778	4.954	0.63	596.38	2.25	15.531	0.000	15.531	141	200	200	DWC	-28	520	0.010	0.60	18.73	0.83	1.12	0.70	OK	0.67	OK	0.01	0.00	0.43		0.42	4.35	4.53
217			1NJRDM4.2	1NJRDM4.1	0	1	H		14.00		14.00	4.910	4.930	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	-700	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.81		3.73	1.10	1.20
218			1NJRDM4.1	NJRDM4	1	1	C		30.00		44.00	4.930	4.954	3.78	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	-1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.73		3.56	1.20	1.39
219			NJRDM4	NJRDM3	2	1	J		20.00		4794.00	4.954	4.782	2.52	604.45	2.25	15.741	0.000	15.741	142	200	200	DWC	116	520	0.010	0.60	18.73	0.84	1.12	0.70	OK	0.67	OK	0.04	0.00	0.42	0.420	0.38	4.53	4.40
220			NJRDM3	NJRDM2	1	1	C		30.00		4824.00	4.782	4.882	3.78	608.23	2.25	15.839	0.000	15.839	143	200	200	DWC	-300	520	0.010	0.60	18.73	0.85	1.12	0.71	OK	0.67	OK	0.06	0.00	0.38		0.32	4.40	4.56
221			NJRDM2	NJRDM1	1	1	C		20.00		4844.00	4.882	4.810	2.52	610.75	2.25	15.905	0.000	15.905	143	200	200	DWC	278	520	0.010	0.60	18.73	0.85	1.12	0.71	OK	0.67	OK	0.04	0.00	0.32		0.28	4.56	4.53
222			NJRDM1	PMRDM20	1	1	C		17.00		4861.00	4.809	4.736	2.14	612.89	2.25	15.961	0.000	15.961	143	200	200	DWC	233	520	0.010	0.60	18.73	0.85	1.12	0.71	OK	0.67	OK	0.03	0.00	0.28		0.25	4.53	4.49
223			PMRDM33	PMRDM32	0	1	H		33.00		33.00	4.942	5.013	4.16	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	-465	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	3.84		3.66	1.10	1.35
224			PMRDM32	PMRDM31	1	1	C		30.00		63.00	5.013	5.085	3.78	7.94	2.25	0.207	0.000	0.207	17	200	200	DWC	-417	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.66		3.49	1.35	1.60
225			PMRDM31	PMRDM30	1	1	C		30.00		93.00	5.085	4.929	3.78	11.73	2.25	0.305	0.000	0.305	20	200	200	DWC	192	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.49		3.32	1.60	1.61
226			PMRDM30	PMRDM29	1	1	C		30.00		123.00	4.930	4.767	3.78	15.51	2.25	0.404	0.000	0.404	23	200	200	DWC	184	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.32		3.23	1.61	1.54
227			PMRDM29	PMRDM28	1	1	C		20.00		143.00	4.767	4.740	2.52	18.03	2.25	0.470	0.000	0.470	25	200	200	DWC	741	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.23		3.17	1.54	1.57
228			PRRDM9	PRRDM8	0	1	H		13.00		13.00	4.822	4.819	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	4333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	3.72		3.65	1.10	1.17
229			PRRDM8	PRRDM7	1	1	C		25.00		38.00	4.819	4.740	3.15	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	316	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.65		3.51	1.17	1.23
230			PRRDM7	PRRDM6	1	1	C		10.00		48.00	4.740	4.789	1.26	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-204	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.51		3.45	1.23	1.34
231			PRRDM6	PRRDM5	1	1	C		35.00		83.00	4.789	5.165	4.41	10.46	2.25	0.273	0.000	0.273	19	200	200	DWC	-93	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	3.45		3.26	1.34	1.91
232			PRRDM5	PRRDM4	1	1	C		10.00		93.00	5.165	4.870	1.26	11.73	2.25	0.305	0.000	0.305	20	200	200	DWC	34	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.26		3.20	1.91	1.67
233			PRRDM4	PRRDM3	1	1	C		25.00		118.00	4.870	4.913	3.15	14.88	2.25	0.387	0.000	0.387	23	200	200	DWC	-581	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	3.20		3.12	1.67	1.79
234			PRRDM3	PRRDM2	1	1	C		10.00		128.00	4.913	4.928	1.26	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	-667	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	3.12		3.09	1.79	1.84
235			PRRDM2	PRRDM1	1	1	C		30.00		158.00	4.928	4.931	3.78	19.92	2.25	0.519	0.000	0.519	26	200	200	DWC	-10000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.09		3.00	1.84	1.93
236			PRRDM1	PMRDM28	1	1	C		5.00		163.00	4.931	4.740	0.63	20.55	2.25	0.535	0.000	0.535	27	200	200	DWC	26	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.01	0.00	3.00		2.99	1.93	1.75
237			PMRDM28	PMRDM27	2	1	J		8.00		314.00	4.740	4.667	1.01	39.59	2.25	1.031	0.000	1.031	37	200	200	DWC	110	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	2.99	2.990	2.97	1.75	1.70
238			PMRDM27	PMRDM26	1	1	C		30.00		344.00	4.667	4.609	3.78	43.37	2.25	1.130	0.000	1.130	38	200	200	DWC	517	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.97		2.91	1.70	1.70
239			PMRDM26	PMRDM25	1	1	C		30.00		374.00	4.609	4.574	3.78	47.16	2.25	1.228	0.000	1.228	40	200	200	DWC	857	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.91		2.85	1.70	1.72
240			PMRDM25	PMRDM24	1	1	C		30.00		404.00	4.574	4.539	3.78	50.94	2.25	1.327	0.000	1.327	42	200	200	DWC	857	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.85		2.79	1.72	1.75
241			PMRDM24.7	PMRDM24.6	0	1	H		18.00		18.00	4.791	4.763	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	643	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	3.69		3.59	1.10	1.17
242			PMRDM24.6	PMRDM24.5	1	1	C		30.00		48.00	4.763	4.840	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-390	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.59		3.42	1.17	1.42
243			PMRDM24.5	PMRDM24.4	1	1	C		12.00		60.00	4.840	4.881	1.51	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-293	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	3.42		3.35	1.42	1.53
244			PMRDM24.4	PMRDM24.3	1	1	C		20.00		80.00	4.881	4.923	2.52	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.35		3.24	1.53	1.68
245			PMRDM24.3.1	PMRDM24.3	0	1	H		27.00		27.00	4.990	4.923	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	403	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	3.89		3.74	1.10	1.18
246			PMRDM24.3	PMRDM24.2	2	1	J		14.00		121.00	4.923	4.856	1.77	15.26	2.25	0.397	0.000	0.397	23	200	200	DWC	209	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	3.24	3.240	3.20	1.68	1.66
247			PMRDM24.2	PMRDM24.1	1	1	C		30.00		151.00	4.860	4.770	3.78	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	333	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.20		3.11	1.66	1.66
248			PMRDM24.1	PMRDM24A	1	1	C		30.00		181.00	4.770	4.648	3.78	22.82	2.25	0.594	0.000	0.594	28	200	200	DWC	246	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.11		3.02	1.66	1.63
249			PMRDM24A	PMRDM24	1	1	C		5.00		186.00	4.648	4.539	0.63	23.45	2.25	0.611	0.000	0.611	28	200	200	DWC	46	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.01	0.00	3.02		3.01	1.63	1.53
250			PMRDM24	PMRDM23	2	1	J		14.00		604.00	4.539	4.474	1.77	76.15	2.25	1.983	0.000	1.983	51	200	200	DWC	215	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	2.79	2.790	2.76	1.75	1.71
251			PMRDM23	PMRDM22	1	1	C		30.00		634.00	4.474	4.449	3.78	79.94	2.25	2.082	0.000	2.082	52	200	200	DWC	1200	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	2.76		2.70	1.71	1.75
252			PMRDM22	PMRDM21	1	1	C		17.00		651.00	4.449	4.587	2.14	82.08	2.25	2.138	0.000	2.138	53	200	200	DWC	-123	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	2.70		2.67	1.75	1.92
253			PMRDM21	PMRDM21.1	1	1	C		30.00		681.00	4.587	4.746	3.78	85.86	2.25	2.236	0.000	2.236	54	200	200	DWC	-189	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	2.67		2.61	1.92	2.14
254			PMRDM21.1	PMRDM20	1	1	C		30.00		711.00	4.750	4.736	3.78	89.65	2.25	2.335	0.000	2.335	55	200	200	DWC	2143	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	2.61		2.55	2.14	2.19
255			PMRDM20	PMRDM19	2	1	J		20.00		5592.00	4.736	4.544	2.52	705.06	2.25	18.361	0.000	18.361	153	250	250	DWC	104	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.03	0.00	0.25	0.250	0.22	4.49	4.32
256			PMRDM19	THRRDM34.5	1	1	C		15.00		5607.00	4.544	4.513	1.89	706.95	2.25	18.410	0.000	18.410	154	250	250	DWC	484	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.02	0.00	0.22		0.20	4.32	4.31
257			THRRDM34.5	THRRDM34.4	1	1	C		20.00		5627.00	4.513	4.482	2.52	709.47	2.25	18.476	0.000	18.476	154	250	250	DWC	645	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.03	0.00	0.20		0.17	4.31	4.31
258			THRRDM34.4	THRRDM34.3	1	1	C		25.00		5652.00	4.482	4.354	3.15	712.63	2.25	18.558	0.000	18.558	154	250	250	DWC	195	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.04	0.00	0.17		0.13	4.31	4.22
259			THRRDM34.3	THRRDM34.2	1	1	C		30.00		5682.00	4.354	4.304	3.78	716.41	2.25	18.656	0.000	18.656	155	250	250	DWC	594	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	0.13		0.09	4.22	4.21
260			THRRDM34.2	THRRDM34.1	1	1	C		30.00		5712.00	4.304	4.150	3.78	720.19	2.25	18.755	0.000	18.755	155	250	250	DWC	195	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	0.09		0.05	4.21	4.10
261			THRRDM34.1	THRRDM34	1	1	C		20.00		5732.00	4.150	4.051	2.52	722.71	2.25	18.821	0.000	18.821	155	250	250	DWC	202	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.03	0.00	0.05		0.02	4.10	4.03
262			THRDM15.5	THRDM15.4	0	1	H		11.00		11.00	5.070	5.106	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	-306	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	3.97		3.91	1.10	1.20
263			THRDM15.4	THRDM15.3	1	1	C		5.00		16.00	5.106	5.211	0.63	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	-48	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.91		3.88	1.20	1.33
264			THRDM15.3	THRDM15.2	1	1	C		20.00		36.00	5.211	5.343	2.52	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	-152	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.88		3.77	1.33	1.57
265			THRDM15.2.1	THRDM15.2	0	1	H		23.00		23.00	5.380	5.343	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	622	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	4.28		4.15	1.10	1.19
266			THRDM15.2	THRDM15.1A	2	1	J		15.00		74.00	5.343	5.251	1.89	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	163	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.77	3.770	3.69	1.57	1.56
267			THRDM15.1A	THRDM15.1	1	1	C		30.00		104.00	5.251	5.180	3.78	13.11	2.25	0.341	0.000	0.341	21	200	200	DWC	423	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.69		3.52	1.56	1.66
268			THRDM15.1	THRDM15	1	1	C		20.00		124.00	5.180	5.049	2.52	15.63	2.25	0.407	0.000	0.407	23	200	200	DWC	153	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.52		3.46	1.66	1.59
269			THRDM13	THRDM14	0	1	H		20.00		20.00	5.010	5.065	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-364	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.91		3.80	1.10	1.27
270			THRDM14	THRDM15	1	1	C		8.00		28.00	5.065	5.049	1.01	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	3.80		3.76	1.27	1.29
271			THRDM15	THRDM16	2	1	J		30.00		182.00	5.049	4.843	3.78	22.95	2.25	0.598	0.000	0.598	28	200	200	DWC	146	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.06	0.00	3.46	3.460	3.40	1.59	1.44
272			THRDM16	THRDM17	1	1	C		30.00		212.00	4.843	4.911	3.78	26.73	2.25	0.696	0.000	0.696	30	200	200	DWC	-441	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	3.40		3.34	1.44	1.57
273			THRDM17.5	THRDM17.4	0	1	H		22.00		22.00	5.080	5.035	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	489	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.98		3.86	1.10	1.18

Sl. No.	Road	Element	Man Holes				Man hole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
274			THRDM17.4	THRDM17.3	1	1	C		5.00		27.00	5.035	5.018	0.63	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	294	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.86		3.83	1.18	1.19
275			THRDM17.3.1	THRDM17.3	0	1	H		21.00		21.00	5.063	5.018	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	467	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.96		3.84	1.10	1.18
276			THRDM17.3	THRDM17.2	2	1	J		17.00		65.00	5.018	5.082	2.14	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-266	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.83	3.830	3.74	1.19	1.34
277			THRDM17.2	THRDM17.1	1	1	C		30.00		95.00	5.082	4.915	3.78	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	180	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.74		3.57	1.34	1.35
278			THRDM17.1	THRDM17	1	1	C		30.00		125.00	4.915	4.911	3.78	15.76	2.25	0.410	0.000	0.410	23	200	200	DWC	7500	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.57		3.48	1.35	1.43
279			THRDM17	THRMANRDM18	2	1	J		22.00		359.00	4.911	4.982	2.77	45.26	2.25	1.179	0.000	1.179	39	200	200	DWC	-310	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	3.34	3.340	3.30	1.57	1.68
280			MANRDM13	MANRDM12	0	1	H		22.00		22.00	5.000	5.082	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	-268	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.90		3.78	1.10	1.30
281			MANRDM12	MANRDM11	1	1	C		20.00		42.00	5.082	5.166	2.52	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	-238	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.78		3.67	1.30	1.50
282			MANRDM11	MANRDM10	1	1	C		30.00		72.00	5.166	4.940	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	133	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.67		3.50	1.50	1.44
283			MANRDM10	MANRDM9	1	1	C		20.00		92.00	4.940	4.970	2.52	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	-667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.50		3.39	1.44	1.58
284			MANRDM9	MANRDM8	1	1	C		30.00		122.00	4.970	4.863	3.78	15.38	2.25	0.401	0.000	0.401	23	200	200	DWC	280	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.39		3.30	1.58	1.56
285			MANRDM8	MANRDM7	1	1	C		25.00		147.00	4.863	4.871	3.15	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	-3125	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	3.30		3.22	1.56	1.65
286			MANRDM7	MANRDM6	1	1	C		15.00		162.00	4.871	4.880	1.89	20.43	2.25	0.532	0.000	0.532	27	200	200	DWC	-1667	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	3.22		3.17	1.65	1.71
287			MANRDM6.6	MANRDM6.5	0	1	H		12.00		12.00	5.510	5.436	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	162	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.08	0.00	4.41		4.33	1.10	1.11
288			MANRDM6.5	MANRDM6.4	1	1	C		20.00		32.00	5.436	5.311	2.52	4.03	2.25	0.105	0.000	0.105	12	200	200	DWC	160	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.12	0.00	4.33		4.21	1.11	1.10
289			MANRDM6.4	MANRDM6.3	1	1	C		15.00		47.00	5.311	5.183	1.89	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	117	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.13	0.00	4.21		4.08	1.10	1.10
290			MANRDM6.3	MANRDM6.2	1	1	C		15.00		62.00	5.183	5.159	1.89	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	4.08		4.00	1.10	1.16
291			MANRDM6.2	MANRDM6.1	1	1	C		26.00		88.00	5.159	5.040	3.28	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	218	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	4.00		3.86	1.16	1.18
292			MANRDM6.1	MANRDM6	1	1	C		30.00		118.00	5.040	4.880	3.78	14.88	2.25	0.387	0.000	0.387	23	200	200	DWC	188	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.86		3.77	1.18	1.11
293			MANRDM6	MANRDM5	2	1	J		20.00		300.00	4.880	4.766	2.52	37.83	2.25	0.985	0.000	0.985	36	200	200	DWC	175	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	3.17	3.170	3.13	1.71	1.64
294			MANRDM5	MANRDM4	1	1	C		5.00		305.00	4.766	4.757	0.63	38.46	2.25	1.001	0.000	1.001	36	200	200	DWC	556	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.01	0.00	3.13		3.12	1.64	1.64
295			MANRDM4	MANRDM3	1	1	C		16.00		321.00	4.757	4.867	2.02	40.47	2.25	1.054	0.000	1.054	37	200	200	DWC	-145	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	3.12		3.09	1.64	1.78
296			MANRDM3	MANRDM2	1	1	C		30.00		351.00	4.867	5.142	3.78	44.26	2.25	1.152	0.000	1.152	39	200	200	DWC	-109	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	3.09		3.03	1.78	2.11
297			MANRDM2	MANRDM1	1	1	C		30.00		381.00	5.142	5.251	3.78	48.04	2.25	1.251	0.000	1.251	40	200	200	DWC	-275	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	3.03		2.97	2.11	2.28
298			MANRDM1	THRMANRDM18	1	1	C		30.00		411.00	5.251	4.982	3.78	51.82	2.25	1.349	0.000	1.349	42	200	200	DWC	112	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.97		2.91	2.28	2.07
299			THRMANRDM18	THRRDM19	2	1	J		15.00		785.00	4.982	4.812	1.89	98.98	2.25	2.577	0.000	2.577	58	200	200	DWC	88	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	2.91	2.910	2.88	2.07	1.93
300			THRRDM19	THRRDM20	1	1	C		14.00		799.00	4.812	4.197	1.77	100.74	2.25	2.623	0.000	2.623	58	200	200	DWC	23	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	2.88		2.85	1.93	1.35
301			THRRDM20.3	THRRDM20.2	0	1	H		17.00		17.00	5.014	4.912	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	167	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.10	0.00	3.91		3.81	1.10	1.10
302			THRRDM20.2	THRRDM20.1	1	1	C		20.00		37.00	4.912	4.810	2.52	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	196	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.12	0.00	3.81		3.69	1.10	1.12
303			THRRDM20.1	THRRDM20	1	1	C		30.00		67.00	4.810	4.197	3.78	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	49	50	0.010	1.92	60.42	0.00	0.30	0.07	OK	0.58	OK	0.60	0.00	3.69		3.09	1.12	1.11
304			THRRDM20	THRRDM21	2	1	J		20.00		886.00	4.197	4.599	2.52	111.71	2.25	2.909	0.000	2.909	61	200	200	DWC	-50	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	2.85	2.850	2.81	1.35	1.79
305			THRRDM21	THRRDM22	1	1	C		20.00		906.00	4.599	4.674	2.52	114.23	2.25	2.975	0.000	2.975	62	200	200	DWC	-267	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	2.81		2.77	1.79	1.90
306			THRRDM22	THRRDM23	1	1	C		15.00		921.00	4.674	4.498	1.89	116.12	2.25	3.024	0.000	3.024	63	200	200	DWC	85	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	2.77		2.74	1.90	1.76
307			THRRDM23	THRRDM24	1	1	C		15.00		936.00	4.498	4.568	1.89	118.01	2.25	3.073	0.000	3.073	63	200	200	DWC	-214	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	2.74		2.71	1.76	1.86
308			THRRDM24	THRRDM25	1	1	C		14.00		950.00	4.568	4.638	1.77	119.78	2.25	3.119	0.000	3.119	64	200	200	DWC	-200	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.03	0.00	2.71		2.68	1.86	1.96
309			THRRDM25	THRRDM26	1	1	C		30.00		980.00	4.638	4.708	3.78	123.56	2.25	3.218	0.000	3.218	65	200	200	DWC	-429	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	2.68		2.62	1.96	2.09
310			THRRDM26	THRRDM27	1	1	C		20.00		1000.00	4.708	4.653	2.52	126.08	2.25	3.283	0.000	3.283	65	200	200	DWC	364	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	2.62		2.58	2.09	2.07
311			THRRDM27	THRKNRDM28	1	1	C		26.00		1026.00	4.653	4.349	3.28	129.36	2.25	3.369	0.000	3.369	66	200	200	DWC	86	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.05	0.00	2.58		2.53	2.07	1.82
312			KNRDM12	KNRDM11	0	1	H		18.00		18.00	5.070	5.246	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-102	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	3.97		3.87	1.10	1.38
313			KNRDM11	KNRDM10	1	1	C		20.00		38.00	5.246	5.425	2.52	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	-112	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.87		3.76	1.38	1.67
314			KNRDM10	KNRDM9	1	1	C		30.00		68.00	5.425	5.471	3.78	8.57	2.25	0.223	0.000	0.223	17	200	200	DWC	-652	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.76		3.59	1.67	1.88
315			KNRDM9.3	KNRDM9.2	0	1	H		24.00		24.00	5.422	5.414	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	3000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	4.32		4.19	1.10	1.22
316			KNRDM9.2	KNRDM9.1	1	1	C		20.00		44.00	5.414	5.476	2.52	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	-323	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	4.19		4.08	1.22	1.40
317			KNRDM9.1	KNRDM9	1	1	C		30.00		74.00	5.476	5.471	3.78	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	6000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.08		3.91	1.40	1.56
318			KNRDM9	KNRDM8	2	1	J		25.00		167.00	5.471	5.213	3.15	21.06	2.25	0.548	0.000	0.548	27	200	200	DWC	97	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	3.59	3.590	3.51	1.88	1.70
319			KNRDM8	KNRDM7	1	1	C		30.00		197.00	5.213	5.165	3.78	24.84	2.25	0.647	0.000	0.647	29	200	200	DWC	625	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	3.51		3.44	1.70	1.73
320			KNRDM7.9	KNRDM7.8	0	1	H		28.00		28.00	5.301	5.283	3.53	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	1556	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	4.20		4.04	1.10	1.24
321			KNRDM7.8	KNRDM7.7	1	1	C		30.00		58.00	5.283	5.282	3.78	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	30000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.04		3.87	1.24	1.41
322			KNRDM7.7	KNRDM7.6	1	1	C		15.00		73.00	5.282	5.336	1.89	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	-278	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.87		3.79	1.41	1.55
323			KNRDM7.6	KNRDM7.5	1	1	C		10.00		83.00	5.336	5.390	1.26	10.46	2.25	0.273	0.000	0.273	19	200	200	DWC	-185	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.79		3.73	1.55	1.66
324			KNRDM7.5	KNRDM7.4	1	1	C		25.00		108.00	5.390	5.339	3.15	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	490	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.73		3.59	1.66	1.75
325			KNRDM7.4	KNRDM7.3	1	1	C		5.00		113.00	5.339	5.334	0.63	14.25	2.25	0.371	0.000	0.371	22	200	200	DWC	1000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	3.59		3.57	1.75	1.76
326			KNRDM7.3	KNRDM7.2	1	1	C		18.00		131.00	5.334	5.345	2.27	16.52	2.25	0.430	0.000	0.430	24	200	200	DWC	-1636	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.57		3.51	1.76	1.84
327			KNRDM7.2	KNRDM7.1	1	1	C		18.00		149.00	5.345	5.165	2.27	18.79	2.25	0.489	0.000	0.489	25	200	200	DWC	100	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.51		3.45	1.84	1.72
328			KNRDM7.1	KNRDM7	1	1	C		5.00		154.00	5.165	5.165	0.63	19.42	2.25	0.506	0.000	0.506	26	200	200	DWC	0	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	3.45		3.43	1.72	1.74
329			KNRDM7.14	KNRDM7.13	0	1	H		16.00		16.00	5.542	5.448	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	170	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	4.44		4.35	1.10	1.10
330			KNRDM7.13	KNRDM7.12	1	1	C		30.00		46.00	5.448	5.425	3.78	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	1304	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.35		4.18	1.10	1.25
331			KNRDM7.12	KNRDM7.11	1	1	C		30.00		76.00	5.425	5.392	3.78	9.58	2.25	0.250	0.000	0.250	18	200	200	DWC	909	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.18		4.01	1.25	1.38
332			KNRDM7.11	KNRDM7.10	1	1	C		30.00		106.00	5.392	5.260	3.78	13.36	2.25	0.348	0.000	0.348	22	200	200	DWC	227	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.01		3.84	1.38	1.42
333			KNRDM7.10	KNRDM7	1	1	C		10.00		116.00	5.260	5.165	1.26	14.63	2.25	0.381	0.000	0.381	23	200	200	DWC	105	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	3.84		3.81	1.42	1.36
334			KNRDM7	KNRDM6	3	1	J		15.00		482.00	5.165	5.029	1.89	60.77	2.25	1.583	0.000	1.583	45	200	200	DWC	110	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	3.43	3.430	3.40	1.74	1.63
335			KNRDM6	KNRDM5	1	1	C		30.00		512.00	5.029	4.893	3.78	64.56	2.25	1.681	0.000	1.681	47	200	200	DWC	221	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	3.40		3.34	1.63	1.55
336			KNRDM5	KNRDM4	1	1	C		30.00		542.00	4.893	4.952	3.78	68.34	2.25	1.780	0.000	1.780	48	200	200	DWC	-508	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	3.34		3.28	1.55	1.67
337			KNRDM4	KNRDM3	1	1	C		30.00		572.00	4.952	5.051	3.78	72.12	2.25	1.878	0.000	1.878	49	200	200	DWC	-303	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	3.28		3.22	1.67	1.83
338			KNRDM3.2	KNRDM3.1	0	1	H		18.00		18.00	4.874	4.968	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-191	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	3.77		3.67	1.10	1.30
339			KNRDM3.1	KNRDM3	1	1	C		30.00		48.00	4.968	5.051	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-361	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.67		3.50	1.30	1.55
340			KNRDM3	KNRDM2	2	1	J		13.00		633.00	5.051	4.815	1.64	79.81	2.25	2.078	0.000	2.078	52	200	200	DWC	55	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	3.22	3.220	3.19	1.83	1.63
341			KNRDM2	KNRDM1	1	1	C		25.00		658.00	4.815	4.582	3.15	82.96	2.25	2.161	0.000	2.161	53	200	200	DWC	107	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.05	0.00	3.19		3.14	1.63	1.44
342			KNRDM1	THRKNRDM28	1	1	C		30.00		688.00	4.582	4.349	3.78	86.75	2.25	2.259	0.000	2.259	54	200	200	DWC	129	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	3.14		3.08	1.44	1.27

Sl. No.	Road	Element	Man Holes				Man hole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
343			THRKNRDM28	THRRDM29	2	1	J		20.00		1734.00	4.349	4.392	2.52	218.63	2.25	5.693	0.000	5.693	86	200	200	DWC	-465	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.04	0.00	2.53	2.530	2.49	1.82	1.90
344			THRRDM29	THRRDM30	1	1	C		15.00		1749.00	4.392	4.465	1.89	220.52	2.25	5.743	0.000	5.743	86	200	200	DWC	-205	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.03	0.00	2.49		2.46	1.90	2.01
345			THRRDM30	THRDMRDM31	1	1	C		17.00		1766.00	4.465	4.361	2.14	222.66	2.25	5.799	0.000	5.799	86	200	200	DWC	163	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.03	0.00	2.46		2.43	2.01	1.93
346			DMRDM6	DMRDM5	0	1	H		20.00		20.00	4.743	4.625	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	169	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.64		3.53	1.10	1.10
347			DMRDM5	DMRDM4	1	1	C		30.00		50.00	4.625	4.562	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.53		3.36	1.10	1.20
348			DMRDM4	DMRDM3	1	1	C		20.00		70.00	4.562	4.546	2.52	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.36		3.25	1.20	1.30
349			DMRDM3	DMRDM2	1	1	C		15.00		85.00	4.546	4.454	1.89	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	163	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.25		3.17	1.30	1.28
350			DMRDM2	DMRDM1	1	1	C		30.00		115.00	4.454	4.539	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	-353	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.17		3.08	1.28	1.46
351			DMRDM1	THRDMRDM31	1	1	C		5.00		120.00	4.539	4.361	0.63	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	28	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	3.08		3.06	1.46	1.30
352			THRDMRDM31	THRRDM32	2	1	J		20.00		1906.00	4.361	4.360	2.52	240.32	2.25	6.258	0.000	6.258	90	200	200	DWC	20000	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.04	0.00	2.43	2.430	2.39	1.93	1.97
353			THRRDM32	THRRDM33	1	1	C		30.00		1936.00	4.360	4.261	3.78	244.10	2.25	6.357	0.000	6.357	90	200	200	DWC	303	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.06	0.00	2.39		2.33	1.97	1.93
354			THRRDM33	THRRDM34	1	1	C		28.00		1964.00	4.261	4.051	3.53	247.63	2.25	6.449	0.000	6.449	91	200	200	DWC	133	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.05	0.00	2.33		2.28	1.93	1.77
355			THRRDM34	THRRDM35	2	1	J		26.00		7722.00	4.051	3.861	3.28	973.62	2.25	25.355	0.000	25.355	180	250	250	DWC	137	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.04	0.00	0.02	0.020	-0.02	4.03	3.88
356			THRRDM35	THRRDM36	1	1	C		20.00		7742.00	3.861	3.854	2.52	976.14	2.25	25.420	0.000	25.420	180	250	250	DWC	2857	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.03	0.00	-0.02		-0.05	3.88	3.90
357			THRRDM36	THRRDM37	1	1	C		30.00		7772.00	3.854	3.768	3.78	979.92	2.25	25.519	0.000	25.519	181	250	250	DWC	349	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.04	0.00	-0.05		-0.09	3.90	3.86
358			THRRDM37	THRRDM38	1	1	C		15.00		7787.00	3.768	3.682	1.89	981.82	2.25	25.568	0.000	25.568	181	250	250	DWC	174	700	0.010	0.60	29.28	0.87	1.12	0.72	OK	0.67	OK	0.02	0.00	-0.09		-0.11	3.86	3.79
359			THRRDM38	MBCTHRRDM38	1	1	C		20.00		7807.00	3.682	3.875	2.52	984.34	2.25	25.634	0.000	25.634	181	250	250	DWC	-104	700	0.010	0.60	29.28	0.88	1.13	0.73	OK	0.67	OK	0.03	0.00	-0.11		-0.14	3.79	4.02
360			BGRDM11	BGRDM10	0	1	H		30.00		30.00	2.090	1.968	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	246	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.99		0.82	1.10	1.15
361			BGRDM10	BGRDM9.1	1	1	C		18.00		48.00	1.968	1.623	2.27	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	52	60	0.010	1.75	55.15	0.00	0.30	0.07	OK	0.53	OK	0.30	0.00	0.82		0.52	1.15	1.10
362			BGRDM9.1.3	BGRDM9.1.2	0	1	H		30.00		30.00	1.760	1.849	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-337	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.66		0.49	1.10	1.36
363			BGRDM9.1.2	BGRDM9.1.1	1	1	C		30.00		60.00	1.849	1.894	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.49		0.32	1.36	1.57
364			BGRDM9.1.1	BGRDM9.1	1	1	C		30.00		90.00	1.894	1.623	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.32		0.15	1.57	1.47
365			BGRDM9.1	BGRDM9	2	1	J		12.00		150.00	1.623	1.690	1.51	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	-179	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	0.15	0.150	0.11	1.47	1.58
366			BGRDM9	BGRDM8	1	1	C		30.00		180.00	1.690	1.662	3.78	22.70	2.25	0.591	0.000	0.591	28	200	200	DWC	1071	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.11		0.04	1.58	1.62
367			BGRDM8	BGRDM7	1	1	C		30.00		210.00	1.662	1.687	3.78	26.48	2.25	0.690	0.000	0.690	30	200	200	DWC	-1200	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.04		-0.03	1.62	1.72
368			BGRDM7	BGRDM6	1	1	C		30.00		240.00	1.687	1.800	3.78	30.26	2.25	0.788	0.000	0.788	32	200	200	DWC	-265	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.03		-0.09	1.72	1.89
369			BGRDM6	BGRDM5	1	1	C		30.00		270.00	1.800	1.750	3.78	34.04	2.25	0.887	0.000	0.887	34	200	200	DWC	600	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.09		-0.15	1.89	1.90
370			BGRDM3.1.1	BGRDM3.1.2	0	1	H		20.00		20.00	1.812	1.740	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	278	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.71		0.60	1.10	1.14
371			BGRDM3.1.2	BGRDM3.1.3	1	1	C		32.00		52.00	1.740	1.637	4.03	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	311	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.60		0.42	1.14	1.22
372			BGRDM3.1.3	BGRDM3.1.4	1	1	C		10.00		62.00	1.637	1.601	1.26	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	278	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.42		0.36	1.22	1.24
373			BGRDM3.1.4	BGRDM3.1.5	1	1	C		20.00		82.00	1.601	1.768	2.52	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	-120	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.36		0.25	1.24	1.52
374			BGRDM3.1.5	BGRDM5	1	1	C		16.00		98.00	1.768	1.750	2.02	12.36	2.25	0.322	0.000	0.322	21	200	200	DWC	889	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.25		0.16	1.52	1.59
375			BGRDM5	BGRDM4	2	1	J		30.00		398.00	1.750	1.683	3.78	50.18	2.25	1.307	0.000	1.307	41	200	200	DWC	448	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-0.15	-0.150	-0.21	1.90	1.89
376			BGRDM4	BGRDM3.1	1	1	C		30.00		428.00	1.683	1.841	3.78	53.96	2.25	1.405	0.000	1.405	43	200	200	DWC	-190	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.21		-0.27	1.89	2.11
377			BGRDM3.1	BGRDM3	1	1	C		9.00		437.00	1.841	1.805	1.13	55.10	2.25	1.435	0.000	1.435	43	200	200	DWC	250	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.02	0.00	-0.27		-0.29	2.11	2.10
378			BGRDM3	BGRDM2	1	1	C		30.00		467.00	1.805	1.669	3.78	58.88	2.25	1.533	0.000	1.533	45	200	200	DWC	221	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.29		-0.35	2.10	2.02
379			BGRDM2	BGRDM1	1	1	C		25.00		492.00	1.669	1.750	3.15	62.03	2.25	1.615	0.000	1.615	46	200	200	DWC	-309	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	-0.35		-0.40	2.02	2.15
380			BGRDM1	PMRDM2	1	1	C		22.00		514.00	1.750	1.900	2.77	64.81	2.25	1.688	0.000	1.688	47	200	200	DWC	-147	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	-0.40		-0.44	2.15	2.34
381			PMRDM2	PMRDM3	1	1	C		30.00		544.00	1.900	1.930	3.78	68.59	2.25	1.786	0.000	1.786	48	200	200	DWC	-1000	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.44		-0.50	2.34	2.43
382			PMRDM3	PMRDM4	1	1	C		15.00		559.00	1.930	2.058	1.89	70.48	2.25	1.835	0.000	1.835	49	200	200	DWC	-117	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.03	0.00	-0.50		-0.53	2.43	2.59
383			PMRDM4	PMRDM5	1	1	C		25.00		584.00	2.058	2.039	3.15	73.63	2.25	1.918	0.000	1.918	50	200	200	DWC	1316	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.05	0.00	-0.53		-0.58	2.59	2.62
384			PMRDM5	PMRDM6	1	1	C		14.00		598.00	2.039	2.050	1.77	75.40	2.25	1.963	0.000	1.963	51	200	200	DWC	-1273	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.03	0.00	-0.58		-0.61	2.62	2.66
385			PMRDM6.2	PMRDM6.1	0	1	H		26.00		26.00	1.790	1.904	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-228	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.69		0.55	1.10	1.35
386			PMRDM6.1	PMRDM6	1	1	C		20.00		46.00	1.904	2.050	2.52	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	-137	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.55		0.44	1.35	1.61
387			PMRDM6	PMRDM7	2	1	J		30.00		674.00	2.050	2.062	3.78	84.98	2.25	2.213	0.000	2.213	54	200	200	DWC	-2500	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.61	-0.61	-0.67	2.66	2.73
388			PMRDM7	PMRDM8	1	1	C		30.00		704.00	2.062	2.085	3.78	88.76	2.25	2.312	0.000	2.312	55	200	200	DWC	-1304	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.67		-0.73	2.73	2.82
389			PMRDM8	PMRDM9	1	1	C		25.00		729.00	2.085	2.259	3.15	91.92	2.25	2.394	0.000	2.394	56	200	200	DWC	-144	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	-0.73		-0.78	2.82	3.04
390			PMRDM9	PMRDM9.1	1	1	C		15.00		744.00	2.259	2.273	1.89	93.81	2.25	2.443	0.000	2.443	56	200	200	DWC	-1071	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.03	0.00	-0.78		-0.81	3.04	3.08
391			PMRDM9.1	PMRDM10	1	1	C		17.00		761.00	2.273	2.339	2.14	95.95	2.25	2.499	0.000	2.499	57	200	200	DWC	-258	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.03	0.00	-0.81		-0.84	3.08	3.18
392			PMRDM10.10.2	PMRDM10.10.1	0	1	H		30.00		30.00	2.821	3.563	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-40	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.72		1.55	1.10	2.01
393			PMRDM10.10.1	PMRDM10.10	1	1	C		30.00		60.00	3.563	3.630	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-448	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.55		1.38	2.01	2.25
394			PMRDM10.10	PMRDM10.9	1	1	C		19.00		79.00	3.630	2.921	2.40	9.96	2.25	0.259	0.000	0.259	19	200	200	DWC	27	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.38		1.27	2.25	1.65
395			PMRDM10.9	PMRDM10.8	1	1	C		7.00		86.00	2.921	2.830	0.88	10.84	2.25	0.282	0.000	0.282	19	200	200	DWC	77	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	1.27		1.23	1.65	1.60
396			PMRDM10.8	PMRDM10.7	1	1	C		24.00		110.00	2.830	2.906	3.03	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	-316	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	1.23		1.10	1.60	1.81
397			PMRDM10.7	PMRDM10.6	1	1	C		20.00		130.00	2.910	3.799	2.52	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	-22	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.10		1.04	1.81	2.76
398			NJRDM4.1	NJRDM4.2	0	1	H		20.00		20.00	4.640	4.568	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	278	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.54		3.43	1.10	1.14
399			NJRDM4.2	NJRDM4.3	1	1	C		30.00		50.00	4.568	4.251	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	95	105	0.010	1.32	41.69	0.00	0.30	0.07	OK	0.40	OK	0.29	0.00	3.43		3.14	1.14	1.11
400			NJRDM4.3	NJRDM4.4	1	1	C		30.00		80.00	4.251	3.935	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	95	96	0.010	1.39	43.60	0.01	0.30	0.07	OK	0.42	OK	0.31	0.00	3.14		2.83	1.11	1.11
401			NJRDM4.4	NJRDM4.5	1	1	C		30.00		110.00	3.935	3.867	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	441	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.83		2.66	1.11	1.21
402			NJRDM4.5	PMRDM10.6	1	1	C		30.00		140.00	3.870	3.799	3.78	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	423	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.66		2.57	1.21	1.23
403			PMRDM10.6	PMRDM10.5	2	1	J		11.00		281.00	3.799	3.209	1.39	35.43	2.25	0.923	0.000	0.923	35	200	200	DWC	19	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	1.04	1.040	1.02	2.76	2.19
404			PMRDM10.5	PMRDM10.4	1	1	C		20.00		301.00	3.209	2.620	2.52	37.95	2.25	0.988	0.000	0.988	36	200	200	DWC	34	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	1.02		0.98	2.19	1.64
405			PMRDM10.4	PMRDM10.3	1	1	C		20.00		321.00	2.620	2.636	2.52	40.47	2.25	1.054	0.000	1.054	37	200	200	DWC	-1250	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.98		0.94	1.64	1.70
406			PMRDM10.3	PMRDM10.2	1	1	C		20.00		341.00	2.636	2.650	2.52	42.99	2.25	1.120	0.000	1.120	38	200	200	DWC	-1429	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.94		0.90	1.70	1.75
407			PMRDM10.2	PMRDM10.1	1	1	C		30.00		371.00	2.650	2.594	3.78	46.78	2.25	1.218	0.000	1.218	40	200	200	DWC	536	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.90		0.84	1.75	1.75
408			PMRDM10.1	PMRDM10	1	1	C		30.00		401.00	2.594	2.339	3.78	50.56	2.25	1.317	0.000	1.317	41	200	200	DWC	118	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.84		0.78	1.75	1.56
409			PMRDM10	PMRDM11	2	1	J		30.00		1192.00	2.339	2.663	3.78	150.29	2.25	3.914	0.000	3.914	71	200	200	DWC	-93	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.06	0.00	-0.84	-0.84	-0.90	3.18	3.56
410			PMRDM11	PMRDM12L	1	0	C	L	10.00		1202.00	2.663	2.747	1.26	151.55	2.25	3.947	0.000	3.947	71	200	200	DWC	-119	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.02	0.00	-0.90		-0.92	3.56	3.67
411			PMRDM12	PMRDM13	0	1	H		20.00	1202	1222.00	2.747	3.143	2.52	154.07	2.25	4.012	0.000	4.012	72	200	200	DWC	-51	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.04	0.00	1.65		1.61	1.10	1.53

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
412			PMRDM18	PMRDM17	0	1	H		20.00		20.00	4.451	4.434	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	1176	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.35		3.24	1.10	1.19
413			PMRDM17	PMRDM16	1	1	C		15.00		35.00	4.434	4.418	1.89	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	937	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.24		3.16	1.19	1.26
414			PMRDM16	PMRDM15	1	1	C		30.00		65.00	4.418	3.783	3.78	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	47	60	0.010	1.75	55.15	0.00	0.30	0.07	OK	0.53	OK	0.50	0.00	3.16		2.66	1.26	1.12
415			PMRDM15	PMRDM14	1	1	C		30.00		95.00	3.783	3.191	3.78	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	51	52	0.010	1.88	59.25	0.01	0.30	0.07	OK	0.56	OK	0.58	0.00	2.66		2.08	1.12	1.11
416			PMRDM14	PMRDM13	1	1	C		30.00		125.00	3.191	3.143	3.78	15.76	2.25	0.410	0.000	0.410	23	200	200	DWC	625	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.08		1.99	1.11	1.15
417			PMRDM13	MBCRDM41	2	1	J		30.00		1377.00	3.143	3.299	3.78	173.62	2.25	4.521	0.000	4.521	76	200	200	DWC	-192	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	1.61	1.61	1.55	1.53	1.75
418			MBCRDM41.3	MBCRDM41.2	0	1	H		27.00		27.00	3.622	3.683	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-443	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	2.52		2.37	1.10	1.31
419			MBCRDM41.2	MBCRDM41.1	1	1	C		30.00		57.00	3.683	3.527	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	192	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.37		2.20	1.31	1.33
420			MBCRDM41.1	MBCRDM41	1	1	C		30.00		87.00	3.527	3.299	3.78	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	132	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.20		2.03	1.33	1.27
421			MBCRDM41	MBCRDM40	2	1	J		28.00		1492.00	3.299	3.479	3.53	188.12	2.25	4.899	0.000	4.899	79	200	200	DWC	-156	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.05	0.00	1.55	1.55	1.50	1.75	1.98
422			MBCRDM40	MBCRDM39	1	1	C		20.00		1512.00	3.479	3.741	2.52	190.64	2.25	4.965	0.000	4.965	80	200	200	DWC	-76	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.04	0.00	1.50		1.46	1.98	2.28
423			MBCRDM39.2	MBCRDM39.1	0	1	H		30.00		30.00	4.010	3.875	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	222	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.91		2.74	1.10	1.14
424			MBCRDM39.1	MBCRDM39	1	1	C		30.00		60.00	3.875	3.741	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	224	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.74		2.57	1.14	1.17
425			MBCRDM39	MBCTHRRDM38	2	1	J		14.00		1586.00	3.741	3.875	1.77	199.97	2.25	5.208	0.000	5.208	82	200	200	DWC	-104	180	0.010	1.01	31.84	0.16	0.74	0.28	OK	0.75	OK	0.08	0.00	1.46	1.46	1.38	2.28	2.50
426			MBCTHRRDM38	MBCRDM37	2	1	J		20.00		9413.00	3.875	3.872	2.52	1186.83	2.25	30.907	0.000	30.907	199	300	300	DWC	6667	870	0.010	0.60	42.70	0.72	1.09	0.63	OK	0.66	OK	0.02	0.00	-0.14	-0.140	-0.16	4.02	4.03
427			MBCRDM37.3	MBCRDM37.2	0	1	H		20.00		20.00	3.973	4.020	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-426	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.87		2.76	1.10	1.26
428			MBCRDM37.2	MBCRDM37.1	1	1	C		30.00		50.00	4.020	4.059	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-769	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.76		2.59	1.26	1.47
429			MBCRDM37.1	MBCRDM37	1	1	C		30.00		80.00	4.059	3.872	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	160	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.59		2.42	1.47	1.45
430			MBCRDM37	MBCRDM36	2	1	J		26.00		9519.00	3.872	4.009	3.28	1200.19	2.25	31.255	0.000	31.255	200	300	300	DWC	-190	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.03	0.00	-0.16	-0.160	-0.19	4.03	4.20
431			MBCRDM36	MBCRDM35	1	1	C		10.00		9529.00	4.009	4.331	1.26	1201.45	2.25	31.288	0.000	31.288	200	300	300	DWC	-31	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.01	0.00	-0.19		-0.20	4.20	4.53
432			MBCRDM35	MBCRDM34	1	1	C		14.00		9543.00	4.331	4.414	1.77	1203.22	2.25	31.334	0.000	31.334	200	300	300	DWC	-169	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.02	0.00	-0.20		-0.22	4.53	4.63
433			MBCRDM34	MBCPORDM33	1	1	C		30.00		9573.00	4.414	4.547	3.78	1207.00	2.25	31.432	0.000	31.432	201	300	300	DWC	-226	870	0.010	0.60	42.70	0.74	1.09	0.64	OK	0.66	OK	0.03	0.00	-0.22		-0.25	4.63	4.80
434			PORDM2	PORDM1	0	1	H		30.00		30.00	4.560	4.539	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1429	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.46		3.29	1.10	1.25
435			PORDM1	MBCPORDM33	1	1	C		30.00		60.00	4.539	4.547	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-3750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.29		3.12	1.25	1.43
436			MBCPORDM33	MBCRDM32	2	1	J		18.00		9651.00	4.547	4.603	2.27	1216.84	2.25	31.688	0.000	31.688	201	300	300	DWC	-321	870	0.010	0.60	42.70	0.74	1.09	0.64	OK	0.66	OK	0.02	0.00	-0.25	-0.250	-0.27	4.80	4.87
437			MBCRDM32	MBCRDM31	1	1	C		15.00		9666.00	4.603	4.590	1.89	1218.73	2.25	31.738	0.000	31.738	202	300	300	DWC	1154	870	0.010	0.60	42.70	0.74	1.09	0.64	OK	0.66	OK	0.02	0.00	-0.27		-0.29	4.87	4.88
438			MBCRDM31	MBCRDM30	1	1	C		5.00		9671.00	4.590	4.660	0.63	1219.36	2.25	31.754	0.000	31.754	202	300	300	DWC	-71	870	0.010	0.60	42.70	0.74	1.09	0.64	OK	0.66	OK	0.01	0.00	-0.29		-0.30	4.88	4.96
439			MBCRDM30	MBCRDM29	1	1	C		20.00		9691.00	4.660	4.526	2.52	1221.88	2.25	31.820	0.000	31.820	202	300	300	DWC	149	870	0.010	0.60	42.70	0.75	1.10	0.65	OK	0.66	OK	0.02	0.00	-0.30		-0.32	4.96	4.85
440			MBCRDM29	MBCTARDM28	1	1	C		25.00		9716.00	4.526	4.284	3.15	1225.03	2.25	31.902	0.000	31.902	202	300	300	DWC	103	870	0.010	0.60	42.70	0.75	1.10	0.65	OK	0.66	OK	0.03	0.00	-0.32		-0.35	4.85	4.63
441			TARDM6	TARDM5	0	1	H		14.00		14.00	3.642	3.556	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	163	163	0.010	1.06	33.46	0.00	0.30	0.07	OK	0.32	OK	0.09	0.00	2.54		2.45	1.10	1.11
442			TARDM5	TARDM4	1	1	C		3.00		17.00	3.556	3.556	0.38	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.02	0.00	2.45		2.43	1.11	1.13
443			TARDM4.1	TARDM4	0	1	H		18.00		18.00	2.973	3.556	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-31	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	1.87		1.77	1.10	1.79
444			TARDM4	TARDM3	2	1	J		14.00		49.00	3.556	3.611	1.77	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	-255	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	1.77	1.770	1.69	1.79	1.92
445			TARDM3	TARDM2	1	1	C		18.00		67.00	3.611	3.854	2.27	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-74	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	1.69		1.59	1.92	2.26
446			TARDM2	TARDM1	1	1	C		30.00		97.00	3.854	4.120	3.78	12.23	2.25	0.318	0.000	0.318	21	200	200	DWC	-113	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.59		1.42	2.26	2.70
447			TARDM1	MBCTARDM28	1	1	C		30.00		127.00	4.120	4.284	3.78	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	-183	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.42		1.33	2.70	2.95
448			MBCTARDM28	MBCKYRDM27	2	1	J		23.00		9866.00	4.284	4.171	2.90	1243.94	2.25	32.394	0.000	32.394	204	300	300	DWC	204	870	0.010	0.60	42.70	0.76	1.10	0.65	OK	0.66	OK	0.03	0.00	-0.35	-0.350	-0.38	4.63	4.55
449			KYRDM6	KYRDM5	0	1	H		21.00		21.00	4.990	4.921	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	304	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	3.89		3.77	1.10	1.15
450			KYRDM5	KYRDM4	1	1	C		24.00		45.00	4.921	4.710	3.03	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	114	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.16	0.00	3.77		3.61	1.15	1.10
451			KYRDM4.1	KYRDM4	0	1	H		15.00		15.00	4.600	4.710	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-136	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.50		3.42	1.10	1.29
452			KYRDM4	KYRDM3	2	1	J		5.00		65.00	4.710	4.589	0.63	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	41	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	3.42	3.420	3.39	1.29	1.20
453			KYRDM3	KYRDM2	1	1	C		10.00		75.00	4.589	4.580	1.26	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	1111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.39		3.33	1.20	1.25
454			KYRDM2	KYRDM1	1	1	C		30.00		105.00	4.580	4.471	3.78	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	275	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.33		3.16	1.25	1.31
455			KYRDM1	MBCKYRDM27	1	1	C		30.00		135.00	4.471	4.171	3.78	17.02	2.25	0.443	0.000	0.443	24	200	200	DWC	100	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.16		3.07	1.31	1.10
456			MBCKYRDM27	MBCRDM26	2	1	J		22.00		10023.00	4.171	3.890	2.77	1263.74	2.25	32.910	0.000	32.910	205	300	300	DWC	78	870	0.010	0.60	42.70	0.77	1.10	0.66	OK	0.66	OK	0.03	0.00	-0.38	-0.380	-0.41	4.55	4.30
457			MBCRDM26	MBCRDM25	1	1	C		15.00		10038.00	3.890	3.825	1.89	1265.63	2.25	32.959	0.000	32.959	205	300	315	DWC	231	870	0.010	0.60	42.70	0.77	1.10	0.66	OK	0.66	OK	0.02	0.00	-0.41		-0.43	4.30	4.26
458			MBCRDM25	MBCRDM24	1	1	C		25.00		10063.00	3.825	3.794	3.15	1268.78	2.25	33.041	0.000	33.041	206	300	315	DWC	806	870	0.010	0.60	42.70	0.77	1.10	0.66	OK	0.66	OK	0.03	0.00	-0.43		-0.46	4.26	4.25
459			MBCRDM24	MBCRDM23	1	1	C		20.00		10083.00	3.794	3.763	2.52	1271.31	2.25	33.107	0.000	33.107	206	300	315	DWC	645	870	0.010	0.60	42.70	0.78	1.10	0.67	OK	0.66	OK	0.02	0.00	-0.46		-0.48	4.25	4.24
460			MBCRDM23.6	MBCRDM23.5	0	1	H		17.00		17.00	4.880	4.762	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	144	145	0.010	1.13	35.48	0.00	0.30	0.07	OK	0.34	OK	0.12	0.00	3.78		3.66	1.10	1.10
461			MBCRDM23.5	MBCRDM23.4	1	1	C		20.00		37.00	4.762	4.718	2.52	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	455	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.66		3.55	1.10	1.17
462			MBCRDM23.4	MBCRDM23.3	1	1	C		5.00		42.00	4.718	4.616	0.63	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	49	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.03	0.00	3.55		3.52	1.17	1.10
463			MBCRDM23.3.2	MBCRDM23.3.1	0	1	H		21.00		21.00	4.830	4.677	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	137	135	0.010	1.17	36.77	0.00	0.30	0.07	OK	0.35	OK	0.16	0.00	3.73		3.57	1.10	1.11
464			MBCRDM23.3.1	MBCRDM23.3	1	1	C		15.00		36.00	4.677	4.616	1.89	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	246	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.57		3.49	1.11	1.13
465			MBCRDM23.3	MBCRDM23.2	2	1	J		10.00		88.00	4.616	4.554	1.26	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	161	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.49	3.490	3.43	1.13	1.12
466			MBCRDM23.2	MBCRDM23.1	1	1	C		20.00		108.00	4.554	4.371	2.52	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	109	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.17	0.00	3.43		3.26	1.12	1.11
467			MBCRDM23.1	MBCRDM23	1	1	C		20.00		128.00	4.371	3.763	2.52	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	33	33	0.010	2.36	74.37	0.01	0.30	0.07	OK	0.71	OK	0.61	0.00	3.26		2.65	1.11	1.11
468			MBCRDM23	MBCASRDM22	2	1	J		20.00		10231.00	3.763	3.794	2.52	1289.97	2.25	33.593	0.000	33.593	207	300	300	DWC	-645	870	0.010	0.60	42.70	0.79	1.10	0.67	OK	0.66	OK	0.02	0.00	-0.48	-0.480	-0.50	4.24	4.29
469			1ASRDM7	1ASRDM6	0	1	H		5.00		5.00	2.640	2.582	0.63	0.63	2.25	0.016	0.000	0.016	5	200	200	DWC	86	90	0.010	1.43	45.03	0.00	0.30	0.07	OK	0.43	OK	0.06	0.00	1.54		1.48	1.10	1.10
470			1ASRDM6	1ASRDM5	1	1	C		25.00		30.00	2.582	2.698	3.15	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-216	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.48		1.34	1.10	1.36
471			1ASRDM5	1ASRDM4	1	1	C		10.00		40.00	2.698	2.815	1.26	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	-85	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.34		1.28	1.36	1.54
472			1ASRDM4	1ASRDM3	1	1	C		25.00		65.00	2.815	3.070	3.15	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-98	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.28		1.14	1.54	1.93
473			1ASRDM3	1ASRDM2	1	1	C		20.00		85.00	3.070	3.377	2.52	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	-65	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.14		1.03	1.93	2.35
474			1ASRDM2	1ASRDM1	1	1	C		20.00		105.00	3.377	3.511	2.52	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.03		0.92	2.35	2.59
475			1ASRDM1	MBCASRDM22	1	1	C		19.00		124.00	3.511	3.794	2.40	15.63	2.25	0.407	0.000	0.407	23	200	200	DWC	-67	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.92		0.86	2.59	2.93
476			MBCASRDM22	MBCRDM21	2	1	J		16.00		10371.00	3.794	3.825	2.02	1307.62	2.25	34.053	0.000	34.053	209	342	400	HDPE	-516	1000	0.010	0.61	56.49	0.60	1.04	0.56	OK	0.64	OK	0.02	0.00	-0.50	-0.500	-0.52	4.29	4.35
477			MBCRDM21.3	MBCRDM21.2	0	1	H		26.00		26.00	3.330	3.648	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	-82	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.23		2.09	1.10	1.56
478			MBCRDM21.2	MBCRDM21.1	1	1	C		30.00		56.00	3.648	4.223	3.78	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	-52	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.09		1.92	1.56	2.30
479			MBCRDM21.1	MBCRDM21	1	1	C		30.00		86.00	4.223	3.825	3.78	10.84	2.25	0.282	0.000	0.282	19	200	200	DWC	75	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.92		1.75	2.30	2.08
480			MBCRDM21	MBCRDM20	2	1	J		15.00		10472.00	3.825	3.821	1.89	1320.35	2.25	34.384	0.000	34.384	210	342	400	HDPE	3750	1000	0.010	0.61	56.49	0.61	1.05	0.57	OK	0.64	OK	0.02	0.00	1.75	1.750	1.73	2.08	2.09

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
481			MBCRDM20	MBCRDM19	1	1	C		30.00		10502.00	3.821	3.913	3.78	1324.13	2.25	34.483	0.000	34.483	210	342	400	HDPE	-326	1000	0.010	0.61	56.49	0.61	1.05	0.57	OK	0.64	OK	0.03	0.00	1.73		1.70	2.09	2.21
482			MBCRDM19	MBCRDM18	1	1	C		30.00		10532.00	3.913	3.978	3.78	1327.92	2.25	34.581	0.000	34.581	210	342	400	HDPE	-462	1000	0.010	0.61	56.49	0.61	1.05	0.57	OK	0.64	OK	0.03	0.00	1.70		1.67	2.21	2.31
483			MBCRDM18	MBCRDM17	1	1	C		30.00		10562.00	3.978	4.160	3.78	1331.70	2.25	34.680	0.000	34.680	211	342	400	HDPE	-165	1000	0.010	0.61	56.49	0.61	1.05	0.57	OK	0.64	OK	0.03	0.00	1.67		1.64	2.31	2.52
484			MBCRDM17	MBCDMPRDM16	1	1	C		10.00		10572.00	4.160	4.230	1.26	1332.96	2.25	34.713	0.000	34.713	211	342	400	HDPE	-143	1000	0.010	0.61	56.49	0.61	1.05	0.57	OK	0.64	OK	0.01	0.00	1.64		1.63	2.52	2.60
485			DMPRDM5	DMPRDM4	0	1	H		15.00		15.00	2.874	3.005	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-115	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.77		1.69	1.10	1.32
486			DMPRDM4.2	DMPRDM4.1	0	1	H		21.00		21.00	3.180	3.748	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	-37	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.08		1.96	1.10	1.79
487			DMPRDM4.1	DMPRDM4	1	1	C		12.00		33.00	3.748	3.005	1.51	4.16	2.25	0.108	0.000	0.108	12	200	200	DWC	16	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.96		1.89	1.79	1.12
488			DMPRDM4	DMPRDM3	2	1	J		25.00		73.00	3.005	3.394	3.15	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	-64	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.69	1.690	1.55	1.32	1.84
489			DMPRDM3	DMPRDM2	1	1	C		20.00		93.00	3.394	3.748	2.52	11.73	2.25	0.305	0.000	0.305	20	200	200	DWC	-56	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.55		1.44	1.84	2.31
490			DMPRDM2	DMPRDM1	1	1	C		30.00		123.00	3.748	4.470	3.78	15.51	2.25	0.404	0.000	0.404	23	200	200	DWC	-42	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.44		1.35	2.31	3.12
491			DMPRDM1	DMPRDM1A	1	1	C		20.00		143.00	4.470	4.359	2.52	18.03	2.25	0.470	0.000	0.470	25	200	200	DWC	180	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.35		1.29	3.12	3.07
492			DMPRDM1A	MBCDMPRDM16	1	1	C		5.00		148.00	4.359	4.230	0.63	18.66	2.25	0.486	0.000	0.486	25	200	200	DWC	39	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	1.29		1.27	3.07	2.96
493			MBCDMPRDM16	MBCRDM15	2	1	J		18.00		10738.00	4.230	4.335	2.27	1353.89	2.25	35.258	0.000	35.258	212	342	400	HDPE	-171	1000	0.010	0.61	56.49	0.62	1.05	0.57	OK	0.64	OK	0.02	0.00	1.27	1.270	1.25	2.96	3.09
494			MBCRDM15	MBCRDM14	1	1	C		20.00		10758.00	4.335	4.440	2.52	1356.41	2.25	35.323	0.000	35.323	213	342	400	HDPE	-190	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.02	0.00	1.25		1.23	3.09	3.21
495			MBCRDM14	MBCRDM13	1	1	C		10.00		10768.00	4.440	4.448	1.26	1357.67	2.25	35.356	0.000	35.356	213	342	400	HDPE	-1250	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.01	0.00	1.23		1.22	3.21	3.23
496			MBCRDM13	MBCRDM12	1	1	C		15.00		10783.00	4.448	4.452	1.89	1359.56	2.25	35.405	0.000	35.405	213	342	400	HDPE	-3750	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.02	0.00	1.22		1.20	3.23	3.25
497			MBCRDM12	MBCBHVRDM11	1	1	C		20.00		10803.00	4.452	4.570	2.52	1362.09	2.25	35.471	0.000	35.471	213	342	400	HDPE	-169	1000	0.010	0.61	56.49	0.63	1.05	0.58	OK	0.64	OK	0.02	0.00	1.20		1.18	3.25	3.39
498			BHVRDM2	BHVRDM1	0	1	H		50.00		50.00	4.310	4.644	6.30	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-150	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.28	0.00	3.21		2.93	1.10	1.71
499			BHVRDM1	MBCBHVRDM11	1	1	C		40.00		90.00	4.644	4.570	5.04	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	541	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.22	0.00	2.93		2.71	1.71	1.86
500			MBCBHVRDM11	MBCRDM10	2	1	J		40.00		10933.00	4.570	4.552	5.04	1378.48	2.25	35.898	0.000	35.898	214	342	400	HDPE	2222	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.04	0.00	1.18	1.180	1.14	3.39	3.41
501			MBCRDM10	MBCRDM9	1	1	C		20.00		10953.00	4.552	4.380	2.52	1381.00	2.25	35.963	0.000	35.963	215	342	400	HDPE	116	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.02	0.00	1.14		1.12	3.41	3.26
502			MBCRDM9	MBCRDM8	1	1	C		5.00		10958.00	4.380	4.389	0.63	1381.63	2.25	35.980	0.000	35.980	215	342	400	HDPE	-556	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.01	0.00	1.12		1.11	3.26	3.28
503			MBCRDM8	MBCRDM7	1	1	C		20.00		10978.00	4.389	4.346	2.52	1384.15	2.25	36.046	0.000	36.046	215	342	400	HDPE	465	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.02	0.00	1.11		1.09	3.28	3.26
504			MBCRDM7.1	MBCRDM7	0	1	H		40.00		40.00	4.360	4.346	5.04	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	2857	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	3.26		3.04	1.10	1.31
505			MBCRDM7	MBCRDM6	2	1	J		5.00		11023.00	4.346	4.320	0.63	1389.82	2.25	36.193	0.000	36.193	215	342	400	HDPE	192	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.01	0.00	1.09	1.090	1.08	3.26	3.24
506			MBCRDM6	MBCKGRDM5	1	1	C		25.00		11048.00	4.320	4.235	3.15	1392.98	2.25	36.275	0.000	36.275	215	342	400	HDPE	294	1000	0.010	0.61	56.49	0.64	1.06	0.59	OK	0.65	OK	0.03	0.00	1.08		1.05	3.24	3.19
507			KGRDM3.5	KGRDM3.4	0	1	H		27.00		27.00	4.920	4.951	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-871	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	3.82		3.67	1.10	1.28
508			KGRDM3.4	KGRDM3.3	1	1	C		5.00		32.00	4.951	4.936	0.63	4.03	2.25	0.105	0.000	0.105	12	200	200	DWC	333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.67		3.64	1.28	1.30
509			KGRDM3.3	KGRDM3.2	1	1	C		20.00		52.00	4.936	4.959	2.52	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	-870	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.64		3.53	1.30	1.43
510			KGRDM3.2	KGRDM3.1	1	1	C		30.00		82.00	4.959	4.980	3.78	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	-1429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.53		3.36	1.43	1.62
511			KGRDM3.1	KGRDM3	1	1	C		5.00		87.00	4.980	4.851	0.63	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	39	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	3.36		3.33	1.62	1.52
512			KGRDM3	KGRDM4	1	1	C		30.00		117.00	4.851	4.635	3.78	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	139	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.33		3.16	1.52	1.48
513			KGRDM4	KGRDM5	1	1	C		20.00		137.00	4.635	4.435	2.52	17.27	2.25	0.450	0.000	0.450	24	200	200	DWC	100	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.16		3.10	1.48	1.34
514			KGRDM5	MBCKGRDM5	1	1	C		14.00		151.00	4.435	4.235	1.77	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	70	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	3.10		3.06	1.34	1.18
515			MBCKGRDM5	MBCRDM4	2	1	J		15.00		11214.00	4.235	4.157	1.89	1413.91	2.25	36.820	0.000	36.820	217	342	400	HDPE	192	1000	0.010	0.61	56.49	0.65	1.06	0.59	OK	0.65	OK	0.02	0.00	1.05	1.050	1.03	3.19	3.13
516			MBCRDM4	MBCRDM3	1	1	C		20.00		11234.00	4.157	4.014	2.52	1416.43	2.25	36.886	0.000	36.886	217	342	400	HDPE	140	1000	0.010	0.61	56.49	0.65	1.06	0.59	OK	0.65	OK	0.02	0.00	1.03		1.01	3.13	3.00
517			MBCRDM3	MBCRDM2	1	1	C		25.00		11259.00	4.014	3.821	3.15	1419.58	2.25	36.968	0.000	36.968	218	342	400	HDPE	130	1000	0.010	0.61	56.49	0.65	1.06	0.59	OK	0.65	OK	0.03	0.00	1.01		0.98	3.00	2.84
518			MBCRDM2	MBCRDM1.1	1	1	C		19.00		11278.00	3.821	3.855	2.40	1421.98	2.25	37.031	0.000	37.031	218	342	400	HDPE	-559	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.02	0.00	0.98		0.96	2.84	2.90
519			MBCRDM1.1.2	MBCRDM1.1.1	0	1	H		4.00		4.00	3.860	4.220	0.50	0.50	2.25	0.013	0.000	0.013	5	200	200	DWC	-11	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.02	0.00	2.76		2.74	1.10	1.48
520			MBCRDM1.1.1	MBCRDM1.1	1	1	C		15.00		19.00	4.220	3.855	1.89	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	41	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.74		2.66	1.48	1.20
521			MBCRDM1.1	MBCRDM1	2	1	J		18.00		11315.00	3.855	3.619	2.27	1426.64	2.25	37.152	0.000	37.152	218	342	400	HDPE	76	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.02	0.00	0.96	0.960	0.94	2.90	2.68
522			MBCRDM1	BSRDM17	1	1	C		20.00		11335.00	3.619	3.460	2.52	1429.16	2.25	37.218	0.000	37.218	218	342	400	HDPE	126	1000	0.010	0.61	56.49	0.66	1.07	0.60	OK	0.66	OK	0.02	0.00	0.94		0.92	2.68	2.54
523			EMRDM16	EMRDM15	0	1	H		30.00		30.00	4.487	4.487	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.39		3.22	1.10	1.27
524			EMRDM15	EMRDM14	1	1	C		6.00		36.00	4.487	4.552	0.76	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	-92	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.22		3.19	1.27	1.36
525			EMRDM14	EMRDM13	1	1	C		8.00		44.00	4.552	4.414	1.01	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	58	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	3.19		3.15	1.36	1.26
526			EMRDM13	EMRDM12	1	1	C		10.00		54.00	4.414	4.448	1.26	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	-294	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	3.15		3.09	1.26	1.36
527			EMRDM12	EMRDM11	1	1	C		6.00		60.00	4.448	4.487	0.76	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-154	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	3.09		3.06	1.36	1.43
528			EMRDM11	EMRDM10	1	1	C		20.00		80.00	4.487	4.490	2.52	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-6667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.06		2.95	1.43	1.54
529			EMRDM10	EMRDM9	1	1	C		30.00		110.00	4.490	4.488	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	15000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.95		2.78	1.54	1.71
530			EMRDM9.5	EMRDM9.4	0	1	H		10.00		10.00	4.770	4.701	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	145	145	0.010	1.13	35.48	0.00	0.30	0.07	OK	0.34	OK	0.07	0.00	3.67		3.60	1.10	1.10
531			EMRDM9.4	EMRDM9.3	1	1	C		30.00		40.00	4.701	4.658	3.78	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	698	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.60		3.43	1.10	1.23
532			EMRDM9.3	EMRDM9.2	1	1	C		30.00		70.00	4.658	4.602	3.78	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	536	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.43		3.26	1.23	1.34
533			EMRDM9.2	EMRDM9.1	1	1	C		30.00		100.00	4.602	4.489	3.78	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	265	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.26		3.09	1.34	1.40
534			EMRDM9.1	EMRDM9	1	1	C		8.00		108.00	4.489	4.488	1.01	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	8000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	3.09		3.05	1.40	1.44
535			EMRDM9	EMRDM8	2	1	J		28.00		246.00	4.488	4.564	3.53	31.02	2.25	0.808	0.000	0.808	33	200	200	DWC	-368	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	2.78	2.780	2.73	1.71	1.83
536			EMRDM8	EMRDM7	1	1	C		30.00		276.00	4.564	4.649	3.78	34.80	2.25	0.906	0.000	0.906	34	200	200	DWC	-353	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.73		2.67	1.83	1.98
537			EMRDM7	EMRDM6	1	1	C		30.00		306.00	4.649	4.783	3.78	38.58	2.25	1.005	0.000	1.005	36	200	200	DWC	-224	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.67		2.61	1.98	2.17
538			EMRDM6	EMRDM5	1	1	C		30.00		336.00	4.783	4.844	3.78	42.36	2.25	1.103	0.000	1.103	38	200	200	DWC	-492	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.61		2.55	2.17	2.29
539			EMRDM5	EMCMRDM4	1	1	C		30.00		366.00	4.844	4.700	3.78	46.15	2.25	1.202	0.000	1.202	40	200	200	DWC	208	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.55		2.49	2.29	2.21
540			EMCMRDM4.2	EMCMRDM4.1	0	1	H		41.00		41.00	4.711	4.771	5.17	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	-683	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.23	0.00	3.61		3.38	1.10	1.39
541			EMCMRDM4.1	EMCMRDM4	1	1	C		30.00		71.00	4.771	4.700	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	423	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.38		3.21	1.39	1.49
542			CMRDM14	CMRDM13	0	1	H		20.00		20.00	5.263	5.162	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	198	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	4.16		4.05	1.10	1.11
543			CMRDM13	CMRDM12	1	1	C		28.00		48.00	5.162	5.176	3.53	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-2000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	4.05		3.89	1.11	1.29
544			CMRDM12	CMRDM12A	1	1	C		13.00		61.00	5.176	4.982	1.64	7.69	2.25	0.200	0.000	0.200	16	200	200	DWC	67	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	3.89		3.82	1.29	1.16
545			CMRDM12A	CMRDM11	1	1	C		13.00		74.00	4.982	4.788	1.64	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	67	95	0.010	1.39	43.83	0.01	0.30	0.07	OK	0.42	OK	0.14	0.00	3.82		3.68	1.16	1.11
546			CMRDM11	CMRDM10	1	1	C		25.00		99.00	4.788	4.702	3.15	12.48	2.25	0.325	0.000	0.325	21	200	200	DWC	291	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.68		3.54	1.11	1.16
547			CMRDM10	CMRDM9	1	1	C		20.00		119.00	4.702	4.730	2.52	15.00	2.25	0.391	0.000	0.391	23	200	200	DWC	-714	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	3.54		3.48	1.16	1.25
548			CMRDM9	CMRDM8	1	1	C		8.00		127.00	4.730	4.730	1.01	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	0	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	3.48		3.45	1.25	1.28
549			CMRDM8	CMRDM7	1	1	C		30.00		157.00	4.730	4.938	3.78	19.80	2.25	0.515	0.000	0.515	26	200	200	DWC	-144	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.45		3.36	1.28	1.58

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
550			CMRDM7	CMRDM6	1	1	C		30.00		187.00	4.938	4.738	3.78	23.58	2.25	0.614	0.000	0.614	28	200	200	DWC	150	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	3.36		3.29	1.58	1.45
551			CMRDM6	CMRDM5	1	1	C		30.00		217.00	4.738	4.679	3.78	27.36	2.25	0.713	0.000	0.713	31	200	200	DWC	508	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	3.29		3.23	1.45	1.45
552			CMRDM5	CMRDM4	1	1	C		30.00		247.00	4.679	4.697	3.78	31.14	2.25	0.811	0.000	0.811	33	200	200	DWC	-1667	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	3.23		3.17	1.45	1.53
553			CMRDM4	CMRDM3	1	1	C		20.00		267.00	4.697	4.698	2.52	33.66	2.25	0.877	0.000	0.877	34	200	200	DWC	-20000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	3.17		3.13	1.53	1.57
554			CMRDM3	CMTRRDM2	1	1	C		22.00		289.00	4.698	4.699	2.77	36.44	2.25	0.949	0.000	0.949	35	200	200	DWC	-22000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	3.13		3.09	1.57	1.61
555			TRRDM1	TRRDM2	0	1	H		20.00		20.00	4.673	4.572	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	198	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.57		3.46	1.10	1.11
556			TRRDM2	CMTRRDM2	1	1	C		30.00		50.00	4.572	4.699	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-236	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.46		3.29	1.11	1.41
557			CMTRRDM2	CMRDM1	2	1	J		30.00		369.00	4.699	4.757	3.78	46.52	2.25	1.212	0.000	1.212	40	200	200	DWC	-517	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	3.09	3.090	3.03	1.61	1.73
558			CMRDM1	EMCMRDM4	1	1	C		20.00		389.00	4.757	4.700	2.52	49.05	2.25	1.277	0.000	1.277	41	200	200	DWC	351	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	3.03		2.99	1.73	1.71
559			EMCMRDM4	EMRDM3	3	1	J		30.00		856.00	4.700	4.744	3.78	107.93	2.25	2.811	0.000	2.811	60	200	200	DWC	-682	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	2.49	2.490	2.43	2.21	2.31
560			EMRDM3	EMRDM2	1	1	C		25.00		881.00	4.744	4.786	3.15	111.08	2.25	2.893	0.000	2.893	61	200	200	DWC	-595	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.05	0.00	2.43		2.38	2.31	2.41
561			EMRDM2	EMRDM1	1	1	C		20.00		901.00	4.786	4.789	2.52	113.60	2.25	2.958	0.000	2.958	62	200	200	DWC	-6667	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	2.38		2.34	2.41	2.45
562			EMRDM1	EREMRDM38	1	1	C		15.00		916.00	4.789	4.757	1.89	115.49	2.25	3.008	0.000	3.008	62	200	200	DWC	469	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	2.34		2.31	2.45	2.45
563			ERRDM27	ERRDM28	0	1	H		30.00		30.00	4.391	4.293	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	306	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.29		3.12	1.10	1.17
564			ERRDM28	ERRDM29	1	1	C		30.00		60.00	4.293	4.254	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	769	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.12		2.95	1.17	1.30
565			ERRDM29	ERRDM30	1	1	C		30.00		90.00	4.254	4.387	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-226	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.95		2.78	1.30	1.61
566			ERRDM30	ERRDM31	1	1	C		20.00		110.00	4.387	4.333	2.52	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	370	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.78		2.67	1.61	1.66
567			ERRDM31	ERRDM32	1	1	C		24.00		134.00	4.333	4.420	3.03	16.90	2.25	0.440	0.000	0.440	24	200	200	DWC	-276	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.67		2.59	1.66	1.83
568			ERRDM32.13	ERRDM32.12	0	1	H		15.00		15.00	4.073	4.049	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.97		2.89	1.10	1.16
569			ERRDM32.12	ERRDM32.11	1	1	C		15.00		30.00	4.049	4.025	1.89	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.89		2.81	1.16	1.22
570			ERRDM32.11	ERRDM32.10	1	1	C		4.00		34.00	4.025	4.025	0.50	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.02	0.00	2.81		2.79	1.22	1.24
571			ERRDM32.10	ERRDM32.9	1	1	C		18.00		52.00	4.025	3.899	2.27	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.79		2.69	1.24	1.21
572			ERRDM32.9	ERRDM32.8	1	1	C		30.00		82.00	3.899	3.955	3.78	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	-536	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.69		2.52	1.21	1.44
573			ERRDM32.8	ERRDM32.7	1	1	C		6.00		88.00	3.955	3.954	0.76	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	6000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.52		2.49	1.44	1.46
574			ERRDM32.7	ERRDM32.6	1	1	C		30.00		118.00	3.954	3.871	3.78	14.88	2.25	0.387	0.000	0.387	23	200	200	DWC	361	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.49		2.40	1.46	1.47
575			ERRDM32.6	ERRDM32.5	1	1	C		10.00		128.00	3.871	3.783	1.26	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	114	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	2.40		2.37	1.47	1.41
576			ERRDM32.5	ERRDM32.4	1	1	C		10.00		138.00	3.783	3.696	1.26	17.40	2.25	0.453	0.000	0.453	25	200	200	DWC	115	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	2.37		2.34	1.41	1.36
577			ERRDM32.4	ERRDM32.3	1	1	C		25.00		163.00	3.696	3.952	3.15	20.55	2.25	0.535	0.000	0.535	27	200	200	DWC	-98	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	2.34		2.28	1.36	1.67
578			ERRDM32.3	ERRDM32.2	1	1	C		30.00		193.00	3.952	4.135	3.78	24.33	2.25	0.634	0.000	0.634	29	200	200	DWC	-164	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.28		2.21	1.67	1.93
579			ERRDM32.2	ERRDM32.1	1	1	C		30.00		223.00	4.135	4.172	3.78	28.12	2.25	0.732	0.000	0.732	31	200	200	DWC	-811	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.21		2.15	1.93	2.02
580			ERRDM32.1	ERRDM32	1	1	C		30.00		253.00	4.172	4.420	3.78	31.90	2.25	0.831	0.000	0.831	33	200	200	DWC	-121	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.15		2.09	2.02	2.33
581			ERRDM32	ERRDM33	2	1	J		30.00		417.00	4.420	4.528	3.78	52.58	2.25	1.369	0.000	1.369	42	200	200	DWC	-278	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.09	2.090	2.03	2.33	2.50
582			ERRDM33	ERRDM34	1	1	C		25.00		442.00	4.528	4.427	3.15	55.73	2.25	1.451	0.000	1.451	43	200	200	DWC	248	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	2.03		1.98	2.50	2.45
583			ERRDM34	ERRDM35	1	1	C		21.00		463.00	4.427	4.540	2.65	58.38	2.25	1.520	0.000	1.520	45	200	200	DWC	-186	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	1.98		1.94	2.45	2.60
584			ERRDM35	ERRDM36	1	1	C		30.00		493.00	4.540	4.763	3.78	62.16	2.25	1.619	0.000	1.619	46	200	200	DWC	-135	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.94		1.88	2.60	2.88
585			ERRDM36	ERRDM37	1	1	C		30.00		523.00	4.763	5.000	3.78	65.94	2.25	1.717	0.000	1.717	47	200	200	DWC	-127	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.88		1.82	2.88	3.18
586			ERRDM37	EREMRDM38	1	1	C		30.00		553.00	5.000	4.757	3.78	69.72	2.25	1.816	0.000	1.816	49	200	200	DWC	123	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	1.82		1.76	3.18	3.00
587			EREMRDM38	ERBSRDM39	2	1	J		30.00		1499.00	4.757	4.366	3.78	189.00	2.25	4.922	0.000	4.922	80	200	200	DWC	77	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	1.76	1.760	1.70	3.00	2.67
588			GHRDM10	GHRDM9	0	1	H		14.00		14.00	5.240	5.230	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	1400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	4.14		4.06	1.10	1.17
589			GHRDM9	GHRDM8	1	1	C		30.00		44.00	5.230	4.929	3.78	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	100	125	0.010	1.21	38.21	0.00	0.30	0.07	OK	0.36	OK	0.24	0.00	4.06		3.82	1.17	1.11
590			GHRDM8	GHRDM7	1	1	C		5.00		49.00	4.929	4.732	0.63	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	25	25	0.010	2.71	85.44	0.00	0.30	0.07	OK	0.81	OK	0.20	0.00	3.82		3.62	1.11	1.11
591			GHRDM7	GHRDM6	1	1	C		20.00		69.00	4.732	4.541	2.52	8.70	2.25	0.227	0.000	0.227	17	200	200	DWC	105	110	0.010	1.29	40.73	0.01	0.30	0.07	OK	0.39	OK	0.18	0.00	3.62		3.44	1.11	1.10
592			GHRDM6	GHRDM5	1	1	C		30.00		99.00	4.541	4.568	3.78	12.48	2.25	0.325	0.000	0.325	21	200	200	DWC	-1111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.44		3.27	1.10	1.30
593			GHRDM5.6	GHRDM5.5	0	1	H		25.00		25.00	4.291	4.251	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.19		3.05	1.10	1.20
594			GHRDM5.5	GHRDM5.4	1	1	C		25.00		50.00	4.251	4.331	3.15	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-313	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.05		2.91	1.20	1.42
595			GHRDM5.4	GHRDM5.3	1	1	C		5.00		55.00	4.331	4.368	0.63	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	-135	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.91		2.88	1.42	1.49
596			GHRDM5.3	GHRDM5.2	1	1	C		30.00		85.00	4.368	4.397	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	-1034	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.88		2.71	1.49	1.69
597			GHRDM5.2	GHRDM5.1	1	1	C		30.00		115.00	4.397	4.532	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	-222	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.71		2.62	1.69	1.91
598			GHRDM5.1	GHRDM5	1	1	C		17.00		132.00	4.532	4.568	2.14	16.64	2.25	0.433	0.000	0.433	24	200	200	DWC	-472	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	2.62		2.57	1.91	2.00
599			GHRDM5	GHRDM4	2	1	J		30.00		261.00	4.568	4.639	3.78	32.91	2.25	0.857	0.000	0.857	34	200	200	DWC	-423	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.57	2.570	2.51	2.00	2.13
600			GHRDM4	GHRDM3	1	1	C		25.00		286.00	4.639	4.736	3.15	36.06	2.25	0.939	0.000	0.939	35	200	200	DWC	-258	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	2.51		2.46	2.13	2.28
601			GHRDM3	GHRDM2	1	1	C		30.00		316.00	4.736	4.697	3.78	39.84	2.25	1.038	0.000	1.038	37	200	200	DWC	769	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.46		2.40	2.28	2.30
602			GHRDM2	GHRDM1	1	1	C		28.00		344.00	4.697	4.513	3.53	43.37	2.25	1.130	0.000	1.130	38	200	200	DWC	152	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	2.40		2.35	2.30	2.16
603			GHRDM1	ERRDM45	1	1	C		22.00		366.00	4.513	4.510	2.77	46.15	2.25	1.202	0.000	1.202	40	200	200	DWC	7333	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	2.35		2.31	2.16	2.20
604			ERRDM45	ERRDM44	1	1	C		29.00		395.00	4.510	4.350	3.66	49.80	2.25	1.297	0.000	1.297	41	200	200	DWC	181	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.31		2.25	2.20	2.10
605			ERRDM44	ERRDM43	1	1	C		30.00		425.00	4.350	4.401	3.78	53.59	2.25	1.395	0.000	1.395	43	200	200	DWC	-588	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.25		2.19	2.10	2.21
606			ERRDM43	ERRDM42	1	1	C		30.00		455.00	4.401	4.571	3.78	57.37	2.25	1.494	0.000	1.494	44	200	200	DWC	-176	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	2.19		2.13	2.21	2.44
607			ERRDM42	ERRDM41	1	1	C		30.00		485.00	4.571	4.643	3.78	61.15	2.25	1.592	0.000	1.592	46	200	200	DWC	-417	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	2.13		2.07	2.44	2.57
608			ERRDM41	ERRDM40	1	1	C		30.00		515.00	4.643	4.416	3.78	64.93	2.25	1.691	0.000	1.691	47	200	200	DWC	132	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	2.07		2.01	2.57	2.41
609			ERRDM40.3	ERRDM40.2	0	1	H		15.00		15.00	4.514	4.527	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-1154	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.41		3.33	1.10	1.20
610			ERRDM40.2	ERRDM40.1	1	1	C		20.00		35.00	4.527	4.471	2.52	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	357	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.33		3.22	1.20	1.25
611			ERRDM40.1	ERRDM40	1	1	C		20.00		55.00	4.471	4.416	2.52	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	364	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	3.22		3.11	1.25	1.31
612			ERRDM40	ERBSRDM39	2	1	J		30.00		600.00	4.416	4.366	3.78	75.65	2.25	1.970	0.000	1.970	51	200	200	DWC	600	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	2.01	2.010	1.95	2.41	2.42
613			ERBSRDM39	BSRDM1	2	1	J		16.00		2115.00	4.366	4.575	2.02	266.67	2.25	6.944	0.000	6.944	95	200	200	DWC	-77	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.03	0.00	1.70	1.700	1.67	2.67	2.91
614			BSRDM1	BSRDM2	1	1	C		30.00		2145.00	4.575	4.411	3.78	270.45	2.25	7.043	0.000	7.043	95	200	200	DWC	183	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	1.67		1.61	2.91	2.80
615			BSRDM2	BSRDM3	1	1	C		25.00		2170.00	4.411	4.325	3.15	273.60	2.25	7.125	0.000	7.125	96	200	200	DWC	291	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.05	0.00	1.61		1.56	2.80	2.77
616			BSRDM3	BSRDM4	1	1	C		20.00		2190.00	4.325	4.296	2.52	276.12	2.25	7.191	0.000	7.191	96	200	200	DWC	690	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.04	0.00	1.56		1.52	2.77	2.78
617			BSRDM4.4	BSRDM4.3	0	1	H		12.00		12.00	4.540	4.379	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	75	72	0.010	1.60	50.35	0.00	0.30	0.07	OK	0.48	OK	0.17	0.00	3.44		3.27	1.10	1.11
618			BSRDM4.3	BSRDM4.2	1	1	C		30.00		42.00	4.379	4.313	3.78	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	455	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.27		3.10	1.11	1.21

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
619			BSRDM4.2	BSRDM4.1	1	1	C		30.00		72.00	4.313	4.227	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	349	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.10		2.93	1.21	1.30
620			BSRDM4.1	BSRDM4	1	1	C		5.00		77.00	4.227	4.296	0.63	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	-72	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.93		2.90	1.30	1.40
621			BSRDM4	BSRDM5	2	1	J		27.00		2294.00	4.296	4.039	3.40	289.24	2.25	7.532	0.000	7.532	98	200	200	DWC	105	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.05	0.00	1.52	1.520	1.47	2.78	2.57
622			BSRDM5	BSRDM6	1	1	C		15.00		2309.00	4.039	3.919	1.89	291.13	2.25	7.581	0.000	7.581	99	200	200	DWC	125	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.03	0.00	1.47		1.44	2.57	2.48
623			BSRDM6.6	BSRDM6.5	0	1	H		15.00		15.00	4.440	4.190	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	60	60	0.010	1.75	55.15	0.00	0.30	0.07	OK	0.53	OK	0.25	0.00	3.34		3.09	1.10	1.10
624			BSRDM6.5	BSRDM6.4	1	1	C		5.00		20.00	4.190	4.190	0.63	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.09		3.06	1.10	1.13
625			BSRDM6.4	BSRDM6.3	1	1	C		12.00		32.00	4.190	4.186	1.51	4.03	2.25	0.105	0.000	0.105	12	200	200	DWC	3000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	3.06		2.99	1.13	1.20
626			BSRDM6.3	BSRDM6.2	1	1	C		15.00		47.00	4.186	4.183	1.89	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	5000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.99		2.91	1.20	1.27
627			BSRDM6.2	BSRDM6	1	1	C		30.00		77.00	4.183	3.919	3.78	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	114	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.91		2.74	1.27	1.18
628			BSRDM6	BSRDM7	2	1	J		44.00		2430.00	3.919	4.217	5.55	306.38	2.25	7.979	0.000	7.979	101	200	200	DWC	-148	520	0.010	0.60	18.73	0.43	0.97	0.46	OK	0.58	OK	0.08	0.00	1.44	1.440	1.36	2.48	2.86
629			BSRDM7.5	BSRDM7.4	0	1	H		17.00		17.00	3.930	4.142	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	-80	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.83		2.74	1.10	1.40
630			BSRDM7.4	BSRDM7.3	1	1	C		20.00		37.00	4.142	4.357	2.52	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	-93	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.74		2.63	1.40	1.73
631			BSRDM7.3	BSRDM7.2	1	1	C		30.00		67.00	4.357	4.462	3.78	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.63		2.46	1.73	2.00
632			BSRDM7.2	BSRDM7.1	1	1	C		20.00		87.00	4.462	4.258	2.52	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	98	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.46		2.35	2.00	1.91
633			BSRDM7.1	BSRDM7	1	1	C		5.00		92.00	4.258	4.217	0.63	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	122	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.35		2.32	1.91	1.90
634			BSRDM7.12	BSRDM7.11	0	1	H		19.00		19.00	4.870	4.854	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	1188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.77		3.66	1.10	1.19
635			BSRDM7.11	BSRDM7.10	1	1	C		5.00		24.00	4.854	4.859	0.63	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	3.66		3.63	1.19	1.23
636			BSRDM7.10	BSRDM7.9	1	1	C		28.00		52.00	4.859	4.794	3.53	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	431	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	3.63		3.47	1.23	1.32
637			BSRDM7.9	BSRDM7.8	1	1	C		16.00		68.00	4.794	4.698	2.02	8.57	2.25	0.223	0.000	0.223	17	200	200	DWC	167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.47		3.38	1.32	1.32
638			BSRDM7.8	BSRDM7.7	1	1	C		27.00		95.00	4.698	4.387	3.40	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	87	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	3.38		3.23	1.32	1.16
639			BSRDM7.7	BSRDM7.6	1	1	C		30.00		125.00	4.387	4.101	3.78	15.76	2.25	0.410	0.000	0.410	23	200	200	DWC	105	130	0.010	1.19	37.47	0.01	0.30	0.07	OK	0.36	OK	0.23	0.00	3.23		3.00	1.16	1.10
640			BSRDM7.6	BSRDM7	1	1	C		5.00		130.00	4.101	4.217	0.63	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	-43	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	3.00		2.98	1.10	1.24
641			BSRDM7	BSRDM8	3	1	J		25.00		2677.00	4.217	4.071	3.15	337.53	2.25	8.790	0.000	8.790	106	250	250	DWC	171	520	0.010	0.69	33.97	0.26	0.84	0.35	OK	0.58	OK	0.05	0.00	2.32	2.320	2.27	1.90	1.80
642			BSRDM8	BSRDM9	1	1	C		30.00		2707.00	4.071	3.925	3.78	341.31	2.25	8.888	0.000	8.888	107	250	250	DWC	205	520	0.010	0.69	33.97	0.26	0.84	0.35	OK	0.58	OK	0.06	0.00	2.27		2.21	1.80	1.72
643			BSRDM9.5	BSRDM9.4	0	1	H		7.00		7.00	4.231	4.315	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	-83	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	3.13		3.09	1.10	1.23
644			BSRDM9.4	BSRDM9.3	1	1	C		25.00		32.00	4.315	4.321	3.15	4.03	2.25	0.105	0.000	0.105	12	200	200	DWC	-4167	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.09		2.95	1.23	1.37
645			BSRDM9.3	BSRDM9.2	1	1	C		15.00		47.00	4.321	4.191	1.89	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	115	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.95		2.87	1.37	1.32
646			BSRDM9.2	BSRDM9.1	1	1	C		30.00		77.00	4.191	3.990	3.78	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.87		2.70	1.32	1.29
647			BSRDM9.1	BSRDM9	1	1	C		5.00		82.00	3.990	3.925	0.63	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	77	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	2.70		2.67	1.29	1.26
648			BSRDM9	BSRDM10	2	1	J		13.00		2802.00	3.925	3.796	1.64	353.29	2.25	9.200	0.000	9.200	109	250	250	DWC	101	520	0.010	0.69	33.97	0.27	0.85	0.36	OK	0.59	OK	0.03	0.00	2.21	2.210	2.18	1.72	1.62
649			BSRDM10	BSTHRRDM11	1	1	C		30.00		2832.00	3.796	3.638	3.78	357.07	2.25	9.299	0.000	9.299	109	250	250	DWC	190	520	0.010	0.69	33.97	0.27	0.85	0.36	OK	0.59	OK	0.06	0.00	2.18		2.12	1.62	1.52
650			THRRDM11.7	THRRDM11.6	0	1	H		26.00		26.00	4.730	4.708	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	1182	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	3.63		3.49	1.10	1.22
651			THRRDM11.6	THRRDM11.5	1	1	C		23.00		49.00	4.708	4.651	2.90	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	404	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	3.49		3.36	1.22	1.29
652			THRRDM11.5	THRRDM11.4	1	1	C		3.00		52.00	4.651	4.651	0.38	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	0	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.02	0.00	3.36		3.34	1.29	1.31
653			THRRDM11.4	THRRDM11.3	1	1	C		15.00		67.00	4.651	4.697	1.89	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-326	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	3.34		3.26	1.31	1.44
654			THRRDM11.3	THRRDM11.2	1	1	C		16.00		83.00	4.697	4.631	2.02	10.46	2.25	0.273	0.000	0.273	19	200	200	DWC	242	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.26		3.17	1.44	1.46
655			THRRDM11.2	THRRDM11.1	1	1	C		12.00		95.00	4.631	4.686	1.51	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	-218	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	3.17		3.10	1.46	1.59
656			THRRDM11.1	THRRDM11	1	1	C		17.00		112.00	4.686	4.813	2.14	14.12	2.25	0.368	0.000	0.368	22	200	200	DWC	-134	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	3.10		3.01	1.59	1.80
657			THRRDM12	THRRDM11A	0	1	H		9.00		9.00	4.990	4.958	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	281	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.05	0.00	3.89		3.84	1.10	1.12
658			THRRDM11A	THRRDM11	1	1	C		15.00		24.00	4.958	4.813	1.89	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	103	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.13	0.00	3.84		3.71	1.12	1.10
659			THRRDM11	THRRDM10	2	1	J		15.00		151.00	4.813	4.617	1.89	19.04	2.25	0.496	0.000	0.496	26	200	200	DWC	77	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	3.01	3.010	2.96	1.80	1.66
660			THRRDM10	THRRDM9	1	1	C		20.00		171.00	4.617	4.541	2.52	21.56	2.25	0.561	0.000	0.561	27	200	200	DWC	263	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	2.96		2.91	1.66	1.63
661			THRRDM9	THRRDM8	1	1	C		30.00		201.00	4.541	4.402	3.78	25.34	2.25	0.660	0.000	0.660	29	200	200	DWC	215	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.91		2.84	1.63	1.56
662			THRRDM8	THRRDM7	1	1	C		30.00		231.00	4.402	4.365	3.78	29.13	2.25	0.758	0.000	0.758	32	200	200	DWC	820	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.84		2.78	1.56	1.59
663			THRRDM7	THRKGRDM6	1	1	C		5.00		236.00	4.370	4.365	0.63	29.76	2.25	0.775	0.000	0.775	32	200	200	DWC	1000	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.01	0.00	2.78		2.77	1.59	1.60
664			KGRDM2.3	KGRDM2.2	0	1	H		19.00		19.00	4.740	4.828	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	-216	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.64		3.53	1.10	1.30
665			KGRDM2.2	KGRDM2.1	1	1	C		30.00		49.00	4.828	4.743	3.78	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	353	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.53		3.36	1.30	1.38
666			KGRDM2.1	KGRDM2	1	1	C		5.00		54.00	4.743	4.622	0.63	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	41	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	3.36		3.33	1.38	1.29
667			KGRDM2	KGRDM1	1	1	C		25.00		79.00	4.622	4.468	3.15	9.96	2.25	0.259	0.000	0.259	19	200	200	DWC	162	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	3.33		3.19	1.29	1.28
668			KGRDM1	THRKGRDM6	1	1	C		5.00		84.00	4.468	4.365	0.63	10.59	2.25	0.276	0.000	0.276	19	200	200	DWC	49	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	3.19		3.16	1.28	1.21
669			THRKGRDM6	THRRDM5	2	1	J		15.00		335.00	4.365	4.280	1.89	42.24	2.25	1.100	0.000	1.100	38	200	200	DWC	176	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	2.77	2.770	2.74	1.60	1.54
670			THRRDM5	THRRDM4	1	1	C		20.00		355.00	4.280	4.196	2.52	44.76	2.25	1.166	0.000	1.166	39	200	200	DWC	238	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	2.74		2.70	1.54	1.50
671			THRRDM4	THRRDM3	1	1	C		25.00		380.00	4.196	4.043	3.15	47.91	2.25	1.248	0.000	1.248	40	200	200	DWC	163	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.05	0.00	2.70		2.65	1.50	1.39
672			THRRDM3	THRRDM2	1	1	C		30.00		410.00	4.043	4.036	3.78	51.69	2.25	1.346	0.000	1.346	42	200	200	DWC	4286	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.65		2.59	1.39	1.45
673			THRRDM2.2	THRRDM2.1	0	1	H		24.00		24.00	4.470	4.493	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-1043	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	3.37		3.24	1.10	1.25
674			THRRDM2.1	THRRDM2	1	1	C		25.00		49.00	4.493	4.036	3.15	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	55	80	0.010	1.52	47.76	0.00	0.30	0.07	OK	0.46	OK	0.31	0.00	3.24		2.93	1.25	1.11
675			THRRDM2	THRRDM1	2	1	J		17.00		476.00	4.036	3.751	2.14	60.02	2.25	1.563	0.000	1.563	45	200	200	DWC	60	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	2.59	2.590	2.56	1.45	1.19
676			THRRDM1	BSTHRRDM11	1	1	C		30.00		506.00	3.751	3.638	3.78	63.80	2.25	1.661	0.000	1.661	47	200	200	DWC	265	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	2.56		2.50	1.19	1.14
677			BSTHRRDM11	BSRDM12	2	1	J		20.00		3358.00	3.638	3.656	2.52	423.39	2.25	11.026	0.000	11.026	119	200	200	DWC	-1111	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.04	0.00	2.12	2.120	2.08	1.52	1.58
678			BSRDM12	BSRDM13	1	1	C		20.00		3378.00	3.656	3.571	2.52	425.91	2.25	11.091	0.000	11.091	119	200	200	DWC	235	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.04	0.00	2.08		2.04	1.58	1.53
679			BSRDM13	BSRDM14	1	1	C		25.00		3403.00	3.571	3.486	3.15	429.06	2.25	11.174	0.000	11.174	120	200	200	DWC	294	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.05	0.00	2.04		1.99	1.53	1.50
680			MNPRDM2	MNPRDM3	0	1	H		10.00		10.00	4.470	4.402	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	147	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.07	0.00	3.37		3.30	1.10	1.10
681			MNPRDM3	MNPRDM4	1	1	C		30.00		40.00	4.402	4.318	3.78	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	357	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	3.30		3.13	1.10	1.19
682			MNPRDM4	MNPRDM5	1	1	C		30.00		70.00	4.318	4.036	3.78	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	106	150	0.010	1.11	34.88	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	3.13		2.93	1.19	1.11
683			MNPRDM5	MNPRDM6A	1	1	C		15.00		85.00	4.036	3.992	1.89	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	341	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.93		2.85	1.11	1.14
684			MNPRDM6A	MNPRDM6	1	1	C		30.00		115.00	3.992	3.985	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	4286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.85		2.68	1.14	1.31
685			MNPRDM6	MNPRDM7	1	1	C		25.00		140.00	3.985	4.099	3.15	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	-219	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.68		2.60	1.31	1.50
686			KMRDM1	KMRDM2	0	1	H		30.00		30.00	4.584	4.378	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	146	146	0.010	1.12	35.36	0.00	0.30	0.07	OK	0.34	OK	0.21	0.00	3.48		3.27	1.10	1.11
687			KMRDM2	KMRDM3	1	1	C		30.00		60.00	4.378	4.365	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.27		3.10	1.11	1.27

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
688			KMRDM3	KMRDM4	1	1	C		30.00		90.00	4.365	4.353	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	2500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.10		2.93	1.27	1.42
689			KMRDM4	KMRDM5	1	1	C		25.00		115.00	4.353	4.306	3.15	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	532	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.93		2.85	1.42	1.46
690			KMRDM5	KMRDM6	1	1	C		30.00		145.00	4.306	4.373	3.78	18.28	2.25	0.476	0.000	0.476	25	200	200	DWC	-448	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.85		2.76	1.46	1.61
691			KMRDM6	KMRDM7	1	1	C		30.00		175.00	4.373	4.441	3.78	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	-441	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.76		2.69	1.61	1.75
692			KMRDM7	KMRDM8	1	1	C		30.00		205.00	4.441	4.745	3.78	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	-99	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	2.69		2.62	1.75	2.13
693			KMRDM8	KMRDM9	1	1	C		30.00		235.00	4.745	4.385	3.78	29.63	2.25	0.772	0.000	0.772	32	200	200	DWC	83	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.62		2.56	2.13	1.83
694			KMRDM9	KMRDM10	1	1	C		30.00		265.00	4.385	4.122	3.78	33.41	2.25	0.870	0.000	0.870	34	200	200	DWC	114	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.56		2.50	1.83	1.62
695			KMRDM10	MNPRDM7	1	1	C		22.00		287.00	4.122	4.099	2.77	36.19	2.25	0.942	0.000	0.942	35	200	200	DWC	957	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	2.50		2.46	1.62	1.64
696			MNPRDM7	MNPCHERDM8	2	1	J		16.00		443.00	4.099	3.986	2.02	55.86	2.25	1.455	0.000	1.455	44	200	200	DWC	142	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	2.46	2.460	2.43	1.64	1.56
697			CHERDM4	CHERDM3	0	1	H		18.00		18.00	3.300	3.297	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	6000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.20		2.10	1.10	1.20
698			CHERDM3	CHERDM2	1	1	C		30.00		48.00	3.297	3.296	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	30000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.10		1.93	1.20	1.37
699			CHERDM2	CHERDM1	1	1	C		30.00		78.00	3.296	3.843	3.78	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	-55	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.93		1.76	1.37	2.08
700			CHERDM1	MNPCHERDM8	1	1	C		10.00		88.00	3.843	3.986	1.26	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	-70	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	1.76		1.70	2.08	2.29
701			MNPCHERDM8	MNPRDM9	2	1	J		30.00		561.00	3.986	4.072	3.78	70.73	2.25	1.842	0.000	1.842	49	200	200	DWC	-349	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	1.70	1.700	1.64	2.29	2.43
702			MNPRDM9	MNPRDM10	1	1	C		30.00		591.00	4.072	4.285	3.78	74.52	2.25	1.941	0.000	1.941	50	200	200	DWC	-141	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	1.64		1.58	2.43	2.71
703			MNPRDM10	MNPRDM11	1	1	C		30.00		621.00	4.285	4.138	3.78	78.30	2.25	2.039	0.000	2.039	51	200	200	DWC	204	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	1.58		1.52	2.71	2.62
704			MNPRDM11	MNPRDM12	1	1	C		30.00		651.00	4.138	4.012	3.78	82.08	2.25	2.138	0.000	2.138	53	200	200	DWC	238	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	1.52		1.46	2.62	2.55
705			MNPRDM12	MNPRDM13	1	1	C		30.00		681.00	4.012	3.948	3.78	85.86	2.25	2.236	0.000	2.236	54	200	200	DWC	469	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	1.46		1.40	2.55	2.55
706			MNPRDM13	MNPRDM14	1	1	C		30.00		711.00	3.948	3.885	3.78	89.65	2.25	2.335	0.000	2.335	55	200	200	DWC	476	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	1.40		1.34	2.55	2.55
707			MNPRDM14	MNPSTRDM15	1	1	C		11.00		722.00	3.885	3.885	1.39	91.03	2.25	2.371	0.000	2.371	55	200	200	DWC	0	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.02	0.00	1.34		1.32	2.55	2.57
708			PHRDM18	PHRDM17	0	1	H		30.00		30.00	2.350	2.210	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	214	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.25		1.08	1.10	1.13
709			PHRDM17	PHRDM16	1	1	C		10.00		40.00	2.210	1.844	1.26	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	27	29	0.010	2.52	79.33	0.00	0.30	0.07	OK	0.76	OK	0.34	0.00	1.08		0.74	1.13	1.10
710			PHRDM16	PHRDM15	1	1	C		10.00		50.00	1.844	2.077	1.26	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-43	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.74		0.68	1.10	1.40
711			PHRDM15	PHRDM14	1	1	C		9.00		59.00	2.077	2.064	1.13	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	692	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	0.68		0.63	1.40	1.43
712			PHRDM14	PHRDM13	1	1	C		20.00		79.00	2.064	2.076	2.52	9.96	2.25	0.259	0.000	0.259	19	200	200	DWC	-1667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.63		0.52	1.43	1.56
713			PHRDM13	PHRDM12	1	1	C		20.00		99.00	2.076	2.100	2.52	12.48	2.25	0.325	0.000	0.325	21	200	200	DWC	-833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.52		0.41	1.56	1.69
714			PHRDM12	PHRDM11	1	1	C		20.00		119.00	2.100	2.173	2.52	15.00	2.25	0.391	0.000	0.391	23	200	200	DWC	-274	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.41		0.30	1.69	1.87
715			PHRDM11.2	PHRDM11.1	0	1	H		14.00		14.00	2.034	2.028	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	2333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.93		0.85	1.10	1.18
716			PHRDM11.1	PHRDM11	1	1	C		20.00		34.00	2.028	2.173	2.52	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	-138	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.85		0.74	1.18	1.43
717			PHRDM11	PHRDM10	2	1	J		10.00		163.00	2.173	2.106	1.26	20.55	2.25	0.535	0.000	0.535	27	200	200	DWC	149	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	0.30	0.300	0.28	1.87	1.83
718			PHRDM10	PHRDM9	1	1	C		18.00		181.00	2.106	2.244	2.27	22.82	2.25	0.594	0.000	0.594	28	200	200	DWC	-130	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.28		0.24	1.83	2.00
719			PHRDM9.2	PHRDM9.1	0	1	H		23.00		23.00	2.330	2.316	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	1643	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.23		1.10	1.10	1.22
720			PHRDM9.1	PHRDM9	1	1	C		14.00		37.00	2.316	2.244	1.77	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	194	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.10		1.02	1.22	1.22
721			PHRDM9	PHRDM8	2	1	J		25.00		243.00	2.244	2.382	3.15	30.64	2.25	0.798	0.000	0.798	32	200	200	DWC	-181	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	0.24	0.240	0.19	2.00	2.19
722			PHRDM8	PHRDM7	1	1	C		20.00		263.00	2.382	2.527	2.52	33.16	2.25	0.864	0.000	0.864	34	200	200	DWC	-138	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.19		0.15	2.19	2.38
723			PHRDM7.1	PHRDM7	0	1	H		15.00		15.00	2.560	2.527	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	455	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.46		1.38	1.10	1.15
724			PHRDM7	PHRDM6	2	1	J		20.00		298.00	2.527	2.813	2.52	37.57	2.25	0.978	0.000	0.978	36	200	200	DWC	-70	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.15	0.150	0.11	2.38	2.70
725			PHRDM6.2	PHRDM6.1	0	1	H		17.00		17.00	3.050	3.045	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	3400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.95		1.86	1.10	1.19
726			PHRDM6.1	PHRDM6	1	1	C		38.00		55.00	3.045	2.813	4.79	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	164	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	1.86		1.65	1.19	1.16
727			PHRDM6	PHRDM5	2	1	J		22.00		375.00	2.813	2.886	2.77	47.28	2.25	1.231	0.000	1.231	40	200	200	DWC	-301	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	0.11	0.110	0.07	2.70	2.82
728			PHRDM5.1	PHRDM5	0	1	H		37.00		37.00	3.142	2.886	4.67	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	145	145	0.010	1.13	35.48	0.00	0.30	0.07	OK	0.34	OK	0.26	0.00	2.04		1.78	1.10	1.11
729			PHRDM5	PHRDM4	2	1	J		10.00		422.00	2.886	3.024	1.26	53.21	2.25	1.386	0.000	1.386	43	200	200	DWC	-72	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	0.07	0.070	0.05	2.82	2.97
730			PHRDM4	PHEKRDM3	1	1	C		30.00		452.00	3.024	3.254	3.78	56.99	2.25	1.484	0.000	1.484	44	200	200	DWC	-130	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.05		-0.01	2.97	3.26
731			PHEKRDM3	EKRDM1	1	1	C		15.00		467.00	3.254	3.216	1.89	58.88	2.25	1.533	0.000	1.533	45	200	200	DWC	395	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	-0.01		-0.04	3.26	3.26
732			EKRDM1	EKRDM2	1	1	C		15.00		482.00	3.216	3.255	1.89	60.77	2.25	1.583	0.000	1.583	45	200	200	DWC	-385	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.03	0.00	-0.04		-0.07	3.26	3.33
733			EKRDM2	EKRDM3	1	1	C		13.00		495.00	3.255	3.295	1.64	62.41	2.25	1.625	0.000	1.625	46	200	200	DWC	-325	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	-0.07		-0.10	3.33	3.40
734			EKRDM3.3	EKRDM3.2	0	1	H		35.00		35.00	2.540	2.928	4.41	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	-90	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.44		1.25	1.10	1.68
735			EKRDM3.2	EKRDM3.1	1	1	C		30.00		65.00	2.928	3.320	3.78	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-77	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.25		1.08	1.68	2.24
736			EKRDM3.1	EKRDM3	1	1	C		30.00		95.00	3.320	3.295	3.78	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	1200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.08		0.91	2.24	2.39
737			EKRDM3	EKRDM4	2	1	J		18.00		608.00	3.295	3.310	2.27	76.66	2.25	1.996	0.000	1.996	51	200	200	DWC	-1200	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	-0.10	-0.100	-0.13	3.40	3.44
738			EKRDM4	EKRDM5L	1	0	C	L	20.00		628.00	3.310	3.383	2.52	79.18	2.25	2.062	0.000	2.062	52	200	200	DWC	-274	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	-0.13		-0.17	3.44	3.55
739			EKRDM5	EKRDM6	0	1	H		20.00	628	648.00	3.383	3.460	2.52	81.70	2.25	2.128	0.000	2.128	53	200	200	DWC	-260	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	2.28		2.24	1.10	1.22
740			EKRDM6	EKRDM7	1	1	C		10.00		658.00	3.460	3.693	1.26	82.96	2.25	2.161	0.000	2.161	53	200	200	DWC	-43	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.02	0.00	2.24		2.22	1.22	1.47
741			EKRDM7.3	EKRDM7.2	0	1	H		22.00		22.00	3.780	3.660	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	183	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.68		2.56	1.10	1.10
742			EKRDM7.2	EKRDM7.1	1	1	C		20.00		42.00	3.660	3.720	2.52	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	-333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.56		2.45	1.10	1.27
743			EKRDM7.1	EKRDM7	1	1	C		30.00		72.00	3.720	3.693	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	1111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.45		2.28	1.27	1.41
744			EKRDM7	EKRDM8	2	1	J		25.00		755.00	3.693	3.620	3.15	95.19	2.25	2.479	0.000	2.479	57	200	200	DWC	342	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	2.22	2.220	2.17	1.47	1.45
745			EKRDM8	EKRDM9	1	1	C		25.00		780.00	3.620	3.663	3.15	98.35	2.25	2.561	0.000	2.561	58	200	200	DWC	-581	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.05	0.00	2.17		2.12	1.45	1.54
746			EKRDM9	EKRDM10	1	1	C		5.00		785.00	3.663	3.674	0.63	98.98	2.25	2.577	0.000	2.577	58	200	200	DWC	-455	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.01	0.00	2.12		2.11	1.54	1.56
747			EKRDM10.3	EKRDM10.2	0	1	H		23.00		23.00	3.833	3.763	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	329	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.73		2.60	1.10	1.16
748			EKRDM10.2	EKRDM10.1	1	1	C		15.00		38.00	3.763	3.775	1.89	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	-1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.60		2.52	1.16	1.26
749			EKRDM10.1	EKRDM10	1	1	C		10.00		48.00	3.775	3.674	1.26	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	99	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.52		2.46	1.26	1.21
750			EKRDM10	EKRDM11	2	1	J		15.00		848.00	3.674	3.714	1.89	106.92	2.25	2.784	0.000	2.784	60	200	200	DWC	-375	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.03	0.00	2.11	2.110	2.08	1.56	1.63
751			EKRDM11	EKRDM12	1	1	C		15.00		863.00	3.714	3.928	1.89	108.81	2.25	2.834	0.000	2.834	61	200	200	DWC	-70	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.03	0.00	2.08		2.05	1.63	1.88
752			EKRDM12	EKRDM13	1	1	C		15.00		878.00	3.928	4.049	1.89	110.70	2.25	2.883	0.000	2.883	61	200	200	DWC	-124	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.03	0.00	2.05		2.02	1.88	2.03
753			EKRDM13	EKRDM14	1	1	C		15.00		893.00	4.049	4.100	1.89	112.59	2.25	2.932	0.000	2.932	62	200	200	DWC	-294	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	2.02		1.99	2.03	2.11
754			EKRDM14	STEKRDM3	1	1	C		30.00		923.00	4.100	4.145	3.78	116.38	2.25	3.031	0.000	3.031	63	200	200	DWC	-667	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	1.99		1.93	2.11	2.22
755			STRDM6	STRDM5	0	1	H		14.00		14.00	4.323	4.261	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	226	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.22		3.14	1.10	1.12
756			STRDM5	STRDM4	1	1	C		20.00		34.00	4.261	4.200	2.52	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	328	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.14		3.03	1.12	1.17

Sl. No.	Road	Element	Man Holes				Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
757			STRDM4	STEKRDM3	1	1	C		30.00		64.00	4.200	4.145	3.78	8.07	2.25	0.210	0.000	0.210	17	200	200	DWC	545	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.03		2.86	1.17	1.29
758			STEKRDM3	STRDM2	2	1	J		19.00		1006.00	4.145	4.059	2.40	126.84	2.25	3.303	0.000	3.303	65	200	200	DWC	221	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	1.93	1.930	1.89	2.22	2.17
759			STRDM2	STRDM1	1	1	C		20.00		1026.00	4.059	3.992	2.52	129.36	2.25	3.369	0.000	3.369	66	200	200	DWC	299	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	1.89		1.85	2.17	2.14
760			STRDM1	MNPSTRDM15	1	1	C		30.00		1056.00	3.992	3.885	3.78	133.14	2.25	3.467	0.000	3.467	67	200	200	DWC	280	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	1.85		1.79	2.14	2.10
761			MNPSTRDM15	MNPRDM16	2	1	J		18.00		1796.00	3.513	3.729	2.27	226.45	2.25	5.897	0.000	5.897	87	200	200	DWC	-83	180	0.010	1.01	31.84	0.19	0.77	0.30	OK	0.78	OK	0.10	0.00	1.32	1.320	1.22	2.19	2.51
762			MNPRDM16	MNPRDM17	1	1	C		20.00		1816.00	3.500	3.574	2.52	228.97	2.25	5.963	0.000	5.963	88	200	200	DWC	-270	180	0.010	1.01	31.84	0.19	0.77	0.30	OK	0.78	OK	0.11	0.00	1.22		1.11	2.28	2.46
763			MNPRDM17	MNPRDM18	1	1	C		30.00		1846.00	3.484	3.438	3.78	232.75	2.25	6.061	0.000	6.061	88	200	200	DWC	652	180	0.010	1.01	31.84	0.19	0.77	0.30	OK	0.78	OK	0.17	0.00	1.11		0.94	2.37	2.50
764			MNPRDM18	BSRDM14	1	1	C		20.00		1866.00	3.541	3.486	2.52	235.27	2.25	6.127	0.000	6.127	89	200	200	DWC	364	180	0.010	1.01	31.84	0.19	0.77	0.30	OK	0.78	OK	0.11	0.00	0.94		0.83	2.60	2.66
765			BSRDM14	BSRDM15	2	1	J		25.00		5294.00	3.486	3.503	3.15	667.49	2.25	17.383	0.000	17.383	149	250	250	DWC	-1471	870	0.010	0.53	26.26	0.66	1.07	0.60	OK	0.57	OK	0.03	0.00	0.83	0.830	0.80	2.66	2.70
766			BSRDM15	BSRDM16	1	1	C		20.00		5314.00	3.503	3.381	2.52	670.01	2.25	17.448	0.000	17.448	150	250	250	DWC	164	870	0.010	0.53	26.26	0.66	1.07	0.60	OK	0.57	OK	0.02	0.00	0.80		0.78	2.70	2.60
767			BSRDM16	BSRDM17	1	1	C		25.00		5339.00	3.381	3.460	3.15	673.16	2.25	17.530	0.000	17.530	150	250	250	DWC	-316	870	0.010	0.53	26.26	0.67	1.07	0.60	OK	0.57	OK	0.03	0.00	0.78		0.75	2.60	2.71
768			BSRDM17	BSRDM18	2	1	J		25.00		16699.00	3.460	3.304	3.15	2105.48	2.25	54.830	0.000	54.830	265	342	400	HDPE	160	1000	0.010	0.61	56.49	0.97	1.14	0.80	OK	0.70	OK	0.03	0.00	0.75	0.750	0.72	2.71	2.58
769			BSRDM18.1	BSRDM18	0	1	H		26.00		26.00	3.360	3.304	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	464	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.26		2.12	1.10	1.18
770			BSRDM18	BSRDM19	2	1	J		17.00		16742.00	3.304	3.296	2.14	2110.90	2.25	54.971	0.000	54.971	265	342	400	HDPE	2125	1000	0.010	0.61	56.49	0.97	1.14	0.80	OK	0.70	OK	0.02	0.00	0.72	0.720	0.70	2.58	2.60
771			BSRDM19	BSRDM20	1	1	C		15.00		16757.00	3.296	3.228	1.89	2112.79	2.25	55.021	0.000	55.021	265	342	400	HDPE	221	1000	0.010	0.61	56.49	0.97	1.14	0.80	OK	0.70	OK	0.02	0.00	0.70		0.68	2.60	2.55
772			BSRDM20.3	BSRDM20.2	0	1	H		21.00		21.00	3.780	3.731	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	429	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.68		2.56	1.10	1.17
773			BSRDM20.2	BSRDM20.1	1	1	C		15.00		36.00	3.731	3.366	1.89	4.54	2.25	0.118	0.000	0.118	13	200	200	DWC	41	50	0.010	1.92	60.42	0.00	0.30	0.07	OK	0.58	OK	0.30	0.00	2.56		2.26	1.17	1.11
774			BSRDM20.1	BSRDM20	1	1	C		20.00		56.00	3.366	3.228	2.52	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	145	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	2.26		2.15	1.11	1.08
775			BSRDM20	BSRDM21	2	1	J		21.00		16834.00	3.228	3.196	2.65	2122.50	2.25	55.273	0.000	55.273	266	342	400	HDPE	656	1000	0.010	0.61	56.49	0.98	1.14	0.80	OK	0.70	OK	0.02	0.00	0.68	0.680	0.66	2.55	2.54
776			BSRDM21.3	BSRDM21.2	0	1	H		15.00		15.00	3.880	3.750	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	115	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.13	0.00	2.78		2.65	1.10	1.10
777			BSRDM21.2	BSRDM21.1	1	1	C		15.00		30.00	3.750	3.624	1.89	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	119	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.13	0.00	2.65		2.52	1.10	1.10
778			BSRDM21.1	BSRDM21	1	1	C		30.00		60.00	3.624	3.169	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	66	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.46	0.00	2.52		2.06	1.10	1.11
779			BSRDM21	BSRDM22	2	1	J		20.00		16914.00	3.169	3.056	2.52	2132.58	2.25	55.536	0.000	55.536	266	378	400	DWC	177	1000	0.010	0.66	73.77	0.75	1.10	0.65	OK	0.72	OK	0.02	0.00	0.66	0.660	0.64	2.51	2.42
780			BSRDM22	BSRDM23	1	1	C		18.00		16932.00	3.056	2.943	2.27	2134.85	2.25	55.595	0.000	55.595	267	378	400	DWC	159	1000	0.010	0.66	73.77	0.75	1.10	0.65	OK	0.72	OK	0.02	0.00	0.64		0.62	2.42	2.32
781			BSRDM23.5	BSRDM23.4	0	1	H		7.00		7.00	3.110	3.200	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	-78	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	2.01		1.97	1.10	1.23
782			BSRDM23.4	BSRDM23.3	1	1	C		13.00		20.00	3.200	3.257	1.64	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	-228	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.97		1.90	1.23	1.36
783			BSRDM23.3.1	BSRDM23.3	0	1	H		29.00		29.00	3.362	3.257	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	276	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	2.26		2.10	1.10	1.16
784			BSRDM23.3	BSRDM23.2	2	1	J		15.00		64.00	3.257	3.192	1.89	8.07	2.25	0.210	0.000	0.210	17	200	200	DWC	231	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	1.90	1.900	1.82	1.36	1.37
785			BSRDM23.2	BSRDM23.1	1	1	C		20.00		84.00	3.192	3.151	2.52	10.59	2.25	0.276	0.000	0.276	19	200	200	DWC	488	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.82		1.71	1.37	1.44
786			BSRDM23.1	BSRDM23	1	1	C		30.00		114.00	3.151	2.943	3.78	14.37	2.25	0.374	0.000	0.374	22	200	200	DWC	144	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.71		1.62	1.44	1.32
787			BSRDM23	BSRDM24	2	1	J		20.00		17066.00	2.943	2.615	2.52	2151.75	2.25	56.035	0.000	56.035	268	384	450	HDPE	61	1000	0.010	0.66	76.93	0.73	1.09	0.64	OK	0.72	OK	0.02	0.00	0.62	0.620	0.60	2.32	2.02
788			BSRDM24	BSRDM25	1	1	C		15.00		17081.00	2.615	2.827	1.89	2153.64	2.25	56.084	0.000	56.084	268	384	450	HDPE	-71	1000	0.010	0.66	76.93	0.73	1.09	0.64	OK	0.72	OK	0.02	0.00	0.60		0.58	2.02	2.25
789			BSRDM20.4	BSRDM20.5	0	1	H		15.00		15.00	3.742	3.652	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	167	167	0.010	1.05	33.06	0.00	0.30	0.07	OK	0.32	OK	0.09	0.00	2.64		2.55	1.10	1.10
790			BSRDM20.5	BSRDM20.6	1	1	C		3.00		18.00	3.652	3.649	0.38	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.02	0.00	2.55		2.53	1.10	1.12
791			BSRDM20.6	BSRDM20.7	1	1	C		8.00		26.00	3.649	3.620	1.01	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	276	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	2.53		2.49	1.12	1.13
792			BSRDM20.7	BSRDM20.8	1	1	C		15.00		41.00	3.620	3.371	1.89	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	60	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.23	0.00	2.49		2.26	1.13	1.11
793			BSRDM20.8	BSRDM20.9	1	1	C		30.00		71.00	3.371	3.001	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	81	82	0.010	1.50	47.18	0.00	0.30	0.07	OK	0.45	OK	0.37	0.00	2.26		1.89	1.11	1.11
794			BSRDM20.9	BSRDM20.10	1	1	C		30.00		101.00	3.001	2.544	3.78	12.73	2.25	0.332	0.000	0.332	21	200	200	DWC	66	65	0.010	1.68	52.99	0.01	0.30	0.07	OK	0.51	OK	0.46	0.00	1.89		1.43	1.11	1.11
795			BSRDM20.10	BSRDM20.11	1	1	C		4.00		105.00	2.544	2.355	0.50	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	21	21	0.010	2.96	93.23	0.00	0.30	0.07	OK	0.89	OK	0.19	0.00	1.43		1.24	1.11	1.12
796			BSRDM20.11	BSRDM20.12	1	1	C		10.00		115.00	2.355	2.378	1.26	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	-435	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	1.24		1.21	1.12	1.17
797			BSRDM20.12	BSRDM20.13	1	1	C		15.00		130.00	2.378	2.433	1.89	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	-273	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	1.21		1.16	1.17	1.27
798			BSRDM20.13	BSRDM20.14	1	1	C		10.00		140.00	2.433	2.529	1.26	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	-104	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	1.16		1.13	1.27	1.40
799			BSRDM20.14	BSRDM20.15	1	1	C		20.00		160.00	2.529	2.685	2.52	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	-128	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.13		1.07	1.40	1.62
800			BSRDM20.15	BSRDM25	1	1	C		30.00		190.00	2.685	2.827	3.78	23.96	2.25	0.624	0.000	0.624	29	200	200	DWC	-211	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.07		1.00	1.62	1.83
801			BSRDM25	BSRDM26	2	1	J		25.00		17296.00	2.827	2.782	3.15	2180.75	2.25	56.790	0.000	56.790	269	384	450	HDPE	556	1000	0.010	0.66	76.93	0.74	1.09	0.64	OK	0.72	OK	0.03	0.00	0.58	0.580	0.55	2.25	2.23
802			BSRDM26	BSRDM27	1	1	C		20.00		17316.00	3.693	2.737	2.52	2183.27	2.25	56.856	0.000	56.856	270	384	450	HDPE	21	1000	0.010	0.66	76.93	0.74	1.09	0.64	OK	0.72	OK	0.02	0.00	0.55		0.53	3.14	2.21
803			BSRDM27	BSRDM29	1	1	C		30.00		17346.00	3.620	2.611	3.78	2187.05	2.25	56.955	0.000	56.955	270	384	450	HDPE	30	1000	0.010	0.66	76.93	0.74	1.09	0.64	OK	0.72	OK	0.03	0.00	0.53		0.50	3.09	2.11
804			BSRDM29	BSRDM30	1	1	C		23.00		17369.00	3.833	3.763	2.90	2189.95	2.25	57.030	0.000	57.030	270	384	450	HDPE	329	1000	0.010	0.66	76.93	0.74	1.09	0.64	OK	0.72	OK	0.02	0.00	0.50		0.48	3.33	3.28
805			BSRDM46	BSRDM45	0	1	H		15.00		15.00	1.480	1.435	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.38		0.30	1.10	1.14
806			BSRDM45	BSRDM44	1	1	C		15.00		30.00	1.435	1.528	1.89	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-161	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.30		0.22	1.14	1.31
807			BSRDM44	BSRDM43	1	1	C		20.00		50.00	1.528	1.868	2.52	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-59	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.22		0.11	1.31	1.76
808			BSRDM43	BSRDM42	1	1	C		30.00		80.00	1.868	1.883	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-2000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.11		-0.06	1.76	1.94
809			BSRDM42	BSRDM41	1	1	C		25.00		105.00	1.883	1.919	3.15	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-694	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	-0.06		-0.20	1.94	2.12
810			BSRDM41	BSRDM40	1	1	C		10.00		115.00	1.919	2.881	1.26	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	-10	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	-0.20		-0.23	2.12	3.11
811			BSRDM40	BSRDM39	1	1	C		5.00		120.00	2.881	2.077	0.63	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	6	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.02	0.00	-0.23		-0.25	3.11	2.33
812			BSRDM39	BSRDM38	1	1	C		10.00		130.00	2.077	2.042	1.26	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	286	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	-0.25		-0.28	2.33	2.32
813			BSRDM38	BSRDM37	1	1	C		4.00		134.00	2.042	2.073	0.50	16.90	2.25	0.440	0.000	0.440	24	200	200	DWC	-129	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.01	0.00	-0.28		-0.29	2.32	2.36
814			BSRDM37	BSRDM36	1	1	C		15.00		149.00	2.073	2.177	1.89	18.79	2.25	0.489	0.000	0.489	25	200	200	DWC	-144	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	-0.29		-0.34	2.36	2.52
815			BSRDM36.9	BSRDM36.8	0	1	H		15.00		15.00	1.510	1.568	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-259	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.41		0.33	1.10	1.24
816			BSRDM36.8	BSRDM36.7	1	1	C		25.00		40.00	1.568	1.621	3.15	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	-472	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.33		0.19	1.24	1.43
817			BSRDM36.7	BSRDM36.6	1	1	C		10.00		50.00	1.621	1.713	1.26	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-109	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.19		0.13	1.43	1.58
818			BSRDM36.6	BSRDM36.5	1	1	C		25.00		75.00	1.713	1.666	3.15	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	532	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.13		-0.01	1.58	1.68
819			BSRDM36.5	BSRDM36.4	1	1	C		20.00		95.00	1.666	1.585	2.52	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	247	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.01		-0.12	1.68	1.71
820			BSRDM36.4	BSRDM36.3	1	1	C		10.00		105.00	1.585	1.702	1.26	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	-85	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	-0.12		-0.18	1.71	1.88
821			BSRDM36.3	BSRDM36.2	1	1	C		12.00		117.00	1.702	1.598	1.51	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	115	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	-0.18		-0.22	1.88	1.82
822			BSRDM36.2	BSRDM36.1	1	1	C		10.00		127.00	1.598	1.540	1.26	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	172	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	-0.22		-0.25	1.82	1.79
823			BSRDM36.1	BSRDM36	1	1	C		15.00		142.00	1.540	2.177	1.89	17.90	2.25	0.466	0.000	0.466	25	200	200	DWC	-24	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	-0.25		-0.30	1.79	2.48
824			BSRDM36	BSRDM35	2	1	J		10.00		301.00	2.177	2.205	1.26	37.95	2.25	0.988	0.000	0.988	36	200	200	DWC	-357	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	-0.34	-0.340	-0.36	2.52	2.57
825			BSRDM35	BSRDM34	1	1	C		5.00		306.00	2.205	2.223	0.63	38.58	2.25	1.005	0.000	1.005	36	200	200	DWC	-278	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.01	0.00	-0.36		-0.37	2.57	2.59

Sl. No.	Road	Element	Man Holes				Man hole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
826			BSRDM34.1	BSRDM34	0	1	H		20.00		20.00	2.290	2.223	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	299	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.19		1.08	1.10	1.14
827			BSRDM34	BSRDM33	2	1	J		10.00		336.00	2.223	2.215	1.26	42.36	2.25	1.103	0.000	1.103	38	200	200	DWC	1250	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	-0.37	-0.370	-0.39	2.59	2.61
828			BSRDM33	BSRDM32	1	1	C		10.00		346.00	2.215	2.208	1.26	43.63	2.25	1.136	0.000	1.136	39	200	200	DWC	1429	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	-0.39		-0.41	2.61	2.62
829			BSRDM32	BSRDM31	1	1	C		11.00		357.00	2.208	2.204	1.39	45.01	2.25	1.172	0.000	1.172	39	200	200	DWC	2750	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	-0.41		-0.43	2.62	2.63
830			BSRDM31	BSRDM30	1	1	C		18.00		375.00	2.204	2.524	2.27	47.28	2.25	1.231	0.000	1.231	40	200	200	DWC	-56	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	-0.43		-0.46	2.63	2.98
831			BSRDM30	BSRDM30.1	2	1	J		15.00		17759.00	2.524	2.549	1.89	2239.13	2.25	58.311	0.000	58.311	273	384	450	HDPE	-600	1000	0.010	0.66	76.93	0.76	1.10	0.65	OK	0.73	OK	0.02	0.00	-0.46	-0.46	-0.48	2.98	3.03
832			BSRDM30.1	BSRDM30.2	1	1	C		15.00		17774.00	2.549	2.509	1.89	2241.02	2.25	58.360	0.000	58.360	273	384	450	HDPE	375	1000	0.010	0.66	76.93	0.76	1.10	0.65	OK	0.73	OK	0.02	0.00	-0.48		-0.50	3.03	3.01
833			BSRDM30.2	BSRDM30.3	1	1	C		20.00		17794.00	2.509	2.453	2.52	2243.54	2.25	58.425	0.000	58.425	273	384	450	HDPE	357	1000	0.010	0.66	76.93	0.76	1.10	0.65	OK	0.73	OK	0.02	0.00	-0.50		-0.52	3.01	2.97
834			BSRDM30.3	BSRDM30.4	1	1	C		19.00		17813.00	2.453	2.820	2.40	2245.93	2.25	58.488	0.000	58.488	273	384	450	HDPE	-52	1000	0.010	0.66	76.93	0.76	1.10	0.65	OK	0.73	OK	0.02	0.00	-0.52		-0.54	2.97	3.36
835			BSRDM30.4	WW1	1	0	C	L	15.00		17828.00	2.820	2.820	1.89	2247.83	2.25	58.537	0.000	58.537	274	384	450	HDPE	0	1000	0.010	0.66	76.93	0.76	1.10	0.65	OK	0.73	OK	0.02	0.00	-0.54		-0.56	3.36	3.38
									17828.00		17828.00			2247.83	2247.83		0.000	0.000	0.000	0																					

SEWER NETWORK DESIGN __Block 3C-Muttar STP_ (Block3-Part)

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole
1	4	5	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
2	EDPARDM1	EDPARDM2	H		29		29.00	5.463	5.343	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	242	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	4.36		4.19	1.10	1.15
3	EDPARDM2	EDPARDM3	C		30		59.00	5.343	5.137	3.78	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	146	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.19		4.01	1.15	1.13
4	EDPARDM3	EDPARDM4	C		30		89.00	5.137	5.132	3.78	11.22	2.25	0.292	0.000	0.292	20	200	200	DWC	6000	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.01		3.83	1.13	1.30
5	EDPARDM4	EDPARDM5	C		30		119.00	5.132	5.131	3.78	15.00	2.25	0.391	0.000	0.391	23	200	200	DWC	30000	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.83		3.73	1.30	1.40
6	EDPARDM5	MAEDPARDM5	C		30		149.00	5.131	4.908	3.78	18.79	2.25	0.489	0.000	0.489	25	200	200	DWC	135	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.73		3.63	1.40	1.28
7	MARDM1	MARDM2	H		30		30.00	4.892	4.883	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	3333	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.79		3.61	1.10	1.27
8	MARDM2	MARDM3	C		30		60.00	4.883	4.846	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	811	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.61		3.43	1.27	1.42
9	MARDM3	MARDM4	C		30		90.00	4.846	4.846	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	0	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.43		3.25	1.42	1.60
10	MARDM4	MAEDPARDM5	C		6		96.00	4.846	4.908	0.76	12.10	2.25	0.315	0.000	0.315	21	200	200	DWC	-97	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.04	0.00	3.25		3.21	1.60	1.70
11	MARDM5.13	MARDM5.12	H		8		8.00	5.012	5.007	1.01	1.01	2.25	0.026	0.000	0.026	6	200	200	DWC	1498	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	3.91		3.86	1.10	1.15
12	MARDM5.12	MARDM5.11	C		18		26.00	5.007	4.995	2.27	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	1498	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	3.86		3.75	1.15	1.24
13	MARDM5.11	MARDM5.10	C		30		56.00	4.995	4.975	3.78	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	1498	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.75		3.57	1.24	1.40
14	MARDM5.10B	MARDM5.10A	H		19		19.00	4.975	4.962	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	1513	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	3.87		3.76	1.10	1.20
15	MARDM5.10A	MARDM5.10	C		30		49.00	4.962	4.942	3.78	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	1498	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.76		3.58	1.20	1.36
16	MARDM5.10	MARDM5.9	J		9		114.00	4.942	4.936	1.13	14.37	2.25	0.374	0.000	0.374	22	200	200	DWC	1498	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.03	0.00	3.57	3.570	3.54	1.37	1.40
17	MARDM5.9	MARDM5.8	C		30		144.00	4.936	4.913	3.78	18.16	2.25	0.473	0.000	0.473	25	200	200	DWC	1302	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.54		3.44	1.40	1.47
18	MARDM5.8	MARDM5.7	C		30		174.00	4.913	4.896	3.78	21.94	2.25	0.571	0.000	0.571	27	200	200	DWC	1774	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	3.44		3.36	1.47	1.54
19	MARDM5.7B	MARDM5.7A	H		30		30.00	4.892	4.894	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-12958	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.18	0.00	3.79		3.61	1.10	1.28
20	MARDM5.7A	MARDM5.7	C		23		53.00	4.894	4.896	2.90	6.68	2.25	0.174	0.000	0.174	15	200	200	DWC	-12958	165	0.010	1.06	33.26	0.01	0.30	0.07	OK	0.32	OK	0.14	0.00	3.61		3.47	1.28	1.43
21	MARDM5.7	MARDM5.6	J		11		238.00	4.896	4.897	1.39	30.01	2.25	0.781	0.000	0.781	32	200	200	DWC	-13065	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.02	0.00	3.36	3.360	3.34	1.54	1.56
22	MARDM5.6	MARDM5.5	C		17		255.00	4.897	4.898	2.14	32.15	2.25	0.837	0.000	0.837	33	200	200	DWC	-12958	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	3.34		3.30	1.56	1.60
23	MARDM5.5	MARDM5.4	C		19		274.00	4.898	4.900	2.40	34.55	2.25	0.900	0.000	0.900	34	200	200	DWC	-12717	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	3.30		3.26	1.60	1.64
24	MARDM5.4	MARDM5.3	C		30		304.00	4.900	4.902	3.78	38.33	2.25	0.998	0.000	0.998	36	200	200	DWC	-12958	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	3.26		3.20	1.64	1.70
25	MARDM5.3	MARDM5.2	C		17		321.00	4.902	4.903	2.14	40.47	2.25	1.054	0.000	1.054	37	200	200	DWC	-12958	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	3.20		3.16	1.70	1.74
26	MARDM5.2.1	MARDM5.2	H		10		10.00	4.903	4.904	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	-12894	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	3.80		3.74	1.10	1.16
27	MARDM5.2	MARDM5.1	J		30		361.00	4.904	4.906	3.78	45.52	2.25	1.185	0.000	1.185	39	200	200	DWC	-13173	250	0.010	0.86	27.02	0.04	0.51	0.15	OK	0.44	OK	0.12	0.00	3.16	3.160	3.04	1.74	1.87
28	MARDM5.1	MAEDPARDM5	C		21		382.00	4.906	4.904	2.65	48.16	2.25	1.254	0.000	1.254	40	200	200	DWC	8685	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	3.04		3.00	1.87	1.90
29	MAEDPARDM5	MARDM6	J		30		657.00	4.904	5.079	3.78	82.84	2.25	2.157	0.000	2.157	53	200	200	DWC	-171	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	3.00	3.000	2.94	1.90	2.14
30	MARDM6	MARDM7	C		30		687.00	5.079	5.173	3.78	86.62	2.25	2.256	0.000	2.256	54	200	200	DWC	-319	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	2.94		2.88	2.14	2.29
31	MARDM7	MARDM8	C		30		717.00	5.173	5.240	3.78	90.40	2.25	2.354	0.000	2.354	55	200	200	DWC	-448	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	2.88		2.82	2.29	2.42
32	MARDM8	MARDM9	C		30		747.00	5.240	5.275	3.78	94.18	2.25	2.453	0.000	2.453	56	200	200	DWC	-857	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	2.82		2.76	2.42	2.52
33	MARDM9	MARDM10	C		30		777.00	5.275	5.258	3.78	97.97	2.25	2.551	0.000	2.551	58	200	200	DWC	1765	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.06	0.00	2.76		2.70	2.52	2.56
34	MARDM10	MARDM11	C		30		807.00	5.258	5.186	3.78	101.75	2.25	2.650	0.000	2.650	59	200	200	DWC	417	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.06	0.00	2.70		2.64	2.56	2.55
35	MARDM11	MARDM12	C		21		828.00	5.186	4.954	2.65	104.40	2.25	2.719	0.000	2.719	59	200	200	DWC	91	470	0.010	0.63	19.71	0.14	0.71	0.26	OK	0.44	OK	0.04	0.00	2.64		2.60	2.55	2.35
36	MARDM12	MAMLLNRDM13	C		12		840.00	4.954	4.899	1.51	105.91	2.25	2.758	0.000	2.758	60	200	200	DWC	218	470	0.010	0.63	19.71	0.14	0.71	0.26	OK	0.44	OK	0.03	0.00	2.60		2.57	2.35	2.33
37	MNCRDM5.18.9	MNCRDM5.18.8	H		15		15.00	5.524	5.446	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	192	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	4.42		4.33	1.10	1.12
38	MNCRDM5.18.8	MNCRDM5.18.7	C		30		45.00	5.446	5.285	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	187	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	4.33		4.15	1.12	1.13
39	MNCRDM5.18.7	MNCRDM5.18.7	H		9		9.00	5.285	5.237	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	187	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	4.18		4.13	1.10	1.11
40	MNCRDM5.18.7	MNCRDM5.18.6	J		17		71.00	5.237	5.146	2.14	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	187	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.10	0.00	4.13	4.130	4.03	1.11	1.12
41	MNCRDM5.18.6	MNCRDM5.18.5	C		21		92.00	5.146	5.033	2.65	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	187	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	4.03		3.91	1.12	1.12
42	MNCRDM5.18.5	MAMLLNRDM13	C		25		117.00	5.033	4.899	3.15	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	187	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.15	0.00	3.91		3.76	1.12	1.14
43	MAMLLNRDM13	MARDM14	J		24		981.00	4.899	4.796	3.03	123.69	2.25	3.221	0.000	3.221	65	200	200	DWC	233	470	0.010	0.63	19.71	0.16	0.74	0.28	OK	0.46	OK	0.05	0.00	2.57	2.570	2.52	2.33	2.28
44	MARDM14	MNCRDM5.18.2	C		20		1001.00	4.796	4.728	2.52	126.21	2.25	3.287	0.000	3.287	65	200	200	DWC	294	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.04	0.00	2.52		2.48	2.28	2.25
45	MNCRDM5.18.2	MNCRDM5.18.1	C		10		1011.00	4.728	4.671	1.26	127.47	2.25	3.320	0.000	3.320	66	200	200	DWC	175	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.02	0.00	2.48		2.46	2.25	2.21
46	MNCRDM5.18.1	MNCRDM5.18	C		20		1031.00	4.671	4.624	2.52	129.99	2.25	3.385	0.000	3.385	66	200	200	DWC	426	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.04	0.00	2.46		2.42	2.21	2.20
47	MNCRDM5.18	MNCRDM5.19	C		30		1061.00	4.624	4.565	3.78	133.78	2.25	3.484	0.000	3.484	67	200	200	DWC	508	470	0.010	0.63	19.71	0.18	0.76	0.30	OK	0.48	OK	0.06	0.00	2.42		2.36	2.20	2.21
48	MNCRDM5.19	MAASPRRDM17	C		30		1091.00	4.565	4.591	3.78	137.56	2.25	3.582	0.000	3.582	68	200	200	DWC	-1154	470	0.010	0.63	19.71	0.18	0.76	0.30	OK	0.48	OK	0.06	0.00	2.36		2.30	2.21	2.29
49	ASPRRDM2	ASPRRDM3	H		30		30.00	5.693	5.481	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	142	145	0.010	1.13	35.48	0.00	0.30	0.07	OK	0.34	OK	0.21	0.00	4.59		4.38	1.10	1.10
50	ASPRRDM3	ASPRRDM4	C		30		60.00	5.481	5.366	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	261	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.38		4.20	1.10	1.17
51	ASPRRDM4	ASPRRDM5	C		20		80.00	5.366	5.273	2.52	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	215	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	4.20		4.08	1.17	1.19
52	ASPRRDM5	ASPRRDM6	C		18		98.00	5.273	5.102	2.27	12.36	2.25	0.322	0.000	0.322	21	200	200	DWC	105	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	4.08		3.97	1.19	1.13
53	ASPRRDM6	ASPRRDM7	C		30		128.00	5.102	5.029	3.78	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	411	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.97		3.87	1.13	1.16
54	ASPRRDM7	ASPRRDM8	C		14		142.00	5.029	5.045	1.77	17.90	2.25	0.466	0.000	0.466	25	200	200	DWC	-875	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.05	0.00	3.87		3.82	1.16	1.23
55	ASPRRDM8.3	ASPRRDM8.2	H		6		6.00	5.114	5.113	0.76	0.76	2.25	0.020	0.000	0.020	6	200	200	DWC	6000	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	4.01		3.97	1.10	1.14
56	ASPRRDM8.2	ASPRRDM8.1	C		20		26.00	5.113	5.080	2.52	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	606	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.97		3.85	1.14	1.23
57	ASPRRDM8.1	ASPRRDM8	C		30		56.00	5.080	5.045	3.78	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	857	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.85		3.67	1.23	1.38
58	ASPRRDM8	ASPRRDM9	J		20		218.00	5.045	4.944	2.52	27.49	2.25	0.716	0.000	0.716	31	200	200	DWC	198	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	3.67	3.670	3.63	1.38	1.31
59	ASPRRDM9	ASPRRDM10	C		22		240.00	4.944	4.926	2.77	30.26	2.25	0.788	0.000	0.788	32	200	200	DWC	1222	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.05	0.00	3.63		3.58	1.31	1.35
60	ASPRRDM10	ASPRRDM11	C		30		270.00	4.926	4.831	3.78	34.04	2.25	0.887	0.000	0.887	34	200	200	DWC	316	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	3.58		3.52	1.35	1.31
61	ASPRRDM11	ASPRRDM12	C		20		290.00	4.831	4.785	2.52	36.56	2.25	0.952	0.000	0.952	35	200	200	DWC	435	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	3.52		3.48	1.31	1.31
62	ASPRRDM12	ASPRRDM13	C		30		320.00	4.785	4.819	3.78	40.35	2.25	1.051	0.000	1.051	37	200	200	DWC	-882	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	3.48		3.42	1.31	1.40
63	ASPRRDM13	ASPRRDM14	C		22		342.00	4.819	4.800	2.77	43.12	2.25	1.123	0.000	1.123	38	200	200	DWC	1158	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.05	0.00	3.42		3.37	1.40	1.43
64	ASPRRDM14	ASPRRDM15	C		19		361.00	4.800	4.798	2.40	45.52	2.25	1.185	0.000	1.185	39	200	200	DWC	9500	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	3.37		3.33	1.43	1.47
65	ASPRRDM15	ASPRRDM16	C		13		374.00	4.798	4.753	1.64	47.16	2.25	1.228	0.000	1.228	40	200	200	DWC	289	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.03	0.00	3.33		3.30	1.47	1.45
66	ASPRRDM16	MAASPRRDM17	C		18		392.00	4.753	4.591	2.27	49.42	2.25	1.287	0.000	1.287	41	200	200	DWC	111	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.04	0.00	3.30		3.26	1.45	1.33
67	MAASPRRDM17	MARDM18	J		30		1513.00	4.591	4.520	3.78	190.77	2.25	4.968	0.000	4.968	80	200	200	DWC	423	470	0.010	0.63	19.71	0.25	0.84	0.35	OK	0.53	OK	0.06	0.00	2.30	2.300	2.24	2.29	2.28

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
68	MARDM18	MARDM19	C		30		1543.00	4.520	4.431	3.78	194.55	2.25	5.066	0.000	5.066	81	200	200	DWC	337	470	0.010	0.63	19.71	0.26	0.84	0.35	OK	0.53	OK	0.06	0.00	2.24		2.18	2.28	2.25
69	MARDM19	MARD1RDM20	C		12		1555.00	4.431	4.409	1.51	196.06	2.25	5.106	0.000	5.106	81	200	200	DWC	545	470	0.010	0.63	19.71	0.26	0.84	0.35	OK	0.53	OK	0.03	0.00	2.18		2.15	2.25	2.26
70	SANGRDM1	SANGRDM2	H		30		30.00	5.924	5.932	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-3750	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	4.82		4.64	1.10	1.29
71	SANGRDM2	SANGSANGRD2N	C		28		58.00	5.932	5.839	3.53	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	301	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.16	0.00	4.64		4.48	1.29	1.36
72	SANGRD2M3	SANGRD2M2	H		25		25.00	6.224	6.027	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	127	130	0.010	1.19	37.47	0.00	0.30	0.07	OK	0.36	OK	0.19	0.00	5.12		4.93	1.10	1.10
73	SANGRD2M2	SANGRD2M1	C		30		55.00	6.027	5.942	3.78	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	353	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.93		4.75	1.10	1.19
74	SANGRD2M1	SANGSANGRD2N	C		30		85.00	5.942	5.839	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	291	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.75		4.57	1.19	1.27
75	SANGSANGRD2N	SANGRDM4	J		30		173.00	5.839	5.834	3.78	21.81	2.25	0.568	0.000	0.568	27	200	200	DWC	6000	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	4.48	4.480	4.40	1.36	1.43
76	SANGRDM4	SANGSANGRD3N	C		12		185.00	5.834	5.705	1.51	23.33	2.25	0.607	0.000	0.607	28	200	200	DWC	93	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.03	0.00	4.40		4.37	1.43	1.34
77	SANGRD3M6	SANGRD3M5	H		16		16.00	5.611	5.627	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	-1000	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	4.51		4.42	1.10	1.21
78	SANGRD3M5	SANGRD3M4	C		30		46.00	5.627	5.556	3.78	5.80	2.25	0.151	0.000	0.151	14	200	200	DWC	423	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	4.42		4.24	1.21	1.32
79	SANGRD3M4	SANGRD3M3	C		21		67.00	5.556	5.651	2.65	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-221	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	4.24		4.12	1.32	1.53
80	SANGRD3M3	SANGRD3M2	C		30		97.00	5.651	5.734	3.78	12.23	2.25	0.318	0.000	0.318	21	200	200	DWC	-361	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.12		3.94	1.53	1.79
81	SANGRD3M2	SANGRD3M1	C		30		127.00	5.734	5.769	3.78	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	-857	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.94		3.84	1.79	1.93
82	SANGRD3M1	SANGSANGRD3N	C		30		157.00	5.769	5.705	3.78	19.80	2.25	0.515	0.000	0.515	26	200	200	DWC	469	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.84		3.74	1.93	1.97
83	SANGSANGRD3N	SANGRDM6	J		30		372.00	5.705	5.359	3.78	46.90	2.25	1.221	0.000	1.221	40	200	200	DWC	87	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	3.74	3.740	3.68	1.97	1.68
84	SANGRDM6	SANGRDM7	C		19		391.00	5.359	5.337	2.40	49.30	2.25	1.284	0.000	1.284	41	200	200	DWC	864	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.04	0.00	3.68		3.64	1.68	1.70
85	SANGRDM7	SANGRDM8	C		30		421.00	5.337	5.204	3.78	53.08	2.25	1.382	0.000	1.382	42	200	200	DWC	226	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	3.64		3.58	1.70	1.62
86	SANGRDM8	SANGRDM9	C		30		451.00	5.204	5.230	3.78	56.86	2.25	1.481	0.000	1.481	44	200	200	DWC	-1154	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	3.58		3.52	1.62	1.71
87	SANGRDM9	SANGRD1M10	C		21		472.00	5.230	5.223	2.65	59.51	2.25	1.550	0.000	1.550	45	200	200	DWC	3000	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.04	0.00	3.52		3.48	1.71	1.74
88	SANGRD1M10	RD1M10	C		23		495.00	5.223	5.171	2.90	62.41	2.25	1.625	0.000	1.625	46	200	200	DWC	442	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.05	0.00	3.48		3.43	1.74	1.74
89	RD1M10	RD1M9	C		18		513.00	5.171	5.063	2.27	64.68	2.25	1.684	0.000	1.684	47	200	200	DWC	167	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.04	0.00	3.43		3.39	1.74	1.67
90	RD1M9	RD1M8	C		30		543.00	5.063	4.963	3.78	68.46	2.25	1.783	0.000	1.783	48	200	200	DWC	300	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.06	0.00	3.39		3.33	1.67	1.63
91	RD1M8	RD1M7	C		30		573.00	4.963	4.771	3.78	72.25	2.25	1.881	0.000	1.881	49	200	200	DWC	156	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	3.33		3.27	1.63	1.50
92	RD1M7	RD1M6	C		15		588.00	4.771	4.708	1.89	74.14	2.25	1.931	0.000	1.931	50	200	200	DWC	238	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.03	0.00	3.27		3.24	1.50	1.47
93	RD1M6	RD1M5	C		20		608.00	4.708	4.645	2.52	76.66	2.25	1.996	0.000	1.996	51	200	200	DWC	317	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.04	0.00	3.24		3.20	1.47	1.45
94	RD1M5	RD1ASPRRDM4	C		18		626.00	4.645	4.656	2.27	78.93	2.25	2.055	0.000	2.055	52	200	200	DWC	-1636	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.04	0.00	3.20		3.16	1.45	1.50
95	ASPRRDM11.1	ASPRRDM11.2	H		20		20.00	4.750	4.631	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	168	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.65		3.53	1.10	1.10
96	ASPRRDM11.2	ASPRRDM11.3	C		30		50.00	4.631	4.537	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	319	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.53		3.35	1.10	1.19
97	ASPRRDM11.3	ASPRRDM11.4	C		15		65.00	4.537	4.588	1.89	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-294	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	3.35		3.26	1.19	1.33
98	ASPRRDM11.4	RD1ASPRRDM4	C		16		81.00	4.588	4.656	2.02	10.21	2.25	0.266	0.000	0.266	19	200	200	DWC	-235	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	3.26		3.17	1.33	1.49
99	RD1ASPRRDM4	RD1M3	J		30		737.00	4.656	4.533	3.78	92.92	2.25	2.420	0.000	2.420	56	200	200	DWC	244	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	3.16	3.160	3.10	1.50	1.43
100	RD1M3	RD1M2	C		30		767.00	4.533	4.443	3.78	96.71	2.25	2.518	0.000	2.518	57	200	200	DWC	333	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.06	0.00	3.10		3.04	1.43	1.40
101	RD1M2	RD1M1	C		30		797.00	4.443	4.453	3.78	100.49	2.25	2.617	0.000	2.617	58	200	200	DWC	-3000	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.06	0.00	3.04		2.98	1.40	1.47
102	RD1M1	MARD1RDM20	C		13		810.00	4.453	4.409	1.64	102.13	2.25	2.660	0.000	2.660	59	200	200	DWC	295	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.03	0.00	2.98		2.95	1.47	1.46
103	MARD1RDM20	MARDM21	J		19		2384.00	4.409	4.297	2.40	300.58	2.25	7.828	0.000	7.828	100	200	200	DWC	170	470	0.010	0.63	19.71	0.40	0.94	0.44	OK	0.59	OK	0.04	0.00	2.15	2.150	2.11	2.26	2.19
104	MARDM21	MARD2RDM22	C		30		2414.00	4.297	4.210	3.78	304.37	2.25	7.926	0.000	7.926	101	200	200	DWC	345	470	0.010	0.63	19.71	0.40	0.94	0.44	OK	0.59	OK	0.06	0.00	2.11		2.05	2.19	2.16
105	RD2RD1M9	RD2M8	H		30		30.00	5.440	5.361	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	380	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	4.34		4.16	1.10	1.20
106	RD2M8	RD2M7	C		30		60.00	5.361	5.150	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	142	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.16		3.98	1.20	1.17
107	RD2M7	RD2M6	C		30		90.00	5.150	4.963	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	160	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.98		3.80	1.17	1.16
108	RD2M6	RD2M5	C		30		120.00	4.963	4.764	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	151	200	0.010	0.96	30.21	0.01	0.30	0.07	OK	0.29	Check	0.15	0.00	3.80		3.65	1.16	1.11
109	RD2M5	RD2M4	C		30		150.00	4.764	4.581	3.78	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	164	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	3.65		3.48	1.11	1.10
110	RD2M4	RD2M3	C		30		180.00	4.581	4.445	3.78	22.70	2.25	0.591	0.000	0.591	28	200	200	DWC	221	220	0.010	0.92	28.80	0.02	0.40	0.10	OK	0.37	OK	0.14	0.00	3.48		3.34	1.10	1.11
111	RD2M3	RD2M2	C		30		210.00	4.445	4.374	3.78	26.48	2.25	0.690	0.000	0.690	30	200	200	DWC	423	370	0.010	0.71	22.21	0.03	0.46	0.13	OK	0.32	OK	0.08	0.00	3.34		3.26	1.11	1.11
112	RD2M2	RD2M1	C		20		230.00	4.374	4.283	2.52	29.00	2.25	0.755	0.000	0.755	32	200	200	DWC	220	250	0.010	0.86	27.02	0.03	0.46	0.13	OK	0.39	OK	0.08	0.00	3.26		3.18	1.11	1.10
113	RD2M1	MARD2RDM22	C		15		245.00	4.283	4.210	1.89	30.89	2.25	0.804	0.000	0.804	33	200	200	DWC	205	220	0.010	0.92	28.80	0.03	0.46	0.13	OK	0.42	OK	0.07	0.00	3.18		3.11	1.10	1.10
114	MARD2RDM22	MAMNCRDM23	J		30		2689.00	4.210	4.110	3.78	339.04	2.25	8.829	0.000	8.829	107	200	200	DWC	300	470	0.010	0.63	19.71	0.45	0.98	0.47	OK	0.61	OK	0.06	0.00	2.05	2.050	1.99	2.16	2.12
115	MAMNCRDM23	MARD3RDM24	C		30		2719.00	4.110	4.110	3.78	342.82	2.25	8.928	0.000	8.928	107	200	200	DWC	0	470	0.010	0.63	19.71	0.45	0.98	0.47	OK	0.61	OK	0.06	0.00	1.99		1.93	2.12	2.18
116	RD2M10	RD2M11	H		13		13.00	5.480	5.400	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	163	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.08	0.00	4.38		4.30	1.10	1.10
117	RD2M11	RD2M12	C		30		43.00	5.400	5.151	3.78	5.42	2.25	0.141	0.000	0.141	14	200	200	DWC	120	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.25	0.00	4.30		4.05	1.10	1.10
118	RD2M12	RD2M13	C		30		73.00	5.151	4.860	3.78	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	103	103	0.010	1.34	42.10	0.01	0.30	0.07	OK	0.40	OK	0.29	0.00	4.05		3.76	1.10	1.10
119	RD2M13	RD4RD3M12	C		24		97.00	4.860	4.674	3.03	12.23	2.25	0.318	0.000	0.318	21	200	200	DWC	129	129	0.010	1.19	37.61	0.01	0.30	0.07	OK	0.36	OK	0.19	0.00	3.76		3.57	1.10	1.10
120	RD4RD3M12	RD3M8	C		30		127.00	4.674	4.699	3.78	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	-1200	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.57		3.47	1.10	1.23
121	RD3M8	RD3M7	C		20		147.00	4.699	4.678	2.52	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	952	400	0.010	0.68	21.36	0.02	0.40	0.10	OK	0.27	Check	0.05	0.00	3.47		3.42	1.23	1.26
122	RD3M7	RD3RD3BM6	C		14		161.00	4.678	4.424	1.77	20.30	2.25	0.529	0.000	0.529	26	200	200	DWC	55	135	0.010	1.17	36.77	0.01	0.30	0.07	OK	0.35	OK	0.10	0.00	3.42		3.32	1.26	1.10
123	RD3BM2	RD3BM1	H		21		21.00	4.590	4.508	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	256	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.49		3.37	1.10	1.14
124	RD3BM1	RD3RD3BM6	C		30		51.00	4.508	4.424	3.78	6.43	2.25	0.167	0.000	0.167	15	200	200	DWC	357	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.37		3.19	1.14	1.23
125	RD3RD3BM6	RD3M5	J		21		233.00	4.424	4.340	2.65	29.38	2.25	0.765	0.000	0.765	32	200	200	DWC	250	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	3.19	3.190	3.15	1.23	1.19
126	RD3M5	RD3M4	C		20		253.00	4.340	4.278	2.52	31.90	2.25	0.831	0.000	0.831	33	200	200	DWC	323	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	3.15		3.11	1.19	1.17
127	RD3M4	RD3RD3AM3	C		9		262.00	4.278	4.112	1.13	33.03	2.25	0.860	0.000	0.860	34	200	200	DWC	54	90	0.010	1.43	45.03	0.02	0.40	0.10	OK	0.57	OK	0.10	0.00	3.11		3.01	1.17	1.10
128	RD3RD3AM3	RD3M2	C		18		280.00	4.112	4.224	2.27	35.30	2.25	0.919	0.000	0.919	35	200	200	DWC	-161	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	3.01		2.97	1.10	1.25
129	RD3M2	RD3M1	C		30		310.00	4.224	4.179	3.78	39.09	2.25	1.018	0.000	1.018	37	200	200	DWC	667	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	2.97		2.91	1.25	1.27
130	RD3M1	MARD3RDM24	C		30		340.00	4.179	4.110	3.78	42.87	2.25	1.116	0.000	1.116	38	200	200	DWC	435	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	2.91		2.85	1.27	1.26
131	MARD3RDM24	MARDM25	J		20		3079.00	4.110	4.051	2.52	388.21	2.25	10.110	0.000	10.110	114	200	200	DWC	339	470	0.010	0.63	19.71	0.51	1.01	0.51	OK	0.63	OK	0.04	0.00	1.93	1.930	1.89	2.18	2.16
132	MARDM25	MARDM26	C		30		3109.00	4.051	4.252	3.78	392.00	2.25	10.208	0.000	10.208	115	200	200	DWC	-149	470	0.010	0.63	19.71	0.52	1.01	0.52	OK	0.63	OK	0.06	0.00	1.89		1.83	2.16	2.42
133	MARDM26	MARDM27	C		30		3139.00	4.252	3.832	3.78	395.78	2.25	10.307	0.000	10.307	115	200	200	DWC	71	470	0.010	0.63	19.71	0.52	1.01	0.52	OK	0.63	OK	0.06	0.00	1.83		1.77	2.42	2.06
134	MARDM27	MACKRDM28	C		11		3150.00	3.832	3.793	1.39	397.16	2.25	10.343	0.000	10.343	115	200	200	DWC	282	470	0.010	0.63	19.71	0.52	1.01	0.52	OK	0.63	OK	0.02	0.00	1.77		1.75	2.06	2.04
135	CKRDM17A	MACKRDM28	H		30		30.00	3.731	3.793	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-484	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	2.63		2.45	1.10	1.34
136	MACKRDM28	MARDM29	J		30		3210.00	3.793	3.835	3.78	404.73	2.25	10.540	0.000	10.540	116	200	200	DWC	-714	470	0.010	0.63	19.71	0.53	1.02	0.52	OK	0.64	OK	0.06	0.00	1.75	1.750	1.69	2.04	2.15

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
137	MARDM29	MANNRDM30	C		12		3222.00	3.835	3.878	1.51	406.24	2.25	10.579	0.000	10.579	117	200	200	DWC	-279	470	0.010	0.63	19.71	0.54	1.02	0.53	OK	0.64	OK	0.03	0.00	1.69		1.66	2.15	2.22
138	NNRDM1	MANNRDM30	H		10		10.00	3.903	3.878	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	400	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	2.80		2.74	1.10	1.14
139	MANNRDM30	MARDM31	J		30		3262.00	3.878	3.953	3.78	411.29	2.25	10.711	0.000	10.711	117	200	200	DWC	-400	470	0.010	0.63	19.71	0.54	1.02	0.53	OK	0.64	OK	0.06	0.00	1.66	1.660	1.60	2.22	2.35
140	MARDM31	MARD4M32	C		30		3292.00	3.953	4.095	3.78	415.07	2.25	10.809	0.000	10.809	118	200	200	DWC	-211	470	0.010	0.63	19.71	0.55	1.02	0.53	OK	0.64	OK	0.06	0.00	1.60		1.54	2.35	2.56
141	RD4M11	RD4M10	H		30		30.00	4.470	4.413	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	522	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.37		3.19	1.10	1.22
142	RD4M10	RD4M9	C		30		60.00	4.413	4.339	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	408	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.19		3.01	1.22	1.33
143	RD4M9	RD4RD4CM8	C		13		73.00	4.339	4.361	1.64	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	-591	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.08	0.00	3.01		2.93	1.33	1.43
144	RD4CM2	RD4CM1	H		27		27.00	4.991	4.740	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	108	110	0.010	1.29	40.73	0.00	0.30	0.07	OK	0.39	OK	0.25	0.00	3.89		3.64	1.10	1.10
145	RD4CM1	RD4RD4CM8	C		30		57.00	4.740	4.361	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	79	80	0.010	1.52	47.76	0.00	0.30	0.07	OK	0.46	OK	0.38	0.00	3.64		3.26	1.10	1.10
146	RD4RD4CM8	RD4RD4BM7	J		7		137.00	4.361	4.364	0.88	17.27	2.25	0.450	0.000	0.450	24	200	200	DWC	-2333	400	0.010	0.68	21.36	0.02	0.40	0.10	OK	0.27	Check	0.02	0.00	2.93	2.930	2.91	1.43	1.45
147	RD4BM8	RD4BM7	H		18		18.00	5.381	5.335	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	391	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	4.28		4.17	1.10	1.17
148	RD4BM7	RD4BM6	C		10		28.00	5.335	5.281	1.26	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	185	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	4.17		4.11	1.17	1.17
149	RD4BM6.1	RD4BM6	H		7		7.00	5.314	5.281	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	212	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	4.21		4.17	1.10	1.11
150	RD4BM6	RD4BM5	J		8		43.00	5.281	5.280	1.01	5.42	2.25	0.141	0.000	0.141	14	200	200	DWC	8000	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	4.11	4.110	4.06	1.17	1.22
151	RD4BM5	RD4BM4	C		13		56.00	5.280	5.223	1.64	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	228	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.08	0.00	4.06		3.98	1.22	1.24
152	RD4BM4	RD4BM3	C		16		72.00	5.223	4.902	2.02	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	50	90	0.010	1.43	45.03	0.01	0.30	0.07	OK	0.43	OK	0.18	0.00	3.98		3.80	1.24	1.10
153	RD4BM3.1	RD4BM3	H		20		20.00	4.914	4.902	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	1667	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.81		3.69	1.10	1.21
154	RD4BM3	RD4BM2	J		30		122.00	4.902	4.634	3.78	15.38	2.25	0.401	0.000	0.401	23	200	200	DWC	112	190	0.010	0.98	30.99	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	3.69	3.690	3.53	1.21	1.10
155	RD4BM2	RD4BM1	C		30		152.00	4.634	4.506	3.78	19.16	2.25	0.499	0.000	0.499	26	200	200	DWC	234	240	0.010	0.88	27.58	0.02	0.40	0.10	OK	0.35	OK	0.13	0.00	3.53		3.40	1.10	1.11
156	RD4BM1	RD4RD4BM7	C		30		182.00	4.506	4.364	3.78	22.95	2.25	0.598	0.000	0.598	28	200	200	DWC	211	220	0.010	0.92	28.80	0.02	0.40	0.10	OK	0.37	OK	0.14	0.00	3.40		3.26	1.11	1.10
157	RD4RD4BM7	RD4M6	J		17		336.00	4.364	4.196	2.14	42.36	2.25	1.103	0.000	1.103	38	200	200	DWC	101	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	2.91	2.910	2.87	1.45	1.33
158	RD4M6	RD4M5	C		20		356.00	4.196	4.131	2.52	44.89	2.25	1.169	0.000	1.169	39	200	200	DWC	308	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	2.87		2.83	1.33	1.30
159	RD4M5	RD4M4	C		30		386.00	4.131	4.143	3.78	48.67	2.25	1.267	0.000	1.267	41	200	200	DWC	-2500	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	2.83		2.77	1.30	1.37
160	RD4M4	RD4RD3AM3	C		30		416.00	4.143	4.078	3.78	52.45	2.25	1.366	0.000	1.366	42	200	200	DWC	462	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.77		2.71	1.37	1.37
161	RD3AM1	RD3AM2	H		30		30.00	4.190	4.188	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	15000	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.09		2.91	1.10	1.28
162	RD3AM2	RD3AM3	C		20		50.00	4.188	4.135	2.52	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	377	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	2.91		2.79	1.28	1.35
163	RD3AM3	RD4RD3AM3	C		15		65.00	4.135	4.078	1.89	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	263	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	2.79		2.70	1.35	1.38
164	RD4RD3AM3	RD4M2	J		15		496.00	4.078	4.034	1.89	62.54	2.25	1.629	0.000	1.629	46	200	200	DWC	341	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.03	0.00	2.70	2.700	2.67	1.38	1.36
165	RD4M2	RD4M1	C		28		524.00	4.034	4.042	3.53	66.07	2.25	1.721	0.000	1.721	47	200	200	DWC	-3500	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.06	0.00	2.67		2.61	1.36	1.43
166	RD4M1	MARD4M32	C		10		534.00	4.042	4.095	1.26	67.33	2.25	1.753	0.000	1.753	48	200	200	DWC	-189	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.02	0.00	2.61		2.59	1.43	1.51
167	MARD4M32	MARD5M33	J		24		3850.00	4.095	4.228	3.03	485.42	2.25	12.641	0.000	12.641	127	250	250	DWC	-180	470	0.010	0.73	35.73	0.35	0.92	0.41	OK	0.67	OK	0.05	0.00	1.54	1.540	1.49	2.56	2.74
168	RD5M4	RD5M3	H		21		21.00	5.232	5.043	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	111	111	0.010	1.29	40.55	0.00	0.30	0.07	OK	0.39	OK	0.19	0.00	4.13		3.94	1.10	1.10
169	RD5M3	RD5M2	C		20		41.00	5.043	4.976	2.52	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	299	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.94		3.82	1.10	1.16
170	RD5M2	RD5M1	C		30		71.00	4.976	4.693	3.78	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	106	130	0.010	1.19	37.47	0.01	0.30	0.07	OK	0.36	OK	0.23	0.00	3.82		3.59	1.16	1.10
171	RD5M1	MARD5M33	C		30		101.00	4.693	4.230	3.78	12.73	2.25	0.332	0.000	0.332	21	200	200	DWC	65	65	0.010	1.68	52.99	0.01	0.30	0.07	OK	0.51	OK	0.46	0.00	3.59		3.13	1.10	1.10
172	MARD5M33	MARDM34	J		30		3981.00	4.230	4.189	3.78	501.94	2.25	13.071	0.000	13.071	130	250	250	DWC	732	470	0.010	0.73	35.73	0.37	0.93	0.43	OK	0.68	OK	0.06	0.00	1.49	1.490	1.43	2.74	2.76
173	MARDM34	MARDM35	C		30		4011.00	4.189	4.310	3.78	505.72	2.25	13.170	0.000	13.170	130	250	250	DWC	-248	470	0.010	0.73	35.73	0.37	0.93	0.43	OK	0.68	OK	0.06	0.00	1.43		1.37	2.76	2.94
174	MARDM35	MAGNRDM36	C		26		4037.00	4.310	4.467	3.28	509.00	2.25	13.255	0.000	13.255	130	250	250	DWC	-166	470	0.010	0.73	35.73	0.37	0.93	0.43	OK	0.68	OK	0.06	0.00	1.37		1.31	2.94	3.16
175	GNRDM6	GNRDM5	H		23		23.00	5.143	5.068	2.90	2.90	2.25	0.076	0.000	0.076	10	200	200	DWC	307	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.14	0.00	4.04		3.90	1.10	1.17
176	GNRDM5	GNRDM4	C		14		37.00	5.068	4.971	1.77	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	144	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.08	0.00	3.90		3.82	1.17	1.15
177	GNRDM4	GNRDM3	C		30		67.00	4.971	4.711	3.78	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	115	140	0.010	1.15	36.11	0.01	0.30	0.07	OK	0.34	OK	0.21	0.00	3.82		3.61	1.15	1.10
178	GNRDM3	GNRDM2	C		12		79.00	4.711	4.682	1.51	9.96	2.25	0.259	0.000	0.259	19	200	200	DWC	414	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.07	0.00	3.61		3.54	1.10	1.14
179	GNRDM2	GNRDM1	C		30		109.00	4.682	4.533	3.78	13.74	2.25	0.358	0.000	0.358	22	200	200	DWC	201	280	0.010	0.81	25.53	0.01	0.30	0.07	OK	0.24	Check	0.11	0.00	3.54		3.43	1.14	1.10
180	GNRDM1	MAGNRDM36	C		30		139.00	4.533	4.463	3.78	17.53	2.25	0.456	0.000	0.456	25	200	200	DWC	429	310	0.010	0.77	24.26	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.43		3.33	1.10	1.13
181	MAGNRDM36	MARDM37	J		24		4200.00	4.463	4.629	3.03	529.55	2.25	13.790	0.000	13.790	133	250	250	DWC	-145	470	0.010	0.73	35.73	0.39	0.94	0.44	OK	0.68	OK	0.05	0.00	1.31	1.310	1.26	3.15	3.37
182	MARDM37	MAAARDM38	C		20		4220.00	4.629	4.894	2.52	532.07	2.25	13.856	0.000	13.856	133	250	250	DWC	-75	470	0.010	0.73	35.73	0.39	0.94	0.44	OK	0.68	OK	0.04	0.00	1.26		1.22	3.37	3.67
183	SNRDM2	SNRDM1	H		30		30.00	6.343	6.160	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	164	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	5.24		5.06	1.10	1.10
184	SNRDM1	AASNRDM19	C		30		60.00	6.160	6.044	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	259	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	5.06		4.88	1.10	1.16
185	AASNRDM19.3	AASNRDM19.2	H		44.00	1351	1395.00	6.04	6.032	5.55	175.89	2.25	4.580	0.000	4.580	77	200	200	DWC	5500	470	0.010	0.63	19.71	0.23	0.81	0.33	OK	0.51	OK	0.09	0.00	4.94		4.85	1.10	1.18
186	AASNRDM19.2	AASNRDM19.1	C		11		1406.00	6.032	6.107	1.39	177.27	2.25	4.617	0.000	4.617	77	200	200	DWC	-147	470	0.010	0.63	19.71	0.23	0.81	0.33	OK	0.51	OK	0.02	0.00	4.85		4.83	1.18	1.28
187	AASNRDM19.1	AASNRDM19	C		30		1436.00	6.107	6.044	3.78	181.06	2.25	4.715	0.000	4.715	78	200	200	DWC	476	470	0.010	0.63	19.71	0.24	0.83	0.34	OK	0.52	OK	0.06	0.00	4.83		4.77	1.28	1.27
188	AASNRDM19	AARDM18	J		10		1506.00	6.044	5.972	1.26	189.88	2.25	4.945	0.000	4.945	80	200	200	DWC	139	470	0.010	0.63	19.71	0.25	0.84	0.35	OK	0.53	OK	0.02	0.00	4.77	4.770	4.75	1.27	1.22
189	AARDM18	AARDM17	C		30		1536.00	5.972	5.756	3.78	193.67	2.25	5.043	0.000	5.043	81	200	200	DWC	139	340	0.010	0.74	23.17	0.22	0.80	0.33	OK	0.59	OK	0.09	0.00	4.75		4.66	1.22	1.10
190	AARDM17	AARDM16	C		25		1561.00	5.756	5.504	3.15	196.82	2.25	5.125	0.000	5.125	81	200	200	DWC	99	80	0.010	1.52	47.76	0.11	0.67	0.23	OK	1.02	OK	0.31	0.00	4.66		4.35	1.10	1.15
191	AARDM16	AARDM15	C		30		1591.00	5.504	5.332	3.78	200.60	2.25	5.224	0.000	5.224	82	200	200	DWC	174	250	0.010	0.86	27.02	0.19	0.77	0.30	OK	0.66	OK	0.12	0.00	4.35		4.23	1.15	1.10
192	AARDM15	AARDM14	C		9		1600.00	5.332	5.254	1.13	201.73	2.25	5.254	0.000	5.254	82	200	200	DWC	115	110	0.010	1.29	40.73	0.13	0.70	0.25	OK	0.91	OK	0.08	0.00	4.23		4.15	1.10	1.10
193	AARDM14	AARDM13	C		30		1630.00	5.254	5.348	3.78	205.52	2.25	5.352	0.000	5.352	83	200	200	DWC	-319	470	0.010	0.63	19.71	0.27	0.85	0.36	OK	0.53	OK	0.06	0.00	4.15		4.09	1.10	1.26
194	AARDM13	AARDM12	C		30		1660.00	5.348	5.296	3.78	209.30	2.25	5.451	0.000	5.451	84	200	200	DWC	577	470	0.010	0.63	19.71	0.28	0.86	0.37	OK	0.54	OK	0.06	0.00	4.09		4.03	1.26	1.27
195	AARDM12	AARDM11	C		30		1690.00	5.296	5.247	3.78	213.08	2.25	5.549	0.000	5.549	85	200	200	DWC	612	470	0.010	0.63	19.71	0.28	0.86	0.37	OK	0.54	OK	0.06	0.00	4.03		3.97	1.27	1.28
196	AARDM11	AARDM10	C		30		1720.00	5.247	5.135	3.78	216.86	2.25	5.648	0.000	5.648	85	200	200	DWC	268	470	0.010	0.63	19.71	0.29	0.87	0.38	OK	0.54	OK	0.06	0.00	3.97		3.91	1.28	1.23
197	AARDM10	AARDM9	C		29		1749.00	5.135	5.075	3.66	220.52	2.25	5.743	0.000	5.743	86	200	200	DWC	483	470	0.010	0.63	19.71	0.29	0.87	0.38	OK	0.54	OK	0.06	0.00	3.91		3.85	1.23	1.23
198	AARDM9.2	AARDM9.1	H		26		26.00	5.371	5.220	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	172	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	4.27		4.12	1.10	1.10
199	AARDM9.1	AARDM9	C		9		35.00	5.220	5.080	1.13	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	64	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.14	0.00	4.12		3.98	1.10	1.10
200	AARDM9	AARDM8	J		30		1814.00	5.080	4.714	3.78	228.72	2.25	5.956	0.000	5.956	88	200	200	DWC	82	125	0.010	1.21	38.21	0.16	0.74	0.28	OK	0.90	OK	0.24	0.00	3.85	3.850	3.61	1.23	1.10
201	AARDM8.2	AARDM8.1	H		18		18.00	4.903	5.036	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-135	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	3.80		3.69	1.10	1.35
202	AARDM8.1	AARDM8	C		30		48.00	5.036	4.714	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	93	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.69		3.51	1.35	1.20
203	AARDM8	AARDM7	J		13		1875.00	4.714	4.816	1.64	236.41	2.25	6.156	0.000	6.156	89	200	200	DWC	-127	470	0.010	0.63	19.71	0.31	0.88	0.39	OK	0.55	OK	0.03	0.00	3.51	3.510	3.48	1.20	1.34
204	AARDM7	AARDM6	C		30		1905.00	4.816	4.714	3.78	240.19	2.25	6.255	0.000	6.255	90	200	200	DWC	294	470	0.010	0.63	19.71	0.32	0.89	0.40	OK	0.56	OK	0.06	0.00	3.48		3.42	1.34	1.29
205	AARDM6.2	AARDM6.1	H		28		28.00	5.453	5.180	3.53	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	103	103	0.010	1.34	42.10	0.00	0.30	0.07	OK	0.40	OK	0.27	0.00	4.35		4.08	1.10	1.10

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
206	AARDM6.1	AARDM6	C		30		58.00	5.180	4.714	3.78	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	64	64	0.010	1.70	53.40	0.00	0.30	0.07	OK	0.51	OK	0.47	0.00	4.08		3.61	1.10	1.10
207	AARDM6	AARDM5	J		14		1977.00	4.714	4.640	1.77	249.27	2.25	6.491	0.000	6.491	91	200	200	DWC	189	470	0.010	0.63	19.71	0.33	0.90	0.40	OK	0.56	OK	0.03	0.00	3.42	3.420	3.39	1.29	1.25
208	AARDM5	AARDM4	C		20		1997.00	4.640	4.624	2.52	251.79	2.25	6.557	0.000	6.557	92	200	200	DWC	1250	470	0.010	0.63	19.71	0.33	0.90	0.40	OK	0.56	OK	0.04	0.00	3.39		3.35	1.25	1.27
209	AARDM4.4	AARDM4.3	H		17		17.00	4.954	4.857	2.14	2.14	2.25	0.056	0.000	0.056	9	200	200	DWC	175	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.10	0.00	3.85		3.75	1.10	1.11
210	AARDM4.3	AARDM4.2	C		30		47.00	4.857	4.772	3.78	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	353	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.75		3.57	1.11	1.20
211	AARDM4.2C	AARDM4.2B	H		21		21.00	4.804	4.704	2.65	2.65	2.25	0.069	0.000	0.069	10	200	200	DWC	210	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.70		3.58	1.10	1.12
212	AARDM4.2B	AARDM4.2A	C		10		31.00	4.704	4.880	1.26	3.91	2.25	0.102	0.000	0.102	12	200	200	DWC	-57	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	3.58		3.52	1.12	1.36
213	AARDM4.2A	AARDM4.2	C		30		61.00	4.880	4.772	3.78	7.69	2.25	0.200	0.000	0.200	16	200	200	DWC	278	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.52		3.34	1.36	1.43
214	AARDM4.2	AARDM4.1	J		9		117.00	4.772	4.704	1.13	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	132	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.03	0.00	3.34	3.340	3.31	1.43	1.39
215	AARDM4.1	AARDM4	C		30		147.00	4.704	4.624	3.78	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	375	470	0.010	0.63	19.71	0.02	0.40	0.10	OK	0.25	Check	0.06	0.00	3.31		3.25	1.39	1.37
216	AARDM4	AARDM3	J		30		2174.00	4.624	4.604	3.78	274.11	2.25	7.138	0.000	7.138	96	200	200	DWC	1500	470	0.010	0.63	19.71	0.36	0.92	0.42	OK	0.58	OK	0.06	0.00	3.25	3.250	3.19	1.37	1.41
217	AARDM3	AARDM2	C		30		2204.00	4.604	4.606	3.78	277.89	2.25	7.237	0.000	7.237	97	200	200	DWC	-15000	470	0.010	0.63	19.71	0.37	0.93	0.43	OK	0.58	OK	0.06	0.00	3.19		3.13	1.41	1.48
218	AARDM2	AARDM1	C		20		2224.00	4.606	4.931	2.52	280.41	2.25	7.302	0.000	7.302	97	200	200	DWC	-62	470	0.010	0.63	19.71	0.37	0.93	0.43	OK	0.58	OK	0.04	0.00	3.13		3.09	1.48	1.84
219	AARDM1	MAAARDM38	C		30		2254.00	4.931	4.894	3.78	284.19	2.25	7.401	0.000	7.401	98	200	200	DWC	811	470	0.010	0.63	19.71	0.38	0.93	0.43	OK	0.58	OK	0.06	0.00	3.09		3.03	1.84	1.86
220	MAAARDM38	MARDM39	J		30		6504.00	4.894	5.261	3.78	820.05	2.25	21.355	0.000	21.355	165	250	250	DWC	-82	630	0.010	0.63	30.86	0.69	1.08	0.61	OK	0.68	OK	0.05	0.00	1.22	1.220	1.17	3.67	4.09
221	MARDM39	MARDM40	C		30		6534.00	5.261	5.410	3.78	823.83	2.25	21.454	0.000	21.454	166	250	250	DWC	-201	630	0.010	0.63	30.86	0.70	1.08	0.62	OK	0.68	OK	0.05	0.00	1.17		1.12	4.09	4.29
222	MARDM40	MARDM41	C		17		6551.00	5.410	5.272	2.14	825.98	2.25	21.510	0.000	21.510	166	250	250	DWC	123	630	0.010	0.63	30.86	0.70	1.08	0.62	OK	0.68	OK	0.03	0.00	1.12		1.09	4.29	4.18
223	MARDM41	MALBRDM42	C		27		6578.00	5.272	4.930	3.40	829.38	2.25	21.598	0.000	21.598	166	250	250	DWC	79	630	0.010	0.63	30.86	0.70	1.08	0.62	OK	0.68	OK	0.04	0.00	1.09		1.05	4.18	3.88
224	DLRDM8	DLRDM7	H		13.00		13.00	4.644	4.573	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	183	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.08	0.00	3.54		3.46	1.10	1.11
225	DLRDM7	DLRDM6	C		30.00		43.00	4.573	4.350	3.78	5.42	2.25	0.141	0.000	0.141	14	200	200	DWC	135	140	0.010	1.15	36.11	0.00	0.30	0.07	OK	0.34	OK	0.21	0.00	3.46		3.25	1.11	1.10
226	DLRDM6	DLRDM5	C		5.00		48.00	4.350	4.324	0.63	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	192	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.03	0.00	3.25		3.22	1.10	1.10
227	DLRDM5	DLRDM4	C		10.00		58.00	4.324	4.326	1.26	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	-5000	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.06	0.00	3.22		3.16	1.10	1.17
228	DLRDM4	DLRDM3	C		30.00		88.00	4.326	4.633	3.78	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	-98	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	3.16		2.98	1.17	1.65
229	DLRDM3	DLRDM2	C		30.00		118.00	4.633	4.941	3.78	14.88	2.25	0.387	0.000	0.387	23	200	200	DWC	-97	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.98		2.88	1.65	2.06
230	DLRDM2	DLRDM1	C		30.00		148.00	4.941	4.906	3.78	18.66	2.25	0.486	0.000	0.486	25	200	200	DWC	857	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.88		2.78	2.06	2.13
231	DLRDM1	2MLDLRD10	C		9.00		157.00	4.906	5.024	1.13	19.80	2.25	0.515	0.000	0.515	26	200	200	DWC	-76	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.03	0.00	2.78		2.75	2.13	2.27
232	2MLDLRD10	2MLRDM9	C		18.00		175.00	5.024	4.880	2.27	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	125	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.05	0.00	2.75		2.70	2.27	2.18
233	2MLRDM9	2MLRDM8	C		20.00		195.00	4.880	4.832	2.52	24.59	2.25	0.640	0.000	0.640	29	200	200	DWC	417	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.04	0.00	2.70		2.66	2.18	2.17
234	2MLRDM8	2MLRDM7	C		30.00		225.00	4.832	4.784	3.78	28.37	2.25	0.739	0.000	0.739	31	200	200	DWC	625	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.66		2.60	2.17	2.18
235	2MLRDM7	MLKMBRDM6	C		30.00		255.00	4.784	4.705	3.78	32.15	2.25	0.837	0.000	0.837	33	200	200	DWC	380	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.60		2.54	2.18	2.17
236	MLKMBRDM6	2MLRDM5	C		25.00		280.00	4.705	4.503	3.15	35.30	2.25	0.919	0.000	0.919	35	200	200	DWC	124	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.05	0.00	2.54		2.49	2.17	2.01
237	2MLRDM5	2MLRDM4	C		20.00		300.00	4.503	4.503	2.52	37.83	2.25	0.985	0.000	0.985	36	200	200	DWC	0	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	2.49		2.45	2.01	2.05
238	2MLRDM4	2MLRDM3	C		25.00		325.00	4.503	4.471	3.15	40.98	2.25	1.067	0.000	1.067	37	200	200	DWC	781	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.05	0.00	2.45		2.40	2.05	2.07
239	2MLRDM3	2MLRDM2	C		30.00		355.00	4.471	4.434	3.78	44.76	2.25	1.166	0.000	1.166	39	200	200	DWC	811	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	2.40		2.34	2.07	2.09
240	2MLRDM2	2MLRDM1	C		32.00		387.00	4.434	4.606	4.03	48.79	2.25	1.271	0.000	1.271	41	200	200	DWC	-186	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.07	0.00	2.34		2.27	2.09	2.34
241	2MLRDM1	LBRDM7.16	C		22.00		409.00	4.606	4.627	2.77	51.57	2.25	1.343	0.000	1.343	42	200	200	DWC	-1048	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.05	0.00	2.27		2.22	2.34	2.41
242	LBRDM7.16	LBRDM7.15	C		20.00		429.00	4.627	4.649	2.52	54.09	2.25	1.409	0.000	1.409	43	200	200	DWC	-909	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.04	0.00	2.22		2.18	2.41	2.47
243	LBRDM7.15	LBRDM7.14	C		30.00		459.00	4.649	4.754	3.78	57.87	2.25	1.507	0.000	1.507	44	200	200	DWC	-286	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	2.18		2.12	2.47	2.63
244	LBRDM7.14	LBRDM7.13	C		30.00		489.00	4.754	4.562	3.78	61.66	2.25	1.606	0.000	1.606	46	200	200	DWC	156	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	2.12		2.06	2.63	2.50
245	LBRDM7.13	LBRDM7.12	C		30.00		519.00	4.562	3.866	3.78	65.44	2.25	1.704	0.000	1.704	47	200	200	DWC	43	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.06	0.00	2.06		2.00	2.50	1.87
246	LBRDM7.12	LBRDM7.11	C		10.00		529.00	3.866	3.708	1.26	66.70	2.25	1.737	0.000	1.737	48	200	200	DWC	63	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.02	0.00	2.00		1.98	1.87	1.73
247	LBRDM7.11	LBRDM7.10	C		20.00		549.00	3.708	3.772	2.52	69.22	2.25	1.803	0.000	1.803	48	200	200	DWC	-313	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.04	0.00	1.98		1.94	1.73	1.83
248	LBRDM7.10C	LBRDM7.10B	H		15.00		15.00	3.733	3.741	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-1875	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	2.63		2.54	1.10	1.20
249	LBRDM7.10B	LBRDM7.10A	C		20.00		35.00	3.741	3.753	2.52	4.41	2.25	0.115	0.000	0.115	13	200	200	DWC	-1667	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	2.54		2.42	1.20	1.33
250	LBRDM7.10A	LBRDM7.10	C		30.00		65.00	3.753	3.772	3.78	8.20	2.25	0.213	0.000	0.213	17	200	200	DWC	-1579	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.42		2.24	1.33	1.53
251	LBRDM7.10	LBRDM7.9	J		19.00		633.00	3.772	3.551	2.40	79.81	2.25	2.078	0.000	2.078	52	200	200	DWC	86	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.04	0.00	1.94	1.940	1.90	1.83	1.65
252	LBRDM7.9	LBRDM7.8	C		10.00		643.00	3.551	3.492	1.26	81.07	2.25	2.111	0.000	2.111	52	200	200	DWC	169	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.02	0.00	1.90		1.88	1.65	1.61
253	LBRDM7.8	LBRDM7.7	C		20.00		663.00	3.492	3.484	2.52	83.59	2.25	2.177	0.000	2.177	53	200	200	DWC	2500	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.04	0.00	1.88		1.84	1.61	1.64
254	LBRDM7.7	LBRDM7.6	C		15.00		678.00	3.484	3.330	1.89	85.48	2.25	2.226	0.000	2.226	54	200	200	DWC	97	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.03	0.00	1.84		1.81	1.64	1.52
255	LBRDM7.6	LBRDM7.5	C		30.00		708.00	3.330	3.196	3.78	89.27	2.25	2.325	0.000	2.325	55	200	200	DWC	224	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	1.81		1.75	1.52	1.45
256	LBRDM7.5	LBRDM7.4	C		15.00		723.00	3.196	3.158	1.89	91.16	2.25	2.374	0.000	2.374	55	200	200	DWC	395	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.03	0.00	1.75		1.72	1.45	1.44
257	LBRDM7.4	LBRDM7.3	C		30.00		753.00	3.158	2.977	3.78	94.94	2.25	2.472	0.000	2.472	57	200	200	DWC	166	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.06	0.00	1.72		1.66	1.44	1.32
258	LBRDM7.3	LBRDM7	C		7.00		760.00	2.977	2.990	0.88	95.82	2.25	2.495	0.000	2.495	57	200	200	DWC	-538	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.01	0.00	1.66		1.65	1.32	1.34
259	KMBRDM1	KMBRDM2	H		30.00		30.00	4.752	4.780	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-1071	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.65		3.47	1.10	1.31
260	KMBRDM2	KMBRDM3	C		20.00		50.00	4.780	4.766	2.52	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	1429	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	3.47		3.35	1.31	1.42
261	KMBRDM3	KMBRDM4	C		30.00		80.00	4.766	4.262	3.78	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	60	150	0.010	1.11	34.88	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	3.35		3.15	1.42	1.11
262	KMBRDM4	KMBRDM5	C		20.00		100.00	4.262	3.793	2.52	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	43	43	0.010	2.07	65.15	0.01	0.30	0.07	OK	0.62	OK	0.47	0.00	3.15		2.68	1.11	1.11
263	KMBRDM5	KMBRDM6	C		15.00		115.00	3.793	3.780	1.89	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	1154	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.05	0.00	2.68		2.63	1.11	1.15
264	KMBRDM6	KMBRDM7	C		40.00		155.00	3.780	3.679	5.04	19.54	2.25	0.509	0.000	0.509	26	200	200	DWC	396	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.13	0.00	2.63		2.50	1.15	1.18
265	KMBRDM7.2.2	KMBRDM7.2.1	H		16.00		16.00	4.201	4.090	2.02	2.02	2.25	0.053	0.000	0.053	9	200	200	DWC	144	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.11	0.00	3.10		2.99	1.10	1.10
266	KMBRDM7.2.1	KMBRDM7.2	C		15.00		31.00	4.090	3.973	1.89	3.91	2.25	0.102	0.000	0.102	12	200	200	DWC	128	130	0.010	1.19	37.47	0.00	0.30	0.07	OK	0.36	OK	0.12	0.00	2.99		2.87	1.10	1.10
267	KMBRDM7.4	KMBRDM7.3	H		15.00		15.00	4.000	3.986	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	1071	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	2.90		2.81	1.10	1.18
268	KMBRDM7.3	KMBRDM7.2	C		15.00		30.00	3.986	3.973	1.89	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1154	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	2.81		2.72	1.18	1.25
269	KMBRDM7.2	KMBRDM7.1	J		9.00		70.00	3.973	3.760	1.13	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	42	160	0.010	1.07	33.77	0.01	0.30	0.07	OK	0.32	OK	0.06	0.00	2.72	2.720	2.66	1.25	1.10
270	KMBRDM7.1	KMBRDM7	C		20.00		90.00	3.760	3.679	2.52	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	247	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	2.66		2.50	1.10	1.18
271	KMBRDM7	KMBRDM7A	J		15.00		260.00	3.679	3.581	1.89	32.78	2.25	0.854	0.000	0.854	33	200	200	DWC	153	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	2.50	2.500	2.47	1.18	1.11
272	KMBRDM7A	KMBRDM8	C		20.00		280.00	3.581	3.534	2.52	35.30	2.25	0.919	0.000	0.919	35	200	200	DWC	426	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	2.47		2.43	1.11	1.10
273	KMBRDM8	KMBRDM9	C		30.00		310.00	3.534	3.414	3.78	39.09	2.25	1.018	0.000	1.018	37	200	200	DWC	250	250	0.010	0.86	27.02	0.04	0.51	0.15	OK	0.44	OK	0.12	0.00	2.43		2.31	1.10	1.10
274	KMBRDM9	KMBRDM10	C		30.00		340.00	3.414	3.314	3.78	42.87	2.25	1.116	0.000	1.116	38	200	200	DWC	300	300	0.010	0.78	24.67	0.05	0.53	0.16	OK	0.42	OK	0.10	0.00	2.31		2.21	1.10	1.10

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
275	KMBRDM10	KMBLBRDM11	C		10.00		350.00	3.314	3.298	1.26	44.13	2.25	1.149	0.000	1.149	39	200	200	DWC	625	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.02	0.00	2.21		2.19	1.10	1.11
276	KMBRDM17	KMBRDM16	H		22.00		22.00	3.912	3.820	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	239	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.13	0.00	2.81		2.68	1.10	1.14
277	KMBRDM16	KMBRDM15	C		30.00		52.00	3.820	3.833	3.78	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	-2308	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.68		2.50	1.14	1.33
278	KMBRDM15.4	KMBRDM15.3	H		25.00		25.00	4.013	3.996	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	1471	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	2.91		2.76	1.10	1.24
279	KMBRDM15.3	KMBRDM15.2	C		20.00		45.00	3.996	3.989	2.52	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	2857	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	2.76		2.64	1.24	1.35
280	KMBRDM15.2	KMBRD15.1	C		6.00		51.00	3.989	3.923	0.76	6.43	2.25	0.167	0.000	0.167	15	200	200	DWC	91	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.04	0.00	2.64		2.60	1.35	1.32
281	KMBRD15.1	KMBRDM15	C		30.00		81.00	3.923	3.833	3.78	10.21	2.25	0.266	0.000	0.266	19	200	200	DWC	333	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.60		2.42	1.32	1.41
282	KMBRDM15.15	KMBRDM15.14	H		5.00		5.00	4.344	4.482	0.63	0.63	2.25	0.016	0.000	0.016	5	200	200	DWC	-36	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.03	0.00	3.24		3.21	1.10	1.27
283	KMBRDM15.14	KMBRDM15.13	C		20.00		25.00	4.482	4.544	2.52	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-323	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	3.21		3.09	1.27	1.45
284	KMBRDM15.13	KMBRDM15.12	C		5.00		30.00	4.544	4.605	0.63	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-82	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.03	0.00	3.09		3.06	1.45	1.55
285	KMBRDM15.12	KMBRDM15.11	C		15.00		45.00	4.605	4.503	1.89	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	147	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	3.06		2.97	1.55	1.53
286	KMBRDM15.11	KMBRDM15.10	C		30.00		75.00	4.503	4.226	3.78	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	108	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.97		2.79	1.53	1.44
287	KMBRDM15.10	KMBRDM15.9	C		30.00		105.00	4.226	3.911	3.78	13.24	2.25	0.345	0.000	0.345	21	200	200	DWC	95	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.79		2.61	1.44	1.30
288	KMBRDM15.9	KMBRDM15.8	C		5.00		110.00	3.911	3.940	0.63	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	-172	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.03	0.00	2.61		2.58	1.30	1.36
289	KMBRDM15.8	KMBRDM15.7	C		30.00		140.00	3.940	3.811	3.78	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	233	400	0.010	0.68	21.36	0.02	0.40	0.10	OK	0.27	Check	0.08	0.00	2.58		2.50	1.36	1.31
290	KMBRDM15.7	KMBRDM15.6	C		30.00		170.00	3.811	3.797	3.78	21.43	2.25	0.558	0.000	0.558	27	200	200	DWC	2143	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	2.50		2.42	1.31	1.38
291	KMBRDM15.6	KMBRDM15.5	C		30.00		200.00	3.797	3.870	3.78	25.22	2.25	0.657	0.000	0.657	29	200	200	DWC	-411	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	2.42		2.36	1.38	1.51
292	KMBRDM15.5	KMBRDM15	C		10.00		210.00	3.870	3.833	1.26	26.48	2.25	0.690	0.000	0.690	30	200	200	DWC	270	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.02	0.00	2.36		2.34	1.51	1.49
293	KMBRDM15	KMBRDM14	J		10.00		353.00	3.833	3.673	1.26	44.51	2.25	1.159	0.000	1.159	39	200	200	DWC	62	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.02	0.00	2.34	2.340	2.32	1.49	1.35
294	KMBRDM14	KMBRDM13	C		5.00		358.00	3.673	3.673	0.63	45.14	2.25	1.175	0.000	1.175	39	200	200	DWC	0	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.01	0.00	2.32		2.31	1.35	1.36
295	KMBRDM13	KMBRDM12	C		20.00		378.00	3.673	3.501	2.52	47.66	2.25	1.241	0.000	1.241	40	200	200	DWC	116	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	2.31		2.27	1.36	1.23
296	KMBRDM12	KMBLBRDM11	C		8.00		386.00	3.501	3.298	1.01	48.67	2.25	1.267	0.000	1.267	41	200	200	DWC	39	100	0.010	1.36	42.72	0.03	0.46	0.13	OK	0.62	OK	0.08	0.00	2.27		2.19	1.23	1.11
297	KMBLBRDM11	LBRDM1	J		10.00		746.00	3.298	3.289	1.26	94.06	2.25	2.449	0.000	2.449	56	200	200	DWC	1111	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.02	0.00	2.19	2.190	2.17	1.11	1.12
298	LBRDM1	LBRDM2	C		10.00		756.00	3.289	3.314	1.26	95.32	2.25	2.482	0.000	2.482	57	200	200	DWC	-400	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.02	0.00	2.17		2.15	1.12	1.16
299	LBRDM2	LBRDM3	C		15.00		771.00	3.314	3.230	1.89	97.21	2.25	2.532	0.000	2.532	57	200	200	DWC	179	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.03	0.00	2.15		2.12	1.16	1.11
300	LBRDM3	LBPNKRDM4	C		30.00		801.00	3.230	3.140	3.78	100.99	2.25	2.630	0.000	2.630	58	200	200	DWC	333	350	0.010	0.73	22.84	0.12	0.69	0.24	OK	0.50	OK	0.09	0.00	2.12		2.03	1.11	1.11
301	LBPNKRDM4	LBRDM5	C		30.00		831.00	3.140	3.018	3.78	104.78	2.25	2.729	0.000	2.729	59	200	200	DWC	246	246	0.010	0.87	27.24	0.10	0.65	0.22	OK	0.56	OK	0.12	0.00	2.03		1.91	1.11	1.11
302	LBRDM5	LBRDM6	C		20.00		851.00	3.018	3.024	2.52	107.30	2.25	2.794	0.000	2.794	60	200	200	DWC	-3333	470	0.010	0.63	19.71	0.14	0.71	0.26	OK	0.44	OK	0.04	0.00	1.91		1.87	1.11	1.15
303	LBRDM6	LBRDM7	C		12.00		863.00	3.024	2.990	1.51	108.81	2.25	2.834	0.000	2.834	61	200	200	DWC	353	470	0.010	0.63	19.71	0.14	0.71	0.26	OK	0.44	OK	0.03	0.00	1.87		1.84	1.15	1.15
304	LBRDM7.1	LBRDM7.2	H		19.00		19.00	3.970	3.480	2.40	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	39	39	0.010	2.17	68.41	0.00	0.30	0.07	OK	0.65	OK	0.49	0.00	2.87		2.38	1.10	1.10
305	LBRDM7.2	LBRDM7	C		15.00		34.00	3.480	2.990	1.89	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	31	30	0.010	2.48	78.00	0.00	0.30	0.07	OK	0.74	OK	0.50	0.00	2.38		1.88	1.10	1.11
306	LBRDM7	LBRDM8	J		6.00		1663.00	2.990	2.990	0.76	209.68	2.25	5.460	0.000	5.460	84	200	200	DWC	0	470	0.010	0.63	19.71	0.28	0.86	0.37	OK	0.54	OK	0.01	0.00	1.84	1.840	1.83	1.15	1.16
307	LBRDM8	LBRDM9	C		15.00		1678.00	2.990	2.804	1.89	211.57	2.25	5.510	0.000	5.510	84	200	200	DWC	81	82	0.010	1.50	47.18	0.12	0.69	0.24	OK	1.03	OK	0.18	0.00	1.83		1.65	1.16	1.15
308	LBRDM9	LBRDM10	C		30.00		1708.00	2.804	2.735	3.78	215.35	2.25	5.608	0.000	5.608	85	200	200	DWC	435	470	0.010	0.63	19.71	0.28	0.86	0.37	OK	0.54	OK	0.06	0.00	1.65		1.59	1.15	1.15
309	LBRDM10	LBRDM11	C		6.00		1714.00	2.735	2.881	0.76	216.11	2.25	5.628	0.000	5.628	85	200	200	DWC	-41	470	0.010	0.63	19.71	0.29	0.87	0.38	OK	0.54	OK	0.01	0.00	1.59		1.58	1.15	1.30
310	LBRDM11.3	LBRDM11.2	H		7.00		7.00	3.410	3.310	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	70	70	0.010	1.62	51.06	0.00	0.30	0.07	OK	0.49	OK	0.10	0.00	2.31		2.21	1.10	1.10
311	LBRDM11.2	LBRDM11.1	C		15.00		22.00	3.310	3.100	1.89	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	71	71	0.010	1.61	50.70	0.00	0.30	0.07	OK	0.48	OK	0.21	0.00	2.21		2.00	1.10	1.10
312	LBRDM11.1	LBRDM11	C		20.00		42.00	3.100	2.881	2.52	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	91	91	0.010	1.42	44.79	0.00	0.30	0.07	OK	0.43	OK	0.22	0.00	2.00		1.78	1.10	1.10
313	LBRDM11	LBRDM12	J		7.00		1763.00	2.881	2.847	0.88	222.29	2.25	5.789	0.000	5.789	86	200	200	DWC	206	470	0.010	0.63	19.71	0.29	0.87	0.38	OK	0.54	OK	0.01	0.00	1.58	1.580	1.57	1.30	1.28
314	LBRDM12	LBRDM13	C		20.00		1783.00	2.847	2.751	2.52	224.81	2.25	5.854	0.000	5.854	87	200	200	DWC	208	470	0.010	0.63	19.71	0.30	0.88	0.38	OK	0.55	OK	0.04	0.00	1.57		1.53	1.28	1.22
315	LBRDM13	LBLNRDM14	C		19.00		1802.00	2.751	2.703	2.40	227.20	2.25	5.917	0.000	5.917	87	200	200	DWC	396	470	0.010	0.63	19.71	0.30	0.88	0.38	OK	0.55	OK	0.04	0.00	1.53		1.49	1.22	1.21
316	LNRDM1	LNRDM2	H		7.00		7.00	3.852	3.852	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	0	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	2.75		2.71	1.10	1.14
317	LNRDM2	LNRDM3	C		15.00		22.00	3.852	3.761	1.89	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	165	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	2.71		2.62	1.14	1.14
318	LNRDM3	LNRDM4	C		20.00		42.00	3.761	3.755	2.52	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	3333	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	2.62		2.50	1.14	1.26
319	LNRDM4	LNRDM5	C		30.00		72.00	3.755	3.494	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	115	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.50		2.32	1.26	1.17
320	LNRDM5	LNRDM6	C		20.00		92.00	3.494	3.423	2.52	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	282	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	2.32		2.20	1.17	1.22
321	LNRDM6	LNRDM7	C		30.00		122.00	3.423	3.249	3.78	15.38	2.25	0.401	0.000	0.401	23	200	200	DWC	172	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.20		2.10	1.22	1.15
322	LNRDM7	LNRDM8	C		30.00		152.00	3.249	3.129	3.78	19.16	2.25	0.499	0.000	0.499	26	200	200	DWC	250	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.10		2.00	1.15	1.13
323	LNRDM8	LNRDM9	C		30.00		182.00	3.129	3.008	3.78	22.95	2.25	0.598	0.000	0.598	28	200	200	DWC	248	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.00		1.90	1.13	1.11
324	LNRDM9	LNRDM10	C		25.00		207.00	3.008	2.993	3.15	26.10	2.25	0.680	0.000	0.680	30	200	200	DWC	1667	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.05	0.00	1.90		1.85	1.11	1.14
325	LNRDM10	LNRDM11	C		15.00		222.00	2.993	2.989	1.89	27.99	2.25	0.729	0.000	0.729	31	200	200	DWC	3750	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	1.85		1.82	1.14	1.17
326	LNRDM11	LNRDM12	C		15.00		237.00	2.989	2.914	1.89	29.88	2.25	0.778	0.000	0.778	32	200	200	DWC	200	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	1.82		1.79	1.17	1.12
327	LNRDM12	LNRDM13	C		13.00		250.00	2.914	2.850	1.64	31.52	2.25	0.821	0.000	0.821	33	200	200	DWC	203	360	0.010	0.72	22.52	0.04	0.51	0.15	OK	0.36	OK	0.04	0.00	1.79		1.75	1.12	1.10
328	LNRDM13	LBLNRDM14	C		30.00		280.00	2.850	2.703	3.78	35.30	2.25	0.919	0.000	0.919	35	200	200	DWC	204	200	0.010	0.96	30.21	0.03	0.46	0.13	OK	0.44	OK	0.15	0.00	1.75		1.60	1.10	1.10
329	LBLNRDM14	LBRDM15	J		15.00		2097.00	2.703	2.433	1.89	264.40	2.25	6.885	0.000	6.885	94	200	200	DWC	56	90	0.010	1.43	45.03	0.15	0.73	0.27	OK	1.04	OK	0.17	0.00	1.49	1.490	1.32	1.21	1.11
330	LBRDM15	LBRDM16A	C		12.00		2109.00	2.433	1.998	1.51	265.91	2.25	6.925	0.000	6.925	94	200	200	DWC	28	28	0.010	2.56	80.74	0.09	0.63	0.21	OK	1.62	OK	0.43	0.00	1.32		0.89	1.11	1.11
331	DARDM5.1	DARDM5	H		30.00		30.00	4.569	4.892	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-93	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.47		3.30	1.10	1.59
332	DARDM5	DARDM4	C		26.00		56.00	4.892	5.379	3.28	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	-53	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.15	0.00	3.30		3.15	1.59	2.23
333	DARDM4	DARDM3	C		10.00		66.00	5.379	5.379	1.26	8.32	2.25	0.217	0.000	0.217	17	200	200	DWC	0	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.06	0.00	3.15		3.09	2.23	2.29
334	DARDM3	DARDM2	C		30.00		96.00	5.378	5.378	3.78	12.10	2.25	0.315	0.000	0.315	21	200	200	DWC	0	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.09		2.92	2.29	2.46
335	DARDM2	DARDM1	C		16.00		112.00	5.219	5.219	2.02	14.12	2.25	0.368	0.000	0.368	22	200	200	DWC	0	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.05	0.00	2.92		2.87	2.30	2.35
336	DARDM1	PODARDM1.1	C		30.00		142.00	5.163	5.716	3.78	17.90	2.25	0.466	0.000	0.466	25	200	200	DWC	-54	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.87		2.77	2.29	2.95
337	PODARDM1.1	PNKRDM1	C		30.00		172.00	5.716	5.470	3.78	21.69	2.25	0.565	0.000	0.565	27	200	200	DWC	122	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.77		2.67	2.95	2.80
338	PNKRDM1	PNKRDM2	C		20.00		192.00	5.470	5.431	2.52	24.21	2.25	0.630	0.000	0.630	29	200	200	DWC	513	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.04	0.00	2.67		2.63	2.80	2.80
339	PNKRDM2	PNKALKRDM3	C		22.00		214.00	5.431	5.392	2.77	26.98	2.25	0.703	0.000	0.703	30	200	200	DWC	564	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.05	0.00	2.63		2.58	2.80	2.81
340	PNKALKRDM3	PNKRDM4	C		30.00		244.00	5.392	5.481	3.78	30.76	2.25	0.801	0.000	0.801	32	200	200	DWC	-337	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.58		2.52	2.81	2.96
341	PNKRDM4	PNKRDM5	C		30.00		274.00	5.481	5.390	3.78	34.55	2.25	0.900	0.000	0.900	34	200	200	DWC	330	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	2.52		2.46	2.96	2.93
342	PNKRDM5	PNKRDM6	C		19.00		293.00	5.390	5.312	2.40	36.94	2.25	0.962	0.000	0.962	36	200	200	DWC	244	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	2.46		2.42	2.93	2.89
343	PNKRDM6	PNKRDM7	C		30.00		323.00	5.312	5.244	3.78	40.73	2.25	1.061	0.000	1.061	37	200	200	DWC	441	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	2.42		2.36	2.89	2.88

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow							Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
344	PNKRDM7	PNKRDM8	C		30.00		353.00	5.244	5.378	3.78	44.51	2.25	1.159	0.000	1.159	39	200	200	DWC	-224	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	2.36		2.30	2.88	3.08
345	PNKRDM8	PNKRDM9	C		17.00		370.00	5.378	5.392	2.14	46.65	2.25	1.215	0.000	1.215	40	200	200	DWC	-1214	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	2.30		2.26	3.08	3.13
346	PNKRDM9	PNKRDM10	C		27.00		397.00	5.392	5.329	3.40	50.06	2.25	1.304	0.000	1.304	41	200	200	DWC	429	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.26		2.20	3.13	3.13
347	PNKRDM10	PNKRDM11	C		30.00		427.00	5.329	5.103	3.78	53.84	2.25	1.402	0.000	1.402	43	200	200	DWC	133	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.20		2.14	3.13	2.96
348	PNKRDM11	PNKRDM12	C		24.00		451.00	5.103	4.955	3.03	56.86	2.25	1.481	0.000	1.481	44	200	200	DWC	162	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.05	0.00	2.14		2.09	2.96	2.87
349	PNKRDM12	PNKRDM13	C		30.00		481.00	4.955	4.872	3.78	60.65	2.25	1.579	0.000	1.579	45	200	200	DWC	361	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	2.09		2.03	2.87	2.84
350	PNKRDM13	PNKRDM14	C		32.00		513.00	4.872	4.791	4.03	64.68	2.25	1.684	0.000	1.684	47	200	200	DWC	395	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.07	0.00	2.03		1.96	2.84	2.83
351	PNKRDM13.1	PNKRDM14	H		10.00		10.00	4.881	4.791	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	111	115	0.010	1.27	39.84	0.00	0.30	0.07	OK	0.38	OK	0.09	0.00	3.78		3.69	1.10	1.10
352	PNKRDM14	PNKRDM15	J		21.00		544.00	4.791	4.324	2.65	68.59	2.25	1.786	0.000	1.786	48	200	200	DWC	45	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.04	0.00	1.96	1.960	1.92	2.83	2.40
353	PNKRDM15	PNKRDM16	C		30.00		574.00	4.324	3.930	3.78	72.37	2.25	1.885	0.000	1.885	49	200	200	DWC	76	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	1.92		1.86	2.40	2.07
354	PNKRDM16	PNKRDM17	C		30.00		604.00	3.930	3.537	3.78	76.15	2.25	1.983	0.000	1.983	51	200	200	DWC	76	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	1.86		1.80	2.07	1.74
355	PNKRDM17	PNKRDM18	C		30.00		634.00	3.537	3.184	3.78	79.94	2.25	2.082	0.000	2.082	52	200	200	DWC	85	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	1.80		1.74	1.74	1.44
356	PNKRDM18	PNKRDM19	C		26.00		660.00	3.184	3.063	3.28	83.22	2.25	2.167	0.000	2.167	53	200	200	DWC	215	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	1.74		1.68	1.44	1.38
357	PNKRDM19	PNKRDM20	C		30.00		690.00	3.063	3.033	3.78	87.00	2.25	2.266	0.000	2.266	54	200	200	DWC	1000	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	1.68		1.62	1.38	1.41
358	PNKRDM20	PNK-LBRD M21A	C		7.00		697.00	3.033	2.964	0.88	87.88	2.25	2.289	0.000	2.289	54	200	200	DWC	101	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.01	0.00	1.62		1.61	1.41	1.35
359	KSRDM16	KSRDM15	H		20.00		20.00	3.318	3.245	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	274	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	2.22		2.11	1.10	1.14
360	KSRDM15	KSRDM14	C		5.00		25.00	3.245	3.215	0.63	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	167	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.03	0.00	2.11		2.08	1.14	1.14
361	KSRDM14	KSRDM13	C		20.00		45.00	3.215	3.186	2.52	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	690	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	2.08		1.97	1.14	1.22
362	KSRDM13	KSRDM12	C		30.00		75.00	3.186	3.050	3.78	9.46	2.25	0.246	0.000	0.246	18	200	200	DWC	221	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	1.97		1.80	1.22	1.25
363	KSRDM12	KSRDM11	C		20.00		95.00	3.050	3.039	2.52	11.98	2.25	0.312	0.000	0.312	20	200	200	DWC	1818	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	1.80		1.69	1.25	1.35
364	KSRDM11	KSRDM10	C		20.00		115.00	3.039	3.102	2.52	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	-317	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.07	0.00	1.69		1.62	1.35	1.48
365	KSRDM10.1	KSRDM10	H		12.00		12.00	3.363	3.102	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	46	46	0.010	2.00	62.99	0.00	0.30	0.07	OK	0.60	OK	0.26	0.00	2.26		2.00	1.10	1.10
366	KSRDM10	KSRDM9	J		13.00		140.00	3.102	3.178	1.64	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	-171	470	0.010	0.63	19.71	0.02	0.40	0.10	OK	0.25	Check	0.03	0.00	1.62	1.620	1.59	1.48	1.59
367	KSRDM9.2	KSRDM9.1	H		27.00		27.00	3.202	3.124	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	346	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	2.10		1.95	1.10	1.17
368	KSRDM9.1	KSRDM9	C		30.00		57.00	3.124	3.178	3.78	7.19	2.25	0.187	0.000	0.187	16	200	200	DWC	-556	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	1.95		1.78	1.17	1.40
369	KSRDM9	KSRDM8	J		20.00		217.00	3.178	3.259	2.52	27.36	2.25	0.713	0.000	0.713	31	200	200	DWC	-247	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	1.59	1.590	1.55	1.59	1.71
370	KSRDM8	KSRDM7	C		10.00		227.00	3.259	3.311	1.26	28.62	2.25	0.745	0.000	0.745	31	200	200	DWC	-192	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.02	0.00	1.55		1.53	1.71	1.78
371	KSRDM7.3	KSRDM7.2	H		9.00		9.00	3.023	3.135	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	-80	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	1.92		1.87	1.10	1.27
372	KSRDM7.2	KSRDM7.1	C		30.00		39.00	3.135	3.235	3.78	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-300	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	1.87		1.70	1.27	1.54
373	KSRDM7.1	KSRDM7	C		10.00		49.00	3.235	3.311	1.26	6.18	2.25	0.161	0.000	0.161	15	200	200	DWC	-132	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	1.70		1.64	1.54	1.67
374	KSRDM7	KSRDM6	J		24.00		300.00	3.311	3.513	3.03	37.83	2.25	0.985	0.000	0.985	36	200	200	DWC	-119	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.05	0.00	1.53	1.530	1.48	1.78	2.03
375	KSRDM6	KSRDM5	C		20.00		320.00	3.513	4.242	2.52	40.35	2.25	1.051	0.000	1.051	37	200	200	DWC	-27	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.04	0.00	1.48		1.44	2.03	2.80
376	KSRDM5	KSRDM4	C		20.00		340.00	4.242	4.274	2.52	42.87	2.25	1.116	0.000	1.116	38	200	200	DWC	-625	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	1.44		1.40	2.80	2.87
377	KSRDM4	KSRDM3	C		20.00		360.00	4.274	4.059	2.52	45.39	2.25	1.182	0.000	1.182	39	200	200	DWC	93	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	1.40		1.36	2.87	2.70
378	KSRDM3.5	KSRDM3.4	H		25.00		25.00	3.410	3.620	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-119	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.14	0.00	2.31		2.17	1.10	1.45
379	KSRDM3.4	KSRDM3.3	C		20.00		45.00	3.620	3.830	2.52	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	-95	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	2.17		2.06	1.45	1.77
380	KSRDM3.3	KSRDM3.2	C		5.00		50.00	3.830	3.853	0.63	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	-217	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.03	0.00	2.06		2.03	1.77	1.82
381	KSRDM3.2	KSRDM3.1	C		12.00		62.00	3.853	3.940	1.51	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	-138	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.07	0.00	2.03		1.96	1.82	1.98
382	KSRDM3.1	KSRDM3	C		10.00		72.00	3.940	4.059	1.26	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	-84	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.06	0.00	1.96		1.90	1.98	2.16
383	KSRDM3	KSRDM2	J		20.00		452.00	4.054	4.005	2.52	56.99	2.25	1.484	0.000	1.484	44	200	200	DWC	408	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.04	0.00	1.36	1.360	1.32	2.69	2.69
384	KSRDM2	KSRDM1	C		30.00		482.00	4.005	3.912	3.78	60.77	2.25	1.583	0.000	1.583	45	200	200	DWC	323	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	1.32		1.26	2.69	2.65
385	KSRDM1	PNKKSRDM27	C		15.00		497.00	3.912	3.820	1.89	62.66	2.25	1.632	0.000	1.632	46	200	200	DWC	163	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.03	0.00	1.26		1.23	2.65	2.59
386	PNKMHTRDM30	PNKRDM29	H		15.00		15.00	4.170	4.085	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	176	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	3.07		2.98	1.10	1.11
387	PNKRDM29	PNKRDM28	C		30.00		45.00	4.085	3.912	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	173	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.98		2.81	1.11	1.10
388	PNKRDM28	PNKKSRDM27	C		15.00		60.00	3.912	3.820	1.89	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	163	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	2.81		2.72	1.10	1.10
389	PNKKSRDM27	PNKRDM26	J		12.00		569.00	3.820	3.744	1.51	71.74	2.25	1.868	0.000	1.868	49	200	200	DWC	158	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.03	0.00	1.23	1.230	1.20	2.59	2.54
390	PNKRDM26	PNKRDM25	C		25.00		594.00	3.744	3.587	3.15	74.89	2.25	1.950	0.000	1.950	50	200	200	DWC	159	250	0.010	0.86	27.02	0.07	0.59	0.19	OK	0.51	OK	0.10	0.00	1.20		1.10	2.54	2.49
391	MPLRDM14	MPLRDM15	H		30.00		30.00	4.254	4.140	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	263	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.15		2.98	1.10	1.16
392	MPLRDM15	PNKRDM25	C		15.00		45.00	4.140	3.587	1.89	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	27	30	0.010	2.48	78.00	0.00	0.30	0.07	OK	0.74	OK	0.50	0.00	2.98		2.48	1.16	1.11
393	PNKRDM25	PNKRDM24	J		30.00		669.00	3.583	3.390	3.78	84.35	2.25	2.197	0.000	2.197	53	200	200	DWC	155	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	1.10	1.100	1.04	2.48	2.35
394	PNKRDM24	PNKRDM23	C		20.00		689.00	3.390	3.135	2.52	86.87	2.25	2.262	0.000	2.262	54	200	200	DWC	78	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.04	0.00	1.04		1.00	2.35	2.14
395	PNKRDM23	PNKRDM22	C		30.00		719.00	3.135	2.983	3.78	90.65	2.25	2.361	0.000	2.361	55	200	200	DWC	197	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	1.00		0.94	2.14	2.04
396	PNKRDM22	PNKRDM21	C		30.00		749.00	2.983	3.013	3.78	94.44	2.25	2.459	0.000	2.459	56	200	200	DWC	-1000	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	0.94		0.88	2.04	2.13
397	PNKRDM21	PNK-LBRD M21A	C		13.00		762.00	3.013	2.964	1.64	96.08	2.25	2.502	0.000	2.502	57	200	200	DWC	265	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.03	0.00	0.88		0.85	2.13	2.11
398	PNK-LBRD M21A	LBRDM16A.4	J		4.00		1463.00	2.468	2.334	0.50	184.46	2.25	4.804	0.000	4.804	79	200	200	DWC	30	470	0.010	0.63	19.71	0.24	0.83	0.34	OK	0.52	OK	0.01	0.00	0.85	0.850	0.84	1.62	1.49
399	LBRDM16A.4	LBRDM16A.3	C		13.00		1476.00	2.334	2.199	1.64	186.10	2.25	4.846	0.000	4.846	79	200	200	DWC	97	470	0.010	0.63	19.71	0.25	0.84	0.35	OK	0.53	OK	0.03	0.00	0.84		0.81	1.49	1.39
400	LBRDM16A.3	LBRDM16A.2	C		12.00		1488.00	2.199	2.109	1.51	187.61	2.25	4.886	0.000	4.886	79	200	200	DWC	133	470	0.010	0.63	19.71	0.25	0.84	0.35	OK	0.53	OK	0.03	0.00	0.81		0.78	1.39	1.33
401	LBRDM16A.2	LBRDM16A.1	C		20.00		1508.00	2.109	2.019	2.52	190.13	2.25	4.951	0.000	4.951	80	200	200	DWC	222	470	0.010	0.63	19.71	0.25	0.84	0.35	OK	0.53	OK	0.04	0.00	0.78		0.74	1.33	1.28
402	LBRDM16A.1	LBRDM16A	C		30.00		1538.00	2.019	1.998	3.78	193.92	2.25	5.050	0.000	5.050	81	200	200	DWC	1429	470	0.010	0.63	19.71	0.26	0.84	0.35	OK	0.53	OK	0.06	0.00	0.74		0.68	1.28	1.32
403	LBRDM16A	LBRDM16	J		9.00		3656.00	1.998	2.439	1.13	460.96	2.25	12.004	0.000	12.004	124	200	200	DWC	-20	470	0.010	0.63	19.71	0.61	1.05	0.57	OK	0.66	OK	0.02	0.00	0.68	0.680	0.66	1.32	1.78
404	LBRDM16	LBRDM17	C		10.00		3666.00	2.439	2.449	1.26	462.22	2.25	12.037	0.000	12.037	124	200	200	DWC	-1000	470	0.010	0.63	19.71	0.61	1.05	0.57	OK	0.66	OK	0.02	0.00	0.66		0.64	1.78	1.81
405	LBRDM17	LBRDM17A	C		10.00		3676.00	2.449	2.378	1.26	463.48	2.25	12.070	0.000	12.070	124	200	200	DWC	141	470	0.010	0.63	19.71	0.61	1.05	0.57	OK	0.66	OK	0.02	0.00	0.64		0.62	1.81	1.76
406	LBRDM17A	LBRDM18	C		30.00		3706.00	2.378	2.282	3.78	467.27	2.25	12.168	0.000	12.168	125	200	200	DWC	313	470	0.010	0.63	19.71	0.62	1.05	0.57	OK	0.66	OK	0.06	0.00	0.62		0.56	1.76	1.72
407	LBRDM18	LBRDM19	C		30.00		3736.00	2.282	2.329	3.78	471.05	2.25	12.267	0.000	12.267	126	200	200	DWC	-638	470	0.010	0.63	19.71	0.62	1.05	0.57	OK	0.66	OK	0.06	0.00	0.56		0.50	1.72	1.83
408	LBRDM19	LBRDM20	C		30.00		3766.00	2.329	2.532	3.78	474.83	2.25	12.365	0.000	12.365	126	200	200	DWC	-148	470	0.010	0.63	19.71	0.63	1.05	0.58	OK	0.66	OK	0.06	0.00	0.50		0.44	1.83	2.09
409	LBRDM20	LBRDM21	C		30.00		3796.00	2.532	2.820	3.78	478.61	2.25	12.464	0.000	12.464	127	200	200	DWC	-104	470	0.010	0.63	19.71	0.63	1.05	0.58	OK	0.66	OK	0.06	0.00	0.44		0.38	2.09	2.44
410	LBRDM21	LBRDM22	C		30.00		3826.00	2.820	3.024	3.78	482.40	2.25	12.562	0.000	12.562	127	200	200	DWC	-147	470	0.010	0.63	19.71	0.64	1.06	0.59	OK	0.66	OK	0.06	0.00	0.38		0.32	2.44	2.70
411	LBRDM22	LBRDM23	C		20.00		3846.00	3.024	3.255	2.52	484.92	2.25	12.628	0.000	12.628	127	200	200	DWC	-87	470	0.010	0.63	19.71	0.64	1.06	0.59	OK	0.66	OK	0.04	0.00	0.32		0.28	2.70	2.98
412	LBRDM23	LBRDM24	C		30.00		3876.00	3.255	3.624	3.78	488.70	2.25	12.727	0.000	12.727	128	200	200	DWC	-81	470	0.010	0.63	19.71	0.65	1.06	0.59	OK	0.66	OK	0.06	0.00	0.28		0.22	2.98	3.40

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
413	LBRDM24	LBRDM25	C		30.00		3906.00	3.624	4.112	3.78	492.48	2.25	12.825	0.000	12.825	128	200	200	DWC	-61	470	0.010	0.63	19.71	0.65	1.06	0.59	OK	0.66	OK	0.06	0.00	0.22		0.16	3.40	3.95
414	LBRDM25	LBRDM26	C		25.00		3931.00	4.112	4.223	3.15	495.64	2.25	12.907	0.000	12.907	129	200	200	DWC	-225	470	0.010	0.63	19.71	0.65	1.06	0.59	OK	0.66	OK	0.05	0.00	0.16		0.11	3.95	4.11
415	LBRDM26	LBRDM27	C		20.00		3951.00	4.223	4.312	2.52	498.16	2.25	12.973	0.000	12.973	129	200	200	DWC	-225	470	0.010	0.63	19.71	0.66	1.07	0.60	OK	0.67	OK	0.04	0.00	0.11		0.07	4.11	4.24
416	LBRDM27	LBRDM29	C		19.00		3970.00	4.312	4.432	2.40	500.55	2.25	13.035	0.000	13.035	129	200	200	DWC	-158	470	0.010	0.63	19.71	0.66	1.07	0.60	OK	0.67	OK	0.04	0.00	0.07		0.03	4.24	4.40
417	LBRDM29	LBRDM30	C		30.00		4000.00	4.432	4.570	3.78	504.34	2.25	13.134	0.000	13.134	130	200	200	DWC	-217	470	0.010	0.63	19.71	0.67	1.07	0.60	OK	0.67	OK	0.06	0.00	0.03		-0.03	4.40	4.60
418	LBRDM30	MALBRDM42	C		26.00		4026.00	4.570	4.930	3.28	507.61	2.25	13.219	0.000	13.219	130	200	200	DWC	-72	470	0.010	0.63	19.71	0.67	1.07	0.60	OK	0.67	OK	0.06	0.00	-0.03		-0.09	4.60	5.02
419	MALBRDM42	MARDM43	J		30.00		10634.00	4.930	4.688	3.78	1340.78	2.25	34.916	0.000	34.916	211	271	315	HDPE	124	780	0.010	0.60	34.39	1.02	1.14	0.82	Check	0.68	OK	0.04	0.00	-0.09	-0.090	-0.13	5.02	4.82
420	MARDM43	MARDM44	C		21.00		10655.00	4.688	4.734	2.65	1343.43	2.25	34.985	0.000	34.985	212	271	315	HDPE	-457	780	0.010	0.60	34.39	1.02	1.14	0.82	Check	0.68	OK	0.03	0.00	-0.13		-0.16	4.82	4.89
421	MARDM44	MASNRDM45	C		6.00		10661.00	4.734	4.473	0.76	1344.18	2.25	35.005	0.000	35.005	212	271	315	HDPE	23	780	0.010	0.60	34.39	1.02	1.14	0.82	Check	0.68	OK	0.01	0.00	-0.16		-0.17	4.89	4.64
422	MARDM49	MARDM48	H		30.00		30.00	4.750	4.623	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	236	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.65		3.47	1.10	1.15
423	MARDM48	MARDM47	C		25.00		55.00	4.623	4.467	3.15	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	160	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.15	0.00	3.47		3.32	1.15	1.15
424	MARDM47	MARDM46	C		16.00		71.00	4.467	4.473	2.02	8.95	2.25	0.233	0.000	0.233	18	200	200	DWC	-2667	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	3.32		3.23	1.15	1.24
425	MARDM46	MASNRDM45	C		6.00		77.00	4.473	4.473	0.76	9.71	2.25	0.253	0.000	0.253	18	200	200	DWC	0	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.04	0.00	3.23		3.19	1.24	1.28
426	MASNRDM45	MASNRDM1	J		15.00		10753.00	4.473	4.327	1.89	1355.78	2.25	35.307	0.000	35.307	213	271	315	HDPE	103	780	0.010	0.60	34.39	1.03	1.14	0.82	Check	0.68	OK	0.02	0.00	-0.17	-0.170	-0.19	4.64	4.52
427	MASNRDM1	MASNRDM2	C		30.00		10783.00	4.327	4.404	3.78	1359.56	2.25	35.405	0.000	35.405	213	271	315	HDPE	-390	780	0.010	0.60	34.39	1.03	1.14	0.82	Check	0.68	OK	0.04	0.00	-0.19		-0.23	4.52	4.63
428	MASNRDM2	MASNRDM3	C		15.00		10798.00	4.404	4.565	1.89	1361.46	2.25	35.455	0.000	35.455	213	271	315	HDPE	-93	780	0.010	0.60	34.39	1.03	1.14	0.82	Check	0.68	OK	0.02	0.00	-0.23		-0.25	4.63	4.82
429	MASNRDM3	MASNRDM4L	C	L	30.00		10828.00	4.565	4.773	3.78	1365.24	2.25	35.553	0.000	35.553	213	271	315	HDPE	-144	780	0.010	0.60	34.39	1.03	1.14	0.82	Check	0.68	OK	0.04	0.00	-0.25		-0.29	4.82	5.06
430	MASNRDM4	MASNRDM5	H		26.00	10828.00	10854.00	4.773	4.894	3.28	1368.52	2.25	35.638	0.000	35.638	214	271	315	HDPE	-215	780	0.010	0.60	34.39	1.04	1.14	0.82	Check	0.68	OK	0.03	0.00	3.56		3.53	1.21	1.36
431	MASNRDM5	MASNRDM6	C		16.00		10870.00	4.894	5.008	2.02	1370.53	2.25	35.691	0.000	35.691	214	271	315	HDPE	-140	780	0.010	0.60	34.39	1.04	1.14	0.82	Check	0.68	OK	0.02	0.00	3.53		3.51	1.36	1.50
432	MASNRDM6	MASNRDM7	C		15.00		10885.00	5.008	5.023	1.89	1372.42	2.25	35.740	0.000	35.740	214	271	315	HDPE	-1000	780	0.010	0.60	34.39	1.04	1.14	0.82	Check	0.68	OK	0.02	0.00	3.51		3.49	1.50	1.53
433	MASNRDM7	MASNRDM13	C		21.00		10906.00	5.023	4.960	2.65	1375.07	2.25	35.809	0.000	35.809	214	271	315	HDPE	333	780	0.010	0.60	34.39	1.04	1.14	0.82	Check	0.68	OK	0.03	0.00	3.49		3.46	1.53	1.50
434	SNRDM3	SNRDM4	H		30.00		30.00	6.223	5.950	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	110	110	0.010	1.29	40.73	0.00	0.30	0.07	OK	0.39	OK	0.27	0.00	5.12		4.85	1.10	1.10
435	SNRDM4	SNRDM5	C		10.00		40.00	5.950	5.790	1.26	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	62	62	0.010	1.72	54.26	0.00	0.30	0.07	OK	0.52	OK	0.16	0.00	4.85		4.69	1.10	1.10
436	SNRDM5	SNRDM6	C		18.00		58.00	5.790	5.460	2.27	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	55	55	0.010	1.83	57.61	0.00	0.30	0.07	OK	0.55	OK	0.33	0.00	4.69		4.36	1.10	1.10
437	SNRDM6	SNRDM7	C		15.00		73.00	5.460	5.160	1.89	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	50	50	0.010	1.92	60.42	0.00	0.30	0.07	OK	0.58	OK	0.30	0.00	4.36		4.06	1.10	1.10
438	SNRDM7	SN2CRRDM8	C		30.00		103.00	5.160	5.332	3.78	12.99	2.25	0.338	0.000	0.338	21	200	200	DWC	-174	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.06		3.88	1.10	1.45
439	2CRRDM6	2CRRDM5	H		7.00		7.00	5.583	5.562	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	333	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	4.48		4.44	1.10	1.12
440	2CRRDM5.4	2CRRDM5.3	H		11.00		11.00	5.461	5.497	1.39	1.39	2.25	0.036	0.000	0.036	7	200	200	DWC	-306	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	4.36		4.30	1.10	1.20
441	2CRRDM5.3	2CRRDM5.2	C		8.00		19.00	5.497	5.544	1.01	2.40	2.25	0.062	0.000	0.062	9	200	200	DWC	-170	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	4.30		4.25	1.20	1.29
442	2CRRDM5.2	2CRRDM5.1	C		29.00		48.00	5.544	5.542	3.66	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	14500	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	4.25		4.08	1.29	1.46
443	2CRRDM5.1	2CRRDM5	C		30.00		78.00	5.542	5.562	3.78	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	-1500	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.08		3.90	1.46	1.66
444	2CRRDM5	2CRRDM4	J		18.00		103.00	5.562	5.564	2.27	12.99	2.25	0.338	0.000	0.338	21	200	200	DWC	-9000	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	3.90	3.900	3.79	1.66	1.77
445	2CRRDM4	2CRRDM3	C		17.00		120.00	5.564	5.419	2.14	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	117	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.06	0.00	3.79		3.73	1.77	1.69
446	2CRRDM3	2CRRDM2	C		30.00		150.00	5.419	5.228	3.78	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	157	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.73		3.63	1.69	1.60
447	2CRRDM2	2CRRDM1	C		30.00		180.00	5.228	5.143	3.78	22.70	2.25	0.591	0.000	0.591	28	200	200	DWC	353	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	3.63		3.57	1.60	1.57
448	2CRRDM1	SN2CRRDM8	C		30.00		210.00	5.143	5.332	3.78	26.48	2.25	0.690	0.000	0.690	30	200	200	DWC	-159	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	3.57		3.51	1.57	1.82
449	SN2CRRDM8	SNPARDM9	J		18.00		331.00	5.332	5.057	2.27	41.73	2.25	1.087	0.000	1.087	38	200	200	DWC	65	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.04	0.00	3.51	3.510	3.47	1.82	1.59
450	2PARDM2	2PARDM1	H		15.00		15.00	5.524	5.293	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	65	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.23	0.00	4.42		4.19	1.10	1.10
451	2PARDM1	SNPARDM9	C		30.00		45.00	5.293	5.057	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	127	127	0.010	1.20	37.91	0.00	0.30	0.07	OK	0.36	OK	0.24	0.00	4.19		3.95	1.10	1.11
452	SNPARDM9	SNRDM10	J		24.00		400.00	5.060	4.883	3.03	50.43	2.25	1.313	0.000	1.313	41	200	200	DWC	136	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.05	0.00	3.47	3.470	3.42	1.59	1.46
453	SNRDM10	SNRDM11	C		30.00		430.00	4.883	4.843	3.78	54.22	2.25	1.412	0.000	1.412	43	200	200	DWC	750	250	0.010	0.86	27.02	0.05	0.53	0.16	OK	0.45	OK	0.12	0.00	3.42		3.30	1.46	1.54
454	SNRDM11	SNRDM12	C		30.00		460.00	4.843	5.156	3.78	58.00	2.25	1.510	0.000	1.510	44	200	200	DWC	-96	250	0.010	0.86	27.02	0.06	0.55	0.17	OK	0.47	OK	0.12	0.00	3.30		3.18	1.54	1.98
455	SNRDM12	MASNRDM13	C		13.00		473.00	5.156	4.960	1.64	59.64	2.25	1.553	0.000	1.553	45	200	200	DWC	66	250	0.010	0.86	27.02	0.06	0.55	0.17	OK	0.47	OK	0.05	0.00	3.18		3.13	1.98	1.83
456	MASNRDM13	SNRDM14	J		30.00		11409.00	4.960	4.867	3.78	1438.49	2.25	37.461	0.000	37.461	219	271	315	HDPE	323	780	0.010	0.60	34.39	1.09	1.14	0.82	Check	0.68	OK	0.04	0.00	3.13	3.130	3.09	1.83	1.78
457	SNRDM14	SNRDM15	C		16.00		11425.00	4.867	4.992	2.02	1440.51	2.25	37.513	0.000	37.513	219	271	315	HDPE	-128	780	0.010	0.60	34.39	1.09	1.14	0.82	Check	0.68	OK	0.02	0.00	3.09		3.07	1.78	1.92
458	SNRDM15	SNRDM16	C		13.00		11438.00	4.992	5.184	1.64	1442.15	2.25	37.556	0.000	37.556	219	271	315	HDPE	-68	780	0.010	0.60	34.39	1.09	1.14	0.82	Check	0.68	OK	0.02	0.00	3.07		3.05	1.92	2.13
459	SNRDM16	SNRDM17	C		16.00		11454.00	5.184	5.063	2.02	1444.17	2.25	37.608	0.000	37.608	219	271	315	HDPE	132	780	0.010	0.60	34.39	1.09	1.14	0.82	Check	0.68	OK	0.02	0.00	3.05		3.03	2.13	2.03
460	SNRDM17	SNRDM18	C		22.00		11476.00	5.063	4.948	2.77	1446.94	2.25	37.681	0.000	37.681	220	271	315	HDPE	191	780	0.010	0.60	34.39	1.10	1.14	0.82	Check	0.68	OK	0.03	0.00	3.03		3.00	2.03	1.95
461	SNRDM18	SN3CRRDM19	C		20.00		11496.00	4.948	4.956	2.52	1449.46	2.25	37.746	0.000	37.746	220	271	315	HDPE	-2500	780	0.010	0.60	34.39	1.10	1.14	0.82	Check	0.68	OK	0.03	0.00	3.00		2.97	1.95	1.99
462	SN3CRRDM19	3CRRDM1	C		18.00		11514.00	4.960	5.139	2.27	1451.73	2.25	37.806	0.000	37.806	220	271	315	HDPE	-101	780	0.010	0.60	34.39	1.10	1.14	0.82	Check	0.68	OK	0.02	0.00	2.97		2.95	1.99	2.19
463	3CRRDM1	3CRRDM2	C		30.00		11544.00	5.139	5.138	3.78	1455.51	2.25	37.904	0.000	37.904	220	271	315	HDPE	30000	780	0.010	0.60	34.39	1.10	1.14	0.82	Check	0.68	OK	0.04	0.00	2.95		2.91	2.19	2.23
464	3CRRDM2	3CRRDM3	C		30.00		11574.00	5.138	5.181	3.78	1459.30	2.25	38.003	0.000	38.003	221	271	315	HDPE	-698	780	0.010	0.60	34.39	1.11	1.14	0.82	Check	0.68	OK	0.04	0.00	2.91		2.87	2.23	2.31
465	3CRRDM3	3CRRDM4	C		30.00		11604.00	5.181	5.197	3.78	1463.08	2.25	38.101	0.000	38.101	221	271	315	HDPE	-1875	780	0.010	0.60	34.39	1.11	1.14	0.82	Check	0.68	OK	0.04	0.00	2.87		2.83	2.31	2.37
466	3CRRDM4	3CRRDM5	C		30.00		11634.00	5.197	5.165	3.78	1466.86	2.25	38.200	0.000	38.200	221	271	315	HDPE	937	780	0.010	0.60	34.39	1.11	1.14	0.82	Check	0.68	OK	0.04	0.00	2.83		2.79	2.37	2.38
467	3CRRDM5	PO3CRRDM10	C		27.00		11661.00	5.165	4.975	3.40	1470.27	2.25	38.288	0.000	38.288	221	271	315	HDPE	142	780	0.010	0.60	34.39	1.11	1.14	0.82	Check	0.68	OK	0.03	0.00	2.79		2.76	2.38	2.22
468	PORDM1.18	PORDM1.17	H		9.00		9.00	4.193	4.197	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	-2250	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.05	0.00	3.09		3.04	1.10	1.16
469	PORDM1.17	PORDM1.16	C		20.00		29.00	4.197	3.525	2.52	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	30	32	0.010	2.40	75.52	0.00	0.30	0.07	OK	0.72	OK	0.63	0.00	3.04		2.41	1.16	1.12
470	PORDM1.16	PORDM1.15	C		30.00		59.00	3.525	3.584	3.78	7.44	2.25	0.194	0.000	0.194	16	200	200	DWC	-508	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.41		2.24	1.12	1.34
471	PORDM1.15	PORDM1.14	C		28.00		87.00	3.584	3.890	3.53	10.97	2.25	0.286	0.000	0.286	20	200	200	DWC	-92	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.16	0.00	2.24		2.08	1.34	1.81
472	PORDM1.14	PORDM1.13	C		28.00		115.00	3.890	3.975	3.53	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	-329	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.09	0.00	2.08		1.99	1.81	1.99
473	PORDM1.13	PORDM1.12	C		30.00		145.00	3.975	4.233	3.78	18.28	2.25	0.476	0.000	0.476	25	200	200	DWC	-116	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	1.99		1.89	1.99	2.34
474	PORDM1.12	PORDM1.11	C		30.00		175.00	4.233	4.220	3.78	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	2308	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	1.89		1.81	2.34	2.41
475	PORDM1.11	PORDM1.10	C		30.00		205.00	4.220	4.484	3.78	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	-114	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	1.81		1.75	2.41	2.73
476	PORDM1.10	PORDM1.9	C		17.00		222.00	4.484	4.597	2.14	27.99	2.25	0.729	0.000	0.729	31	200	200	DWC	-150	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	1.75		1.71	2.73	2.89
477	PORDM1.9	PORDM1.8	C		18.00		240.00	4.597	4.710	2.27	30.26	2.25	0.788	0.000	0.788	32	200	200	DWC	-159	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	1.71		1.67	2.89	3.04
478	PORDM1.8	PORDM1.7	C		30.00		270.00	4.710	5.087	3.78	34.04	2.25	0.887	0.000	0.887	34	200	200	DWC	-80	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	1.67		1.61	3.04	3.48
479	PORDM1.7	PORMRDM1.6	C		30.00		300.00	5.087	5.396	3.78	37.83	2.25	0.985	0.000	0.985	36	200	200	DWC	-97	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	1.61		1.55	3.48	3.85
480	RMRDM6	RMRDM5	H		9.00		9.00	3.742	3.905	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	-55	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	2.64		2.59	1.10	1.32
481	RMRDM5	RMRDM4	C		23.00		32.00	3.905	3.687	2.90	4.03	2.25	0.105	0.000	0.105	12	200	200	DWC	106	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.13	0.00	2.59		2.46	1.32	1.23

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
482	RMRDM4	RMRDM3	C		30.00		62.00	3.687	4.054	3.78	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	-82	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.46		2.29	1.23	1.76
483	RMRDM3	RMDARDM2	C		30.00		92.00	4.054	4.497	3.78	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	-68	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.29		2.12	1.76	2.38
484	DARDM6	DARDM7	H		30.00		30.00	4.720	3.796	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	32	32	0.010	2.40	75.52	0.00	0.30	0.07	OK	0.72	OK	0.94	0.00	3.62		2.68	1.10	1.12
485	DARDM7	DARDM8	C		8.00		38.00	3.796	3.735	1.01	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	131	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	2.68		2.63	1.12	1.11
486	DARDM8	DARDM9	C		24.00		62.00	3.735	4.140	3.03	7.82	2.25	0.204	0.000	0.204	17	200	200	DWC	-59	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.14	0.00	2.63		2.49	1.11	1.65
487	DARDM9	RMDARDM2	C		20.00		82.00	4.140	4.497	2.52	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	-56	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	2.49		2.38	1.65	2.12
488	RMDARDM2	RMRDM1	J		5.00		179.00	4.497	4.463	0.63	22.57	2.25	0.588	0.000	0.588	28	200	200	DWC	147	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.01	0.00	2.12	2.120	2.11	2.38	2.35
489	RMRDM1	PORMRDM1.6	C		30.00		209.00	4.463	5.396	3.78	26.35	2.25	0.686	0.000	0.686	30	200	200	DWC	-32	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	2.11		2.05	2.35	3.35
490	PORMRDM1.6	PORDM1.5	J		11.00		520.00	5.396	5.464	1.39	65.56	2.25	1.707	0.000	1.707	47	200	200	DWC	-162	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.02	0.00	1.55	1.550	1.53	3.85	3.93
491	PORDM1.5	PORDM1.4	C		30.00		550.00	5.464	5.631	3.78	69.35	2.25	1.806	0.000	1.806	48	200	200	DWC	-180	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.06	0.00	1.53		1.47	3.93	4.16
492	PORDM1.4	PORDM1.3	C		30.00		580.00	5.631	5.087	3.78	73.13	2.25	1.904	0.000	1.904	50	200	200	DWC	55	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	1.47		1.41	4.16	3.68
493	PORDM1.3	POJCRRDM1.2	C		30.00		610.00	5.090	5.859	3.78	76.91	2.25	2.003	0.000	2.003	51	200	200	DWC	-39	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	1.41		1.35	3.68	4.51
494	POJCRRDM1.2	JCRRDM1	C		22.00		632.00	5.859	5.820	2.77	79.69	2.25	2.075	0.000	2.075	52	200	200	DWC	564	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.05	0.00	1.35		1.30	4.51	4.52
495	JCRRDM1	JCRRDM2	C		30.00		662.00	5.820	5.245	3.78	83.47	2.25	2.174	0.000	2.174	53	200	200	DWC	52	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	1.30		1.24	4.52	4.01
496	JCRRDM2	JCRRDM3	C		30.00		692.00	5.245	4.544	3.78	87.25	2.25	2.272	0.000	2.272	54	200	200	DWC	43	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.06	0.00	1.24		1.18	4.01	3.36
497	JCRRDM3	JCRRDM4	C		21.00		713.00	4.544	4.324	2.65	89.90	2.25	2.341	0.000	2.341	55	200	200	DWC	95	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.04	0.00	1.18		1.14	3.36	3.18
498	JCRRDM4.3	JCRRDM4.2	H		9.00		9.00	4.033	4.187	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	-58	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	2.93		2.88	1.10	1.31
499	JCRRDM4.2	JCRRDM4.1	C		30.00		39.00	4.187	4.313	3.78	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-238	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.88		2.71	1.31	1.60
500	JCRRDM4.1	JCRRDM4	C		30.00		69.00	4.313	4.324	3.78	8.70	2.25	0.227	0.000	0.227	17	200	200	DWC	-2727	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.71		2.54	1.60	1.78
501	JCRRDM4	JCRRDM5	J		22.00		804.00	4.324	4.147	2.77	101.37	2.25	2.640	0.000	2.640	58	200	200	DWC	124	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.05	0.00	1.14	1.140	1.09	3.18	3.06
502	JCRRDM5	JCRYARDM6	C		30.00		834.00	4.147	3.970	3.78	105.15	2.25	2.738	0.000	2.738	60	200	200	DWC	169	470	0.010	0.63	19.71	0.14	0.71	0.26	OK	0.44	OK	0.06	0.00	1.09		1.03	3.06	2.94
503	YARDM2	YARDM1	H		20.00		20.00	4.394	4.354	2.52	2.52	2.25	0.066	0.000	0.066	10	200	200	DWC	500	470	0.010	0.63	19.71	0.00	0.30	0.07	OK	0.19	Check	0.04	0.00	3.29		3.25	1.10	1.10
504	YARDM1	JCRYARDM6	C		30.00		50.00	4.354	3.970	3.78	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	78	80	0.010	1.52	47.76	0.00	0.30	0.07	OK	0.46	OK	0.38	0.00	3.25		2.87	1.10	1.10
505	JCRYARDM6	JCRRDM7	J		25.00		909.00	3.970	3.828	3.15	114.61	2.25	2.985	0.000	2.985	62	200	200	DWC	176	470	0.010	0.63	19.71	0.15	0.73	0.27	OK	0.46	OK	0.05	0.00	1.03	1.030	0.98	2.94	2.85
506	JCRRDM7	JCRRDM8	C		30.00		939.00	3.828	3.913	3.78	118.39	2.25	3.083	0.000	3.083	63	200	200	DWC	-353	470	0.010	0.63	19.71	0.16	0.74	0.28	OK	0.46	OK	0.06	0.00	0.98		0.92	2.85	2.99
507	JCRRDM8.2	JCRRDM8.1	H		30.00		30.00	4.054	4.098	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-682	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.95		2.78	1.10	1.32
508	JCRRDM8.1	JCRRDM8	C		30.00		60.00	4.098	3.913	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	162	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.78		2.61	1.32	1.30
509	JCRRDM8	JCRRDM9	J		12.00		1011.00	3.913	4.719	1.51	127.47	2.25	3.320	0.000	3.320	66	200	200	DWC	-15	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.03	0.00	0.92	0.920	0.89	2.99	3.83
510	JCRRDM9	JCR7CRRDM10	C		30.00		1041.00	4.719	4.505	3.78	131.25	2.25	3.418	0.000	3.418	66	200	200	DWC	140	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.06	0.00	0.89		0.83	3.83	3.68
511	PORDM29	PORDM28	H		30.00		30.00	5.390	5.297	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	323	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	4.29		4.12	1.10	1.18
512	PORDM28	PORDM27	C		30.00		60.00	5.297	4.903	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	76	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.32	0.00	4.12		3.80	1.18	1.10
513	PORDM27	PORDM25	C		32.00		92.00	4.903	4.640	4.03	11.60	2.25	0.302	0.000	0.302	20	200	200	DWC	122	125	0.010	1.21	38.21	0.01	0.30	0.07	OK	0.36	OK	0.26	0.00	3.80		3.54	1.10	1.10
514	PORDM25	PORDM24	C		30.00		122.00	4.640	4.140	3.78	15.38	2.25	0.401	0.000	0.401	23	200	200	DWC	60	60	0.010	1.75	55.15	0.01	0.30	0.07	OK	0.53	OK	0.50	0.00	3.54		3.04	1.10	1.10
515	PORDM24	PORDM23	C		30.00		152.00	4.140	4.111	3.78	19.16	2.25	0.499	0.000	0.499	26	200	200	DWC	1034	400	0.010	0.68	21.36	0.02	0.40	0.10	OK	0.27	Check	0.08	0.00	3.04		2.96	1.10	1.15
516	PORDM23	PO10CRRDM22	C		30.00		182.00	4.111	4.104	3.78	22.95	2.25	0.598	0.000	0.598	28	200	200	DWC	4286	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	2.96		2.90	1.15	1.20
517	10CRRDM1	PO10CRRDM22	H		30.00		30.00	4.173	4.104	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	435	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.07		2.90	1.10	1.20
518	PO10CRRDM22	PORDM21	J		16.00		228.00	4.104	4.181	2.02	28.75	2.25	0.749	0.000	0.749	31	200	200	DWC	-208	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	2.90	2.900	2.87	1.20	1.31
519	PORDM21	PORDM20	C		30.00		258.00	4.181	4.341	3.78	32.53	2.25	0.847	0.000	0.847	33	200	200	DWC	-188	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.87		2.81	1.31	1.53
520	PORDM20	PORDM19	C		30.00		288.00	4.341	4.494	3.78	36.31	2.25	0.946	0.000	0.946	35	200	200	DWC	-196	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	2.81		2.75	1.53	1.74
521	PORDM19	PO7CRRDM18	C		30.00		318.00	4.494	4.589	3.78	40.09	2.25	1.044	0.000	1.044	37	200	200	DWC	-316	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	2.75		2.69	1.74	1.90
522	PORDM16	PORDM17	H		30.00		30.00	4.822	4.645	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	169	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	3.72		3.54	1.10	1.11
523	PORDM17	PO7CRRDM18	C		11.00		41.00	4.645	4.589	1.39	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	196	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.06	0.00	3.54		3.48	1.11	1.11
524	PO7CRRDM18	7CRRDM1	J		30.00		389.00	4.589	4.708	3.78	49.05	2.25	1.277	0.000	1.277	41	200	200	DWC	-252	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	2.69	2.690	2.63	1.90	2.08
525	7CRRDM1	7CRRDM2	C		30.00		419.00	4.708	4.629	3.78	52.83	2.25	1.376	0.000	1.376	42	200	200	DWC	380	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.63		2.57	2.08	2.06
526	7CRRDM2	7CRRDM3	C		30.00		449.00	4.629	4.576	3.78	56.61	2.25	1.474	0.000	1.474	44	200	200	DWC	566	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.57		2.51	2.06	2.07
527	7CRRDM3	7CRRDM4	C		9.00		458.00	4.576	4.516	1.13	57.75	2.25	1.504	0.000	1.504	44	200	200	DWC	150	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.02	0.00	2.51		2.49	2.07	2.03
528	7CRRDM4	7CRRDM5	C		23.00		481.00	4.516	4.424	2.90	60.65	2.25	1.579	0.000	1.579	45	200	200	DWC	250	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.05	0.00	2.49		2.44	2.03	1.98
529	7CRRDM5	7CRRDM6	C		27.00		508.00	4.424	4.364	3.40	64.05	2.25	1.668	0.000	1.668	47	200	200	DWC	450	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	2.44		2.38	1.98	1.98
530	7CRRDM6	7CRRDM7	C		8.00		516.00	4.364	4.383	1.01	65.06	2.25	1.694	0.000	1.694	47	200	200	DWC	-421	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.02	0.00	2.38		2.36	1.98	2.02
531	7CRRDM7	7CRRDM8	C		15.00		531.00	4.383	4.252	1.89	66.95	2.25	1.744	0.000	1.744	48	200	200	DWC	115	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.03	0.00	2.36		2.33	2.02	1.92
532	7CRRDM8	7CRRDM9	C		18.00		549.00	4.252	4.503	2.27	69.22	2.25	1.803	0.000	1.803	48	200	200	DWC	-72	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.04	0.00	2.33		2.29	1.92	2.21
533	7CRRDM9	JCR7CRRDM10	C		30.00		579.00	4.503	4.505	3.78	73.00	2.25	1.901	0.000	1.901	50	200	200	DWC	-15000	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	2.29		2.23	2.21	2.28
534	JCR7CRRDM10	JCRRDM11	J		30.00		1650.00	4.505	4.539	3.78	208.04	2.25	5.418	0.000	5.418	84	200	200	DWC	-882	470	0.010	0.63	19.71	0.27	0.85	0.36	OK	0.53	OK	0.06	0.00	0.83	0.830	0.77	3.68	3.77
535	JCRRDM11	JCRGRRDM12	C		22.00		1672.00	4.539	4.596	2.77	210.81	2.25	5.490	0.000	5.490	84	200	200	DWC	-386	470	0.010	0.63	19.71	0.28	0.86	0.37	OK	0.54	OK	0.05	0.00	0.77		0.72	3.77	3.88
536	GRRDM5	GRRDM4	H		22.00		22.00	4.411	4.602	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	-115	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.13	0.00	3.31		3.18	1.10	1.42
537	GRRDM4	GRRDM3	C		30.00		52.00	4.602	4.511	3.78	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	330	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.18		3.01	1.42	1.50
538	GRRDM3.2	GRRDM3.1	H		8.00		8.00	4.324	4.397	1.01	1.01	2.25	0.026	0.000	0.026	6	200	200	DWC	-110	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	3.22		3.17	1.10	1.23
539	GRRDM3.1	GRRDM3	C		30.00		38.00	4.397	4.511	3.78	4.79	2.25	0.125	0.000	0.125	13	200	200	DWC	-263	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.17		3.00	1.23	1.51
540	GRRDM3	GRRDM2	J		20.00		110.00	4.511	4.598	2.52	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	-230	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.07	0.00	3.00	3.000	2.93	1.51	1.67
541	GRRDM2	GRRDM1	C		7.00		117.00	4.598	4.601	0.88	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	-2333	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.02	0.00	2.93		2.91	1.67	1.69
542	GRRDM1	JCRGRRDM12	C		30.00		147.00	4.601	4.596	3.78	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	6000	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.91		2.81	1.69	1.79
543	JCRGRRDM12	JCRRDM13	J		22.00		1841.00	4.596	4.749	2.77	232.12	2.25	6.045	0.000	6.045	88	200	200	DWC	-144	470	0.010	0.63	19.71	0.31	0.88	0.39	OK	0.55	OK	0.05	0.00	0.72	0.720	0.67	3.88	4.08
544	JCRRDM13.4	JCRRDM13.3	H		9.00		9.00	4.524	4.531	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	-1286	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	3.42		3.37	1.10	1.16
545	JCRRDM13.3	JCRRDM13.2	C		30.00		39.00	4.531	4.639	3.78	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-278	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.37		3.20	1.16	1.44
546	JCRRDM13.2	JCRRDM13.1	C		30.00		69.00	4.639	4.692	3.78	8.70	2.25	0.227	0.000	0.227	17	200	200	DWC	-566	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.20		3.03	1.44	1.66
547	JCRRDM13.1	JCRRDM13	C		10.00		79.00	4.692	4.749	1.26	9.96	2.25	0.259	0.000	0.259	19	200	200	DWC	-175	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.06	0.00	3.03		2.97	1.66	1.78
548	JCRRDM13	JCRPSTRDM14	J		30.00		1950.00	4.479	4.562	3.78	245.86	2.25	6.403	0.000	6.403	91	200	200	DWC	-361	470	0.010	0.63	19.71	0.32	0.89	0.40	OK	0.56	OK	0.06	0.00	0.67	0.670	0.61	3.81	3.95
549	JCRRDM15.7	JCRRDM15.6	H		9.00		9.00	4.532	4.471	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	148	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.06	0.00	3.43		3.37	1.10	1.10
550	JCRRDM15.6	JCRRDM15.5	C		30.00		39.00	4.471	4.460	3.78	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	2727	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.37		3.20	1.10	1.26

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
551	JCRRDM15.5	JCRRDM15.4	C		30.00		69.00	4.460	4.439	3.78	8.70	2.25	0.227	0.000	0.227	17	200	200	DWC	1429	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.20		3.03	1.26	1.41
552	JCRRDM15.4	JCRRDM15.3	C		14.00		83.00	4.439	4.502	1.77	10.46	2.25	0.273	0.000	0.273	19	200	200	DWC	-222	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.08	0.00	3.03		2.95	1.41	1.55
553	JCRRDM15.3	JCRRDM15.2	C		20.00		103.00	4.502	4.524	2.52	12.99	2.25	0.338	0.000	0.338	21	200	200	DWC	-909	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	2.95		2.84	1.55	1.68
554	JCRRDM15.2	JCRRDM15.1	C		30.00		133.00	4.524	4.689	3.78	16.77	2.25	0.437	0.000	0.437	24	200	200	DWC	-182	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.84		2.74	1.68	1.95
555	JCRRDM15.1	JCRRDM15	C		8.00		141.00	4.689	4.713	1.01	17.78	2.25	0.463	0.000	0.463	25	200	200	DWC	-333	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.03	0.00	2.74		2.71	1.95	2.00
556	1STRDM5	1STRDM4	H		30.00		30.00	6.180	5.904	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	109	109	0.010	1.30	40.92	0.00	0.30	0.07	OK	0.39	OK	0.28	0.00	5.08		4.80	1.10	1.10
557	1STRDM4	1STRDM3	C		10.00		40.00	5.904	5.792	1.26	5.04	2.25	0.131	0.000	0.131	13	200	200	DWC	89	90	0.010	1.43	45.03	0.00	0.30	0.07	OK	0.43	OK	0.11	0.00	4.80		4.69	1.10	1.10
558	1STRDM3	1STRDM2	C		30.00		70.00	5.792	5.836	3.78	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	-682	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	4.69		4.52	1.10	1.32
559	1STRDM2	1STRDM1	C		30.00		100.00	5.836	5.809	3.78	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	1111	165	0.010	1.06	33.26	0.01	0.30	0.07	OK	0.32	OK	0.18	0.00	4.52		4.34	1.32	1.47
560	1STRDM1.1	1STRDM1	H		15.00		15.00	5.742	5.809	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	-224	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	4.64		4.55	1.10	1.26
561	1STRDM1	JCR1STRDM24	J		12.00		127.00	5.809	5.703	1.51	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	113	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.04	0.00	4.34	4.340	4.30	1.47	1.40
562	JCRRDM25	JCR1STRDM24	H		30.00		30.00	5.893	5.703	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	158	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.19	0.00	4.79		4.60	1.10	1.10
563	JCR1STRDM24	JCRRDM23	J		22.00		179.00	5.703	5.592	2.77	22.57	2.25	0.588	0.000	0.588	28	200	200	DWC	198	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.05	0.00	4.30	4.300	4.25	1.40	1.34
564	JCRRDM23	JCRRDM22	C		12.00		191.00	5.592	5.590	1.51	24.08	2.25	0.627	0.000	0.627	29	200	200	DWC	6000	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.03	0.00	4.25		4.22	1.34	1.37
565	JCRRDM22	JCRRDM21	C		30.00		221.00	5.590	5.622	3.78	27.86	2.25	0.726	0.000	0.726	31	200	200	DWC	-937	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	4.22		4.16	1.37	1.46
566	JCRRDM21	JCRRDM20	C		30.00		251.00	5.622	5.341	3.78	31.65	2.25	0.824	0.000	0.824	33	200	200	DWC	107	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	4.16		4.10	1.46	1.24
567	JCRRDM20	JCRRDM19	C		30.00		281.00	5.341	5.300	3.78	35.43	2.25	0.923	0.000	0.923	35	200	200	DWC	732	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	4.10		4.04	1.24	1.26
568	JCRRDM19	JCRRDM18	C		30.00		311.00	5.300	5.370	3.78	39.21	2.25	1.021	0.000	1.021	37	200	200	DWC	-429	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	4.04		3.98	1.26	1.39
569	JCRRDM18	JCRSLRDM17	C		30.00		341.00	5.370	5.415	3.78	42.99	2.25	1.120	0.000	1.120	38	200	200	DWC	-667	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	3.98		3.92	1.39	1.50
570	SLRDM2	SLRDM1	H		24.00		24.00	5.013	5.162	3.03	3.03	2.25	0.079	0.000	0.079	11	200	200	DWC	-161	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.14	0.00	3.91		3.77	1.10	1.39
571	SLRDM1	JCRSLRDM17	C		30.00		54.00	5.162	5.415	3.78	6.81	2.25	0.177	0.000	0.177	16	200	200	DWC	-119	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.77		3.60	1.39	1.82
572	JCRSLRDM17	JCRRDM16	J		19.00		414.00	5.415	5.098	2.40	52.20	2.25	1.359	0.000	1.359	42	200	200	DWC	60	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.04	0.00	3.60	3.600	3.56	1.82	1.54
573	JCRRDM16	JCRRDM15	C		30.00		444.00	5.098	4.713	3.78	55.98	2.25	1.458	0.000	1.458	44	200	200	DWC	78	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	3.56		3.50	1.54	1.21
574	JCRRDM15	JCRPSTRDM14	J		24.00		609.00	4.713	4.562	3.03	76.79	2.25	2.000	0.000	2.000	51	200	200	DWC	159	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.05	0.00	2.71	2.710	2.66	2.00	1.90
575	JCRPSTRDM14	PSTRDM2	J		24.00		2583.00	4.562	4.550	3.03	325.67	2.25	8.481	0.000	8.481	104	200	200	DWC	2000	470	0.010	0.63	19.71	0.43	0.97	0.46	OK	0.61	OK	0.05	0.00	0.61	0.610	0.56	3.95	3.99
576	PSTRDM2	PSTRDM1	C		30.00		2613.00	4.550	4.634	3.78	329.46	2.25	8.580	0.000	8.580	105	200	200	DWC	-357	470	0.010	0.63	19.71	0.44	0.98	0.47	OK	0.61	OK	0.06	0.00	0.56		0.50	3.99	4.13
577	PSTRDM1	5CRPSTRDM13	C		30.00		2643.00	4.634	4.733	3.78	333.24	2.25	8.678	0.000	8.678	106	200	200	DWC	-303	470	0.010	0.63	19.71	0.44	0.98	0.47	OK	0.61	OK	0.06	0.00	0.50		0.44	4.13	4.29
578	5CRPSTRDM13	5CRRDM12	C		20.00		2663.00	4.733	4.710	2.52	335.76	2.25	8.744	0.000	8.744	106	200	200	DWC	870	470	0.010	0.63	19.71	0.44	0.98	0.47	OK	0.61	OK	0.04	0.00	0.44		0.40	4.29	4.31
579	5CRRDM2	5CRRDM3	H		30.00		30.00	5.002	5.004	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-15000	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.90		3.73	1.10	1.27
580	5CRRDM3	5CRRDM4	C		30.00		60.00	5.004	4.961	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	698	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.73		3.56	1.27	1.40
581	5CRRDM4	5CRRDM5	C		30.00		90.00	4.961	4.954	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	4286	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.56		3.39	1.40	1.56
582	5CRRDM5	5CRRDM6	C		30.00		120.00	4.954	4.819	3.78	15.13	2.25	0.394	0.000	0.394	23	200	200	DWC	222	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.39		3.29	1.56	1.53
583	5CRRDM6	5CRRDM7	C		30.00		150.00	4.819	4.818	3.78	18.91	2.25	0.493	0.000	0.493	26	200	200	DWC	30000	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.29		3.19	1.53	1.63
584	5CRRDM7	5CRRDM8	C		15.00		165.00	4.818	4.776	1.89	20.80	2.25	0.542	0.000	0.542	27	200	200	DWC	357	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.04	0.00	3.19		3.15	1.63	1.63
585	5CRRDM8	5CRRDM9	C		10.00		175.00	4.776	4.835	1.26	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	-169	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.03	0.00	3.15		3.12	1.63	1.72
586	5CRRDM9	5CRRDM10	C		30.00		205.00	4.835	4.800	3.78	25.85	2.25	0.673	0.000	0.673	30	200	200	DWC	857	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	3.12		3.06	1.72	1.74
587	5CRRDM10	5CRRDM11	C		30.00		235.00	4.800	4.796	3.78	29.63	2.25	0.772	0.000	0.772	32	200	200	DWC	7500	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	3.06		3.00	1.74	1.80
588	5CRRDM11	5CRRDM12	C		16.00		251.00	4.796	4.710	2.02	31.65	2.25	0.824	0.000	0.824	33	200	200	DWC	186	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	3.00		2.97	1.80	1.74
589	5CRRDM12	5CRRDM1.2	J		30.00		2944.00	4.710	4.948	3.78	371.19	2.25	9.666	0.000	9.666	111	200	200	DWC	-126	470	0.010	0.63	19.71	0.49	0.99	0.49	OK	0.62	OK	0.06	0.00	0.40	0.400	0.34	4.31	4.61
590	5CRRDM1.2	5CRRDM1.1	C		30.00		2974.00	4.950	4.948	3.78	374.97	2.25	9.765	0.000	9.765	112	200	200	DWC	15000	470	0.010	0.63	19.71	0.50	1.00	0.50	OK	0.63	OK	0.06	0.00	0.34		0.28	4.61	4.67
591	5CRRDM1.1	5CRRDM1	C		22.00		2996.00	4.948	4.849	2.77	377.75	2.25	9.837	0.000	9.837	112	200	200	DWC	222	470	0.010	0.63	19.71	0.50	1.00	0.50	OK	0.63	OK	0.05	0.00	0.28		0.23	4.67	4.62
592	5CRRDM1	PO5CRRDM15	C		20.00		3016.00	4.849	4.864	2.52	380.27	2.25	9.903	0.000	9.903	113	200	200	DWC	-1333	470	0.010	0.63	19.71	0.50	1.00	0.50	OK	0.63	OK	0.04	0.00	0.23		0.19	4.62	4.67
593	MARDM60	MARDM61	H		26.00		26.00	5.053	4.974	3.28	3.28	2.25	0.085	0.000	0.085	11	200	200	DWC	329	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	3.95		3.80	1.10	1.17
594	MARDM61	PO5CRRDM15	C		30.00		56.00	4.974	4.864	3.78	7.06	2.25	0.184	0.000	0.184	16	200	200	DWC	273	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.80		3.63	1.17	1.23
595	PO5CRRDM15	PORDM14	J		26.00		3098.00	4.864	4.948	3.28	390.61	2.25	10.172	0.000	10.172	114	200	200	DWC	-310	470	0.010	0.63	19.71	0.52	1.01	0.52	OK	0.63	OK	0.06	0.00	0.19	0.190	0.13	4.67	4.82
596	PORDM14	PORDM13	C		30.00		3128.00	4.948	5.011	3.78	394.39	2.25	10.271	0.000	10.271	115	200	200	DWC	-476	470	0.010	0.63	19.71	0.52	1.01	0.52	OK	0.63	OK	0.06	0.00	0.13		0.07	4.82	4.94
597	PORDM13	PORDM12	C		30.00		3158.00	5.011	5.022	3.78	398.17	2.25	10.369	0.000	10.369	115	200	200	DWC	-2727	470	0.010	0.63	19.71	0.53	1.02	0.52	OK	0.64	OK	0.06	0.00	0.07		0.01	4.94	5.01
598	PORDM12	PORDM11L	C	L	30.00		3188.00	5.022	4.940	3.78	401.96	2.25	10.468	0.000	10.468	116	200	200	DWC	366	470	0.010	0.63	19.71	0.53	1.02	0.52	OK	0.64	OK	0.06	0.00	0.01		-0.05	5.01	4.99
599	PORDM11	PO3CRRDM10	H		30.00	3188	3218.00	4.940	4.975	3.78	405.74	2.25	10.566	0.000	10.566	117	200	200	DWC	-857	470	0.010	0.63	19.71	0.54	1.02	0.53	OK	0.64	OK	0.06	0.00	3.84		3.78	1.10	1.20
600	PO3CRRDM10	PORDM9	J		30.00		14909.00	4.975	5.071	3.78	1879.79	2.25	48.953	0.000	48.953	250	342	400	HDPE	-313	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.03	0.00	2.76	2.760	2.73	2.22	2.34
601	PORDM9	PORDM8	C		30.00		14939.00	5.071	5.200	3.78	1883.57	2.25	49.051	0.000	49.051	250	342	400	HDPE	-233	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.03	0.00	2.73		2.70	2.34	2.50
602	PORDM8	PORDM7	C		30.00		14969.00	5.200	5.354	3.78	1887.35	2.25	49.150	0.000	49.150	251	342	400	HDPE	-195	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.03	0.00	2.70		2.67	2.50	2.68
603	PORDM7	PO2CRRCM6	C		30.00		14999.00	5.354	5.700	3.78	1891.13	2.25	49.248	0.000	49.248	251	342	400	HDPE	-87	1000	0.010	0.61	56.49	0.87	1.12	0.72	OK	0.69	OK	0.03	0.00	2.67		2.64	2.68	3.06
604	2CRRDM7	2CRRDM8	H		30.00		30.00	5.774	5.695	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	380	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	4.67		4.50	1.10	1.20
605	2CRRDM8	2CRRDM9	C		17.00		47.00	5.695	5.719	2.14	5.93	2.25	0.154	0.000	0.154	15	200	200	DWC	-708	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.10	0.00	4.50		4.40	1.20	1.32
606	2CRRDM9	2CRRDM10	C		25.00		72.00	5.719	5.653	3.15	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	379	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.14	0.00	4.40		4.26	1.32	1.39
607	2CRRDM10	2CRRDM11	C		30.00		102.00	5.653	5.722	3.78	12.86	2.25	0.335	0.000	0.335	21	200	200	DWC	-435	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	4.26		4.09	1.39	1.63
608	2CRRDM11	PO2CRRCM6	C		12.00		114.00	5.722	5.700	1.51	14.37	2.25	0.374	0.000	0.374	22	200	200	DWC	545	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.04	0.00	4.09		4.05	1.63	1.65
609	PO2CRRCM6	PORDM5	J		30.00		15143.00	5.700	5.696	3.78	1909.29	2.25	49.721	0.000	49.721	252	342	400	HDPE	7500	1000	0.010	0.61	56.49	0.88	1.13	0.73	OK	0.69	OK	0.03	0.00	2.64	2.640	2.61	3.06	3.09
610	PORDM5	PO1CRRDM4	C		15.00		15158.00	5.696	5.780	1.89	1911.18	2.25	49.770	0.000	49.770	252	342	400	HDPE	-179	1000	0.010	0.61	56.49	0.88	1.13	0.73	OK	0.69	OK	0.02	0.00	2.61		2.59	3.09	3.19
611	1CHRDM9	1CHRDM8	H		7.00		7.00	5.280	5.353	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	-96	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	4.18		4.14	1.10	1.21
612	1CHRDM8	1CHRDM7	C		30.00		37.00	5.353	5.500	3.78	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	-204	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	4.14		3.97	1.21	1.53
613	1CHRDM7	1CHRDM6	C		30.00		67.00	5.500	5.524	3.78	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	-1250	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.97		3.80	1.53	1.72
614	1CHRDM6	1CHRDM5	C		30.00		97.00	5.524	5.573	3.78	12.23	2.25	0.318	0.000	0.318	21	200	200	DWC	-612	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.80		3.63	1.72	1.94
615	1CHRDM5	1CH1CRRDM4	C		30.00		127.00	5.573	5.770	3.78	16.01	2.25	0.417	0.000	0.417	24	200	200	DWC	-152	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.63		3.53	1.94	2.24
616	1CHRDM2	1CHRDM3	H		30.00		30.00	6.121	5.855	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	113	113	0.010	1.28	40.19	0.00	0.30	0.07	OK	0.38	OK	0.27	0.00	5.02		4.75	1.10	1.11
617	1CHRDM3	1CH1CRRDM4	C		11.00		41.00	5.855	5.770	1.39	5.17	2.25	0.135	0.000	0.135	14	200	200	DWC	129	130	0.010	1.19	37.47	0.00	0.30	0.07	OK	0.36	OK	0.08	0.00	4.75		4.67	1.11	1.10
618	1CH1CRRDM4	1CRRDM3	J		8.00		176.00	5.770	5.784	1.01	22.19	2.25	0.578	0.000	0.578	28	200	200	DWC	-571	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.02	0.00	3.53	3.530	3.51	2.24	2.27
619	1CRRDM3	1CRRDM2	C		30.00		206.00	5.784	5.724	3.78	25.97	2.25	0.676	0.000	0.676	30	200	200	DWC	500	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.06	0.00	3.51		3.45	2.27	2.27

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow							Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
620	1CRRDM2	1CRRDM1	C		30.00		236.00	5.724	5.694	3.78	29.76	2.25	0.775	0.000	0.775	32	200	200	DWC	1000	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	3.45		3.39	2.27	2.30
621	1CRRDM1	PO1CRRDM4	C		30.00		266.00	5.694	5.780	3.78	33.54	2.25	0.873	0.000	0.873	34	200	200	DWC	-349	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	3.39		3.33	2.30	2.45
622	PO1CRRDM4	1PORDM3	J		30.00		15454.00	5.780	5.963	3.78	1948.50	2.25	50.742	0.000	50.742	255	342	400	HDPE	-164	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.03	0.00	2.59	2.590	2.56	3.19	3.40
623	1PORDM3	1PORDM2	C		30.00		15484.00	5.963	6.060	3.78	1952.28	2.25	50.841	0.000	50.841	255	342	400	HDPE	-309	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.03	0.00	2.56		2.53	3.40	3.53
624	1PORDM2	PORSRDM1	C		8.00		15492.00	6.060	6.050	1.01	1953.29	2.25	50.867	0.000	50.867	255	342	400	HDPE	800	1000	0.010	0.61	56.49	0.90	1.13	0.74	OK	0.69	OK	0.01	0.00	2.53		2.52	3.53	3.53
625	CKRDM1	CKRDM2	H		25.00		25.00	6.433	6.487	3.15	3.15	2.25	0.082	0.000	0.082	11	200	200	DWC	-463	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.14	0.00	5.33		5.19	1.10	1.30
626	CKRDM2	CKRDM3	C		30.00		55.00	6.487	6.552	3.78	6.93	2.25	0.181	0.000	0.181	16	200	200	DWC	-462	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	5.19		5.02	1.30	1.53
627	CKRDM3	CKRDM4	C		30.00		85.00	6.552	6.617	3.78	10.72	2.25	0.279	0.000	0.279	19	200	200	DWC	-462	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	5.02		4.85	1.53	1.77
628	CKRDM4	CKRDM5	C		30.00		115.00	6.617	6.483	3.78	14.50	2.25	0.378	0.000	0.378	22	200	200	DWC	224	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	4.85		4.75	1.77	1.73
629	CKRDM5	CKRDM6	C		11.00		126.00	6.483	6.149	1.39	15.89	2.25	0.414	0.000	0.414	23	200	200	DWC	33	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.04	0.00	4.75		4.71	1.73	1.44
630	CKRDM6	CKRDM7	C		20.00		146.00	6.149	5.927	2.52	18.41	2.25	0.479	0.000	0.479	25	200	200	DWC	90	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.07	0.00	4.71		4.64	1.44	1.29
631	CKRDM7	CKRDM8	C		30.00		176.00	5.927	5.593	3.78	22.19	2.25	0.578	0.000	0.578	28	200	200	DWC	90	175	0.010	1.03	32.29	0.02	0.40	0.10	OK	0.41	OK	0.17	0.00	4.64		4.47	1.29	1.12
632	CKRDM8	CKRDM9	C		30.00		206.00	5.593	5.259	3.78	25.97	2.25	0.676	0.000	0.676	30	200	200	DWC	90	90	0.010	1.43	45.03	0.02	0.40	0.10	OK	0.57	OK	0.33	0.00	4.47		4.14	1.12	1.12
633	CKRDM9	CKRDM10	C		30.00		236.00	5.259	4.926	3.78	29.76	2.25	0.775	0.000	0.775	32	200	200	DWC	90	90	0.010	1.43	45.03	0.02	0.40	0.10	OK	0.57	OK	0.33	0.00	4.14		3.81	1.12	1.12
634	CKRDM10	CKRDM11	C		30.00		266.00	4.926	4.592	3.78	33.54	2.25	0.873	0.000	0.873	34	200	200	DWC	90	90	0.010	1.43	45.03	0.02	0.40	0.10	OK	0.57	OK	0.33	0.00	3.81		3.48	1.12	1.11
635	CKRDM11	CKRDM12	C		30.00		296.00	4.592	4.258	3.78	37.32	2.25	0.972	0.000	0.972	36	200	200	DWC	90	90	0.010	1.43	45.03	0.02	0.40	0.10	OK	0.57	OK	0.33	0.00	3.48		3.15	1.11	1.11
636	CKRDM12	CKRDM13	C		22.00		318.00	4.258	4.014	2.77	40.09	2.25	1.044	0.000	1.044	37	200	200	DWC	90	90	0.010	1.43	45.03	0.02	0.40	0.10	OK	0.57	OK	0.24	0.00	3.15		2.91	1.11	1.10
637	CKRDM13.2	CKRDM13.1	H		30.00		30.00	3.502	3.758	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	-117	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.40		2.23	1.10	1.53
638	CKRDM13.1	CKRDM13	C		30.00		60.00	3.758	4.014	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	-117	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.23		2.06	1.53	1.95
639	CKRDM13	CKRDM14	J		30.00		408.00	4.014	3.939	3.78	51.44	2.25	1.340	0.000	1.340	42	200	200	DWC	400	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.06	2.060	2.00	1.95	1.94
640	CKRDM14	CKRDM15	C		30.00		438.00	3.939	3.864	3.78	55.22	2.25	1.438	0.000	1.438	43	200	200	DWC	400	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	2.00		1.94	1.94	1.92
641	CKRDM15	CKRDM16	C		30.00		468.00	3.864	3.789	3.78	59.01	2.25	1.537	0.000	1.537	45	200	200	DWC	400	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	1.94		1.88	1.92	1.91
642	CKRDM16	CKRDM17	C		18.00		486.00	3.789	3.740	2.27	61.28	2.25	1.596	0.000	1.596	46	200	200	DWC	367	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.04	0.00	1.88		1.84	1.91	1.90
643	CKRDM17	CKRDM18L	C	L	40.00		526.00	3.740	5.000	5.04	66.32	2.25	1.727	0.000	1.727	47	200	200	DWC	-32	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.09	0.00	1.84		1.75	1.90	3.25
644	CKRDM18	CKRDM19	H		34.00	526	560.00	5.000	5.040	4.29	70.61	2.25	1.839	0.000	1.839	49	200	200	DWC	-850	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.07	0.00	3.90		3.83	1.10	1.21
645	CKRDM19	CKRDM20	C		30.00		590.00	5.040	5.000	3.78	74.39	2.25	1.937	0.000	1.937	50	200	200	DWC	750	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	3.83		3.77	1.21	1.23
646	CKRDM20	CKRDM21	C		30.00		620.00	5.000	4.522	3.78	78.17	2.25	2.036	0.000	2.036	51	200	200	DWC	63	85	0.010	1.47	46.34	0.04	0.51	0.15	OK	0.75	OK	0.35	0.00	3.77		3.42	1.23	1.10
647	CKRDM21	CKRDM22	C		30.00		650.00	4.522	5.991	3.78	81.95	2.25	2.134	0.000	2.134	53	200	200	DWC	-20	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	3.42		3.36	1.10	2.63
648	CKRDM22	CKRDM23	C		17.00		667.00	5.991	5.778	2.14	84.10	2.25	2.190	0.000	2.190	53	200	200	DWC	80	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.04	0.00	3.36		3.32	2.63	2.46
649	CKRDM23	PORSRDM1	C		8.00		675.00	5.778	6.050	1.01	85.11	2.25	2.216	0.000	2.216	54	200	200	DWC	-29	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.02	0.00	3.32		3.30	2.46	2.75
650	PORSRDM1	RSRD4M12A	J		30.00		16197.00	6.050	5.980	3.78	2042.18	2.25	53.182	0.000	53.182	261	342	400	HDPE	429	1000	0.010	0.61	56.49	0.94	1.14	0.77	OK	0.70	OK	0.03	0.00	2.52	2.520	2.49	3.53	3.49
651	RSRD4M12A	RSRD4M12	C		28.00		16225.00	5.980	5.910	3.53	2045.71	2.25	53.274	0.000	53.274	261	342	400	HDPE	400	1000	0.010	0.61	56.49	0.94	1.14	0.77	OK	0.70	OK	0.03	0.00	3.30		3.27	2.68	2.64
652	RSRD4M12	RSRD4M11	C		20.00		16245.00	5.910	5.901	2.52	2048.23	2.25	53.339	0.000	53.339	261	342	400	HDPE	2222	1000	0.010	0.61	56.49	0.94	1.14	0.77	OK	0.70	OK	0.02	0.00	3.27		3.25	2.64	2.65
653	RSRD4M11	RSRD4M10	C		30.00		16275.00	5.901	6.021	3.78	2052.02	2.25	53.438	0.000	53.438	261	342	400	HDPE	-250	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.03	0.00	3.25		3.22	2.65	2.80
654	RSRD4M10	RSRD4M9	C		20.00		16295.00	6.021	5.975	2.52	2054.54	2.25	53.504	0.000	53.504	262	342	400	HDPE	435	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.02	0.00	3.22		3.20	2.80	2.78
655	RSRD4M9	RSRD4M8	C		30.00		16325.00	5.975	6.011	3.78	2058.32	2.25	53.602	0.000	53.602	262	342	400	HDPE	-833	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.03	0.00	3.20		3.17	2.78	2.84
656	RSRD4M8	RSRD4M7	C		30.00		16355.00	6.011	6.035	3.78	2062.10	2.25	53.701	0.000	53.701	262	342	400	HDPE	-1250	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.03	0.00	3.17		3.14	2.84	2.90
657	RSRD4M7	RSRD4M6	C		30.00		16385.00	6.035	6.106	3.78	2065.89	2.25	53.799	0.000	53.799	262	342	400	HDPE	-423	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.03	0.00	3.14		3.11	2.90	3.00
658	RSRD4M6	RSRD4M5	C		32.00		16417.00	6.106	5.912	4.03	2069.92	2.25	53.904	0.000	53.904	263	342	400	HDPE	165	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.03	0.00	3.11		3.08	3.00	2.83
659	RSRD4M5	RSRD4M4	C		30.00		16447.00	5.912	5.671	3.78	2073.70	2.25	54.003	0.000	54.003	263	342	400	HDPE	124	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.03	0.00	3.08		3.05	2.83	2.62
660	RSRD4M4	RSRD4M3	C		30.00		16477.00	5.671	5.601	3.78	2077.49	2.25	54.101	0.000	54.101	263	342	400	HDPE	429	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.03	0.00	3.05		3.02	2.62	2.58
661	RSRD4M3	RSRD4M2	C		19.00		16496.00	5.601	5.534	2.40	2079.88	2.25	54.164	0.000	54.164	263	342	400	HDPE	284	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.02	0.00	3.02		3.00	2.58	2.53
662	RSRD4M2	RSRD4M1	C		18.00		16514.00	5.534	5.414	2.27	2082.15	2.25	54.223	0.000	54.223	263	342	400	HDPE	150	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.02	0.00	3.00		2.98	2.53	2.43
663	RSRD4M1	ONHRDM1.6	C		40.00		16554.00	5.414	5.032	5.04	2087.19	2.25	54.354	0.000	54.354	264	342	400	HDPE	105	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.04	0.00	2.98		2.94	2.43	2.09
664	ONHRDM1.6	ONHRDM1.5	C		24.00		16578.00	5.032	5.086	3.03	2090.22	2.25	54.433	0.000	54.433	264	342	400	HDPE	-444	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.02	0.00	2.94		2.92	2.09	2.17
665	ONHRDM1.5	ONHRDM1.4	C		30.00		16608.00	5.086	5.093	3.78	2094.00	2.25	54.531	0.000	54.531	264	342	400	HDPE	-4286	1000	0.010	0.61	56.49	0.97	1.14	0.80	OK	0.70	OK	0.03	0.00	2.92		2.89	2.17	2.20
666	ONHRDM1.4	ONHRDM1.3	C		30.00		16638.00	5.093	5.091	3.78	2097.79	2.25	54.630	0.000	54.630	264	342	400	HDPE	15000	1000	0.010	0.61	56.49	0.97	1.14	0.80	OK	0.70	OK	0.03	0.00	2.89		2.86	2.20	2.23
667	ONHRDM1.3.7	ONHRDM1.3.6	H		14.00		14.00	5.511	5.474	1.77	1.77	2.25	0.046	0.000	0.046	8	200	200	DWC	378	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.08	0.00	4.41		4.33	1.10	1.14
668	ONHRDM1.3.6	ONHRDM1.3.5	C		20.00		34.00	5.474	5.421	2.52	4.29	2.25	0.112	0.000	0.112	12	200	200	DWC	377	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	4.33		4.21	1.14	1.21
669	ONHRDM1.3.5	ONHRDM1.3.4	C		16.00		50.00	5.421	5.379	2.02	6.30	2.25	0.164	0.000	0.164	15	200	200	DWC	381	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	4.21		4.12	1.21	1.26
670	ONHRDM1.3.4	ONHRDM1.3.3	C		20.00		70.00	5.379	5.327	2.52	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	385	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	4.12		4.00	1.26	1.33
671	ONHRDM1.3.3	ONHRDM1.3.2	C		30.00		100.00	5.327	5.248	3.78	12.61	2.25	0.328	0.000	0.328	21	200	200	DWC	380	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.00		3.82	1.33	1.43
672	ONHRDM1.3.2	ONHRDM1.3.1	C		30.00		130.00	5.248	5.169	3.78	16.39	2.25	0.427	0.000	0.427	24	200	200	DWC	380	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.82		3.72	1.43	1.45
673	ONHRDM1.3.1	ONHRDM1.3	C		30.00		160.00	5.169	5.091	3.78	20.17	2.25	0.525	0.000	0.525	26	200	200	DWC	385	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.72		3.62	1.45	1.47
674	ONHRDM1.3	ONHRDM1.2	J		18.00		16816.00	5.091	5.275	2.27	2120.23	2.25	55.214	0.000	55.214	266	342	400	HDPE	-98	1000	0.010	0.61	56.49	0.98	1.14	0.80	OK	0.70	OK	0.02	0.00	2.86	2.860	2.84	2.23	2.44
675	ONHRDM1.2	ONHRDM1.1	C		32.00		16848.00	5.275	5.606	4.03	2124.26	2.25	55.319	0.000	55.319	266	342	400	HDPE	-97	1000	0.010	0.61	56.49	0.98	1.14	0.80	OK	0.70	OK	0.03	0.00	2.84		2.81	2.44	2.80
676	CORDM7	CORDM6	H		9.00		9.00	3.473	3.544	1.13	1.13	2.25	0.030	0.000	0.030	7	200	200	DWC	-127	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.05	0.00	2.37		2.32	1.10	1.22
677	CORDM6	CORDM5	C		30.00		39.00	3.544	3.748	3.78	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	-147	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.32		2.15	1.22	1.60
678	CORDM5	CORDM4	C		12.00		51.00	3.748	3.954	1.51	6.43	2.25	0.167	0.000	0.167	15	200	200	DWC	-58	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.07	0.00	2.15		2.08	1.60	1.87
679	CORDM4	CORDM3	C		13.00		64.00	3.954	4.053	1.64	8.07	2.25	0.210	0.000	0.210	17	200	200	DWC	-131	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.07	0.00	2.08		2.01	1.87	2.04
680	CORDM3	CORDM2	C		30.00		94.00	4.053	5.219	3.78	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	-26	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.01		1.84	2.04	3.38
681	CORDM2	CORDM1	C		30.00		124.00	5.219	5.671	3.78	15.63	2.25	0.407	0.000	0.407	23	200	200	DWC	-66	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	1.84		1.74	3.38	3.93
682	CORDM1	ONHRDM1.1	C		30.00		154.00	5.671	5.606	3.78	19.42	2.25	0.506	0.000	0.506	26	200	200	DWC	462	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	1.74		1.64	3.93	3.97
683	ONHRDM1.1	ONHRDM2	J		30.00		17032.00	5.606	5.552	3.78	2147.46	2.25	55.924	0.000	55.924	267	342	400	HDPE	556	1000	0.010	0.61	56.49	0.99	1.14	0.81	Check	0.70	OK	0.03	0.00	1.64	1.640	1.61	3.97	3.94
684	ONHRDM2	SOPDONHRDM1	C		26.00		17058.00	5.552	5.285	3.28	2150.74	2.25	56.009	0.000	56.009	268	342	400	HDPE	97	1000	0.010	0.61	56.49	0.99	1.14	0.81	Check	0.70	OK	0.03	0.00	1.61		1.58	3.94	3.71
685	SCBCRDM11	SCBCRDM10	H		30.00		30.00	4.160	4.082	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	385	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.06		2.89	1.10	1.19
686	SCBCRDM10	SCBCRDM9	C		30.00		60.00	4.082	3.868	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	140	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.89		2.72	1.19	1.15
687	SCBCRDM9	SCBCRDM8	C		14.00		74.00	3.868	3.797	1.77	9.33	2.25	0.243	0.000	0.243	18	200	200	DWC	197	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.08	0.00	2.72		2.64	1.15	1.16
688	SCBCRDM8	SCBCRDM7	C		30.00		104.00	3.797	3.584	3.78	13.11	2.25	0.341	0.000	0.341	21	200	200	DWC	141	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.64		2.47	1.16	1.11

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
689	SCBCRDM7	SCBCRDM6	C		30.00		134.00	3.584	3.242	3.78	16.90	2.25	0.440	0.000	0.440	24	200	200	DWC	88	90	0.010	1.43	45.03	0.01	0.30	0.07	OK	0.43	OK	0.33	0.00	2.47		2.14	1.11	1.10
690	SCBCRDM6	SCBCRDM5	C		30.00		164.00	3.242	2.843	3.78	20.68	2.25	0.538	0.000	0.538	27	200	200	DWC	75	75	0.010	1.57	49.33	0.01	0.30	0.07	OK	0.47	OK	0.40	0.00	2.14		1.74	1.10	1.10
691	SCBCRDM5	SCBCRDM4	C		20.00		184.00	2.843	2.939	2.52	23.20	2.25	0.604	0.000	0.604	28	200	200	DWC	-208	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.04	0.00	1.74		1.70	1.10	1.24
692	SCBCRDM4	SCBCRDM3	C		30.00		214.00	2.939	3.121	3.78	26.98	2.25	0.703	0.000	0.703	30	200	200	DWC	-165	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	1.70		1.64	1.24	1.48
693	SCBCRDM3	SCBCRDM2	C		14.00		228.00	3.121	3.310	1.77	28.75	2.25	0.749	0.000	0.749	31	200	200	DWC	-74	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	1.64		1.61	1.48	1.70
694	SCBCRDM2	SCBCRDM1	C		13.00		241.00	3.310	3.297	1.64	30.39	2.25	0.791	0.000	0.791	32	200	200	DWC	1000	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.03	0.00	1.61		1.58	1.70	1.72
695	SCBCRDM1	TSCBCRDM3	C		30.00		271.00	3.297	2.859	3.78	34.17	2.25	0.890	0.000	0.890	34	200	200	DWC	68	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	1.58		1.52	1.72	1.34
696	TSCBCRDM3	TRDM2	C		16.00		287.00	2.859	2.951	2.02	36.19	2.25	0.942	0.000	0.942	35	200	200	DWC	-174	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.03	0.00	1.52		1.49	1.34	1.46
697	TRDM2	TRDM1	C		30.00		317.00	2.951	3.113	3.78	39.97	2.25	1.041	0.000	1.041	37	200	200	DWC	-185	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	1.49		1.43	1.46	1.68
698	TRDM1	SOPDBLNRDM13	C		30.00		347.00	3.113	3.029	3.78	43.75	2.25	1.139	0.000	1.139	39	200	200	DWC	357	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	1.43		1.37	1.68	1.66
699	BLNRDM3	BLNRDM2	H		12.00		12.00	3.504	3.445	1.51	1.51	2.25	0.039	0.000	0.039	8	200	200	DWC	203	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.07	0.00	2.40		2.33	1.10	1.12
700	BLNRDM2	BLNRDM1	C		30.00		42.00	3.445	3.309	3.78	5.30	2.25	0.138	0.000	0.138	14	200	200	DWC	221	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	2.33		2.16	1.12	1.15
701	BLNRDM1	SOPDBLNRDM13	C		30.00		72.00	3.309	3.029	3.78	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	107	125	0.010	1.21	38.21	0.01	0.30	0.07	OK	0.36	OK	0.24	0.00	2.16		1.92	1.15	1.11
702	SOPDBLNRDM13	SOPDRDM12	J		23.00		442.00	3.029	5.203	2.90	55.73	2.25	1.451	0.000	1.451	43	200	200	DWC	-11	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.05	0.00	1.37	1.370	1.32	1.66	3.88
703	SOPDRDM12	SOPDRDM11	C		30.00		472.00	5.203	3.915	3.78	59.51	2.25	1.550	0.000	1.550	45	200	200	DWC	23	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	1.32		1.26	3.88	2.66
704	SOPDRDM11	SOPDRDM10	C		30.00		502.00	3.915	4.588	3.78	63.29	2.25	1.648	0.000	1.648	46	200	200	DWC	-45	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	1.26		1.20	2.66	3.39
705	SOPDRDM10	SOPDRDM9	C		30.00		532.00	4.588	4.666	3.78	67.08	2.25	1.747	0.000	1.747	48	200	200	DWC	-385	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.06	0.00	1.20		1.14	3.39	3.53
706	SOPDRDM9	SOPDRDM8	C		15.00		547.00	4.666	4.579	1.89	68.97	2.25	1.796	0.000	1.796	48	200	200	DWC	172	470	0.010	0.63	19.71	0.09	0.63	0.21	OK	0.39	OK	0.03	0.00	1.14		1.11	3.53	3.47
707	SOPDRDM8	SOPDRDM7	C		30.00		577.00	4.579	4.714	3.78	72.75	2.25	1.895	0.000	1.895	50	200	200	DWC	-222	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	1.11		1.05	3.47	3.66
708	SOPDRDM7	SOPDRDM6	C		17.00		594.00	4.714	4.845	2.14	74.89	2.25	1.950	0.000	1.950	50	200	200	DWC	-130	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.04	0.00	1.05		1.01	3.66	3.84
709	SOPDRDM6	SOPDRDM5	C		30.00		624.00	4.845	5.199	3.78	78.68	2.25	2.049	0.000	2.049	52	200	200	DWC	-85	470	0.010	0.63	19.71	0.10	0.65	0.22	OK	0.41	OK	0.06	0.00	1.01		0.95	3.84	4.25
710	SOPDRDM5	SOPDRDM4	C		30.00		654.00	5.199	5.238	3.78	82.46	2.25	2.147	0.000	2.147	53	200	200	DWC	-769	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.06	0.00	0.95		0.89	4.25	4.35
711	SOPDRDM4	SOPDRDM3	C		20.00		674.00	5.238	5.219	2.52	84.98	2.25	2.213	0.000	2.213	54	200	200	DWC	1053	470	0.010	0.63	19.71	0.11	0.67	0.23	OK	0.42	OK	0.04	0.00	0.89		0.85	4.35	4.37
712	SOPDRDM3	SOPDRDM2	C		20.00		694.00	5.219	5.213	2.52	87.50	2.25	2.279	0.000	2.279	54	200	200	DWC	3333	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.04	0.00	0.85		0.81	4.37	4.40
713	SOPDRDM2	SOPDONHRDM1	C		38.00		732.00	5.213	5.285	4.79	92.29	2.25	2.403	0.000	2.403	56	200	200	DWC	-528	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.08	0.00	0.81		0.73	4.40	4.56
714	SOPDONHRDM1	ONHRDM3	J		30.00		17820.00	5.285	5.285	3.78	2246.82	2.25	58.511	0.000	58.511	274	342	400	HDPE	0	1000	0.010	0.61	56.49	1.04	1.14	0.82	Check	0.70	OK	0.03	0.00	0.73	0.730	0.70	4.56	4.59
715	ONHRDM3	ONHRDM2.1	C		32.00		17852.00	5.285	5.233	4.03	2250.85	2.25	58.616	0.000	58.616	274	342	400	HDPE	615	1000	0.010	0.61	56.49	1.04	1.14	0.82	Check	0.70	OK	0.03	0.00	0.70		0.67	4.59	4.56
716	ONHRDM2.7	ONHRDM2.6	H		18.00		18.00	2.794	3.061	2.27	2.27	2.25	0.059	0.000	0.059	9	200	200	DWC	-67	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.11	0.00	1.69		1.58	1.10	1.48
717	ONHRDM2.6	ONHRDM2.5	C		30.00		48.00	3.061	3.777	3.78	6.05	2.25	0.158	0.000	0.158	15	200	200	DWC	-42	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	1.58		1.40	1.48	2.38
718	ONHRDM2.5	ONHRDM2.4	C		30.00		78.00	3.777	4.011	3.78	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	-128	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	1.40		1.22	2.38	2.79
719	ONHRDM2.4	ONHRDM2.3	C		30.00		108.00	4.011	4.276	3.78	13.62	2.25	0.355	0.000	0.355	22	200	200	DWC	-113	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.10	0.00	1.22		1.12	2.79	3.16
720	ONHRDM2.3	ONHRDM2.2	C		30.00		138.00	4.276	4.733	3.78	17.40	2.25	0.453	0.000	0.453	25	200	200	DWC	-66	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	1.12		1.02	3.16	3.71
721	ONHRDM2.2	ONHRDM2.1	C		33.00		171.00	4.733	5.233	4.16	21.56	2.25	0.561	0.000	0.561	27	200	200	DWC	-66	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	1.02		0.94	3.71	4.29
722	ONHRDM2.1	ALNRDM1	J		29.00		18052.00	5.233	5.234	3.66	2276.07	2.25	59.273	0.000	59.273	275	342	400	HDPE	-29000	1000	0.010	0.61	56.49	1.05	1.14	0.82	Check	0.70	OK	0.03	0.00	0.67	0.670	0.64	4.56	4.59
723	ALNRDM8	ALNRDM7	H		7.00		7.00	5.363	5.352	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	636	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	4.26		4.22	1.10	1.13
724	ALNRDM7	ALNRDM6	C		30.00		37.00	5.352	5.315	3.78	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	811	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	4.22		4.05	1.13	1.27
725	ALNRDM6	ALNRDM5	C		30.00		67.00	5.315	5.294	3.78	8.45	2.25	0.220	0.000	0.220	17	200	200	DWC	1429	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	4.05		3.88	1.27	1.41
726	ALNRDM5	ALNRDM4	C		13.00		80.00	5.294	5.310	1.64	10.09	2.25	0.263	0.000	0.263	19	200	200	DWC	-812	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.07	0.00	3.88		3.81	1.41	1.50
727	ALNRDM4	ALNRDM3	C		30.00		110.00	5.310	5.343	3.78	13.87	2.25	0.361	0.000	0.361	22	200	200	DWC	-909	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.10	0.00	3.81		3.71	1.50	1.63
728	ALNRDM3	ALNRDM2	C		30.00		140.00	5.343	5.359	3.78	17.65	2.25	0.460	0.000	0.460	25	200	200	DWC	-1875	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	3.71		3.61	1.63	1.75
729	ALNRDM2	ALNRDM1	C		36.00		176.00	5.359	5.234	4.54	22.19	2.25	0.578	0.000	0.578	28	200	200	DWC	288	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.09	0.00	3.61		3.52	1.75	1.71
730	ALNRDM1	ONHRDM4	J		30.00		18258.00	5.234	5.360	3.78	2302.04	2.25	59.949	0.000	59.949	277	342	400	HDPE	-238	1000	0.010	0.61	56.49	1.06	1.14	0.82	Check	0.70	OK	0.03	0.00	0.64	0.640	0.61	4.59	4.75
731	ONHRDM4	ONHRDM3.1	C		11.00		18269.00	5.360	5.349	1.39	2303.43	2.25	59.985	0.000	59.985	277	342	400	HDPE	1000	1000	0.010	0.61	56.49	1.06	1.14	0.82	Check	0.70	OK	0.01	0.00	0.61		0.60	4.75	4.75
732	ONHRDM3.4	ONHRDM3.3	H		7.00		7.00	4.504	4.527	0.88	0.88	2.25	0.023	0.000	0.023	6	200	200	DWC	-304	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	3.40		3.36	1.10	1.17
733	ONHRDM3.3	ONHRDM3.2	C		30.00		37.00	4.527	4.692	3.78	4.67	2.25	0.121	0.000	0.121	13	200	200	DWC	-182	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	3.36		3.19	1.17	1.50
734	ONHRDM3.2	ONHRDM3.1	C		33.00		70.00	4.692	5.349	4.16	8.83	2.25	0.230	0.000	0.230	18	200	200	DWC	-50	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.19	0.00	3.19		3.00	1.50	2.35
735	ONHRDM3.1	ONHRDM5A	J		30.00		18369.00	5.349	5.333	3.78	2316.04	2.25	60.313	0.000	60.313	278	342	400	HDPE	1875	1000	0.010	0.61	56.49	1.07	1.14	0.82	Check	0.70	OK	0.03	0.00	0.60	0.600	0.57	4.75	4.76
736	ONHRDM5A	ONHRDM5	C		30.00		18399.00	5.333	5.316	3.78	2319.82	2.25	60.412	0.000	60.412	278	342	400	HDPE	1765	1000	0.010	0.61	56.49	1.07	1.14	0.82	Check	0.70	OK	0.03	0.00	0.57		0.54	4.76	4.78
737	1KSRDM1	1KSRDM2	H		30.00		30.00	5.193	4.744	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	67	67	0.010	1.66	52.19	0.00	0.30	0.07	OK	0.50	OK	0.45	0.00	4.09		3.64	1.10	1.10
738	1KSRDM2	1KSRDM3	C		30.00		60.00	4.744	4.295	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	67	67	0.010	1.66	52.19	0.00	0.30	0.07	OK	0.50	OK	0.45	0.00	3.64		3.19	1.10	1.11
739	1KSRDM3	1KSRDM4	C		18.00		78.00	4.295	3.847	2.27	9.83	2.25	0.256	0.000	0.256	19	200	200	DWC	40	40	0.010	2.15	67.55	0.00	0.30	0.07	OK	0.64	OK	0.45	0.00	3.19		2.74	1.11	1.11
740	1KSRDM4	1KSRDM5	C		20.00		98.00	3.847	3.898	2.52	12.36	2.25	0.322	0.000	0.322	21	200	200	DWC	-392	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	2.74		2.63	1.11	1.27
741	1KSRDM5	1KSRDM6	C		30.00		128.00	3.898	4.118	3.78	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	-136	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.10	0.00	2.63		2.53	1.27	1.59
742	1KSRDM6	1KSRDM7	C		6.00		134.00	4.118	4.163	0.76	16.90	2.25	0.440	0.000	0.440	24	200	200	DWC	-133	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.02	0.00	2.53		2.51	1.59	1.65
743	1KSRDM7	1KSRDM8	C		30.00		164.00	4.163	4.380	3.78	20.68	2.25	0.538	0.000	0.538	27	200	200	DWC	-138	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	2.51		2.43	1.65	1.95
744	1KSRDM8	1KSRDM9	C		25.00		189.00	4.380	4.256	3.15	23.83	2.25	0.621	0.000	0.621	29	200	200	DWC	202	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.05	0.00	2.43		2.38	1.95	1.88
745	1KSRDM9	1KSRDM10	C		30.00		219.00	4.256	3.955	3.78	27.61	2.25	0.719	0.000	0.719	31	200	200	DWC	100	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.38		2.32	1.88	1.64
746	1KSRDM10	1KSRDM11	C		17.00		236.00	3.955	3.785	2.14	29.76	2.25	0.775	0.000	0.775	32	200	200	DWC	100	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.04	0.00	2.32		2.28	1.64	1.51
747	1KSRDM11	1KSRDM12	C		40.00		276.00	3.785	4.325	5.04	34.80	2.25	0.906	0.000	0.906	34	200	200	DWC	-74	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.09	0.00	2.28		2.19	1.51	2.14
748	1KSRDM12	VTRDM14	C		34.00		310.00	4.325	5.290	4.29	39.09	2.25	1.018	0.000	1.018	37	200	200	DWC	-35	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.07	0.00	2.19		2.12	2.14	3.17
749	VTRDM8	VTRDM9	H		28.00		28.00	6.410	6.160	3.53	3.53	2.25	0.092	0.000	0.092	11	200	200	DWC	112	112	0.010	1.28	40.37	0.00	0.30	0.07	OK	0.38	OK	0.25	0.00	5.31		5.06	1.10	1.10
750	VTRDM9	VTRDM10	C		30.00		58.00	6.160	5.910	3.78	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	120	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.25	0.00	5.06		4.81	1.10	1.10
751	VTRDM10	VTRDM11	C		30.00		88.00	5.910	5.660	3.78	11.10	2.25	0.289	0.000	0.289	20	200	200	DWC	120	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.25	0.00	4.81		4.56	1.10	1.10
752	VTRDM11	VTRDM12	C		28.00		116.00	5.660	5.551	3.53	14.63	2.25	0.381	0.000	0.381	23	200	200	DWC	257	250	0.010	0.86	27.02	0.01	0.30	0.07	OK	0.26	Check	0.11	0.00	4.56		4.45	1.10	1.10
753	VTRDM12	VTRDM13	C		30.00		146.00	5.551	5.420	3.78	18.41	2.25	0.479	0.000	0.479	25	200	200	DWC	229	230	0.010	0.89	28.17	0.02	0.40	0.10	OK	0.36	OK	0.13	0.00	4.45		4.32	1.10	1.10
754	VTRDM13	VTRDM14	C		30.00		176.00	5.420	5.290	3.78	22.19	2.25	0.578	0.000	0.578	28	200	200	DWC	231	240	0.010	0.88	27.58	0.02	0.40	0.10	OK	0.35	OK	0.13	0.00	4.32		4.19	1.10	1.10
755	VTRDM14	VTKDRDM15	J		10.00		496.00	5.290	5.247	1.26	62.54	2.25	1.629	0.000	1.629	46	200	200	DWC	233	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.02	0.00	2.12	2.120	2.10	3.17	3.15
756	KDRDM10	KDRDM9	H		15.00		15.00	5.360	5.040	1.89	1.89	2.25	0.049	0.000	0.049	8	200	200	DWC	47	47	0.010	1.98	62.32	0.00	0.30	0.07	OK	0.59	OK	0.32	0.00	4.26		3.94	1.10	1.10
757	KDRDM9	KDRDM8	C		30.00		45.00	5.040	4.403	3.78	5.67	2.25	0.148	0.000	0.148	14	200	200	DWC	47	47	0.010	1.98	62.32	0.00	0.30	0.07	OK	0.59	OK	0.64	0.00	3.94		3.30	1.10	1.10

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
758	KDRDM8	KDRDM7	C		27.00		72.00	4.403	3.832	3.40	9.08	2.25	0.236	0.000	0.236	18	200	200	DWC	47	47	0.010	1.98	62.32	0.00	0.30	0.07	OK	0.59	OK	0.57	0.00	3.30		2.73	1.10	1.10
759	KDRDM7	KDRDM6	C		14.00		86.00	3.832	3.777	1.77	10.84	2.25	0.282	0.000	0.282	19	200	200	DWC	255	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.08	0.00	2.73		2.65	1.10	1.13
760	KDRDM6	KDRDM5	C		30.00		116.00	3.777	3.613	3.78	14.63	2.25	0.381	0.000	0.381	23	200	200	DWC	183	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.65		2.48	1.13	1.13
761	KDRDM5	KDRDM4	C		10.00		126.00	3.613	3.558	1.26	15.89	2.25	0.414	0.000	0.414	23	200	200	DWC	182	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.03	0.00	2.48		2.45	1.13	1.11
762	KDRDM4	KDRDM3	C		26.00		152.00	3.558	3.394	3.28	19.16	2.25	0.499	0.000	0.499	26	200	200	DWC	159	160	0.010	1.07	33.77	0.01	0.30	0.07	OK	0.32	OK	0.16	0.00	2.45		2.29	1.11	1.10
763	KDRDM3	KDRDM2	C		24.00		176.00	3.394	3.971	3.03	22.19	2.25	0.578	0.000	0.578	28	200	200	DWC	-42	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.06	0.00	2.29		2.23	1.10	1.74
764	KDRDM2	KDRDM1	C		23.00		199.00	3.971	4.525	2.90	25.09	2.25	0.653	0.000	0.653	29	200	200	DWC	-42	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.05	0.00	2.23		2.18	1.74	2.35
765	KDRDM1	VTKDRDM15	C		30.00		229.00	4.525	5.247	3.78	28.87	2.25	0.752	0.000	0.752	31	200	200	DWC	-42	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	2.18		2.12	2.35	3.13
766	VTKDRDM15	VTRDM16	J		25.00		750.00	5.247	5.023	3.15	94.56	2.25	2.463	0.000	2.463	57	200	200	DWC	112	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.05	0.00	2.10	2.100	2.05	3.15	2.97
767	VTRDM16	VTRDM17	C		20.00		770.00	5.023	3.360	2.52	97.08	2.25	2.528	0.000	2.528	57	200	200	DWC	12	470	0.010	0.63	19.71	0.13	0.70	0.25	OK	0.44	OK	0.04	0.00	2.05		2.01	2.97	1.35
768	VTRDM17	IBRDM3	C		50.00		820.00	3.360	3.095	6.30	103.39	2.25	2.692	0.000	2.692	59	200	200	DWC	189	470	0.010	0.63	19.71	0.14	0.71	0.26	OK	0.44	OK	0.11	0.00	2.01		1.90	1.35	1.20
769	IBRDM3.3	IBRDM3.2	H		30.00		30.00	1.810	1.685	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	240	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	0.71		0.53	1.10	1.16
770	IBRDM3.2	IBRDM3.1	C		30.00		60.00	1.685	1.635	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	600	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	0.53		0.35	1.16	1.29
771	IBRDM3.1	IBRDM3	C		30.00		90.00	1.635	3.095	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	-21	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	0.35		0.17	1.29	2.93
772	IBRDM3	IBRDM2	J		29.00		939.00	3.095	2.790	3.66	118.39	2.25	3.083	0.000	3.083	63	200	200	DWC	95	470	0.010	0.63	19.71	0.16	0.74	0.28	OK	0.46	OK	0.06	0.00	0.17	0.170	0.11	2.93	2.68
773	IBRDM2	IBRDM1	C		30.00		969.00	2.790	2.575	3.78	122.18	2.25	3.182	0.000	3.182	64	200	200	DWC	140	470	0.010	0.63	19.71	0.16	0.74	0.28	OK	0.46	OK	0.06	0.00	0.11		0.05	2.68	2.53
774	IBRDM1	VAIBRDM3	C		30.00		999.00	2.575	3.100	3.78	125.96	2.25	3.280	0.000	3.280	65	200	200	DWC	-57	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.06	0.00	0.05		-0.01	2.53	3.11
775	VAIBRDM3	VAVIAPRDM1	C		21.00		1020.00	3.100	3.100	2.65	128.61	2.25	3.349	0.000	3.349	66	200	200	DWC	0	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.04	0.00	-0.01		-0.05	3.11	3.15
776	VAVIAPRDM1	VIAPRDM5	C		27.00		1047.00	3.100	3.554	3.40	132.01	2.25	3.438	0.000	3.438	67	200	200	DWC	-59	470	0.010	0.63	19.71	0.17	0.75	0.29	OK	0.47	OK	0.06	0.00	-0.05		-0.11	3.15	3.66
777	VIAPRDM5	VIAPRDM4	C		30.00		1077.00	3.554	4.005	3.78	135.79	2.25	3.536	0.000	3.536	68	200	200	DWC	-67	470	0.010	0.63	19.71	0.18	0.76	0.30	OK	0.48	OK	0.06	0.00	-0.11		-0.17	3.66	4.18
778	VIAPRDM4	VIAPRDM3	C		30.00		1107.00	4.005	4.456	3.78	139.57	2.25	3.635	0.000	3.635	69	200	200	DWC	-67	470	0.010	0.63	19.71	0.18	0.76	0.30	OK	0.48	OK	0.06	0.00	-0.17		-0.23	4.18	4.69
779	VIAPRDM3	VIAPRDM2L	C	L	30.00		1137.00	4.456	4.903	3.78	143.36	2.25	3.733	0.000	3.733	69	200	200	DWC	-67	470	0.010	0.63	19.71	0.19	0.77	0.30	OK	0.48	OK	0.06	0.00	-0.23		-0.29	4.69	5.19
780	VIAPRDM2	ONHRDM5	H		33.00	1137	1170.00	4.903	5.316	4.16	147.52	2.25	3.842	0.000	3.842	70	200	200	DWC	-80	470	0.010	0.63	19.71	0.19	0.77	0.30	OK	0.48	OK	0.07	0.00	3.80		3.73	1.10	1.59
781	ONHRDM5	ONHRDM6	J		30.00		19599.00	5.316	5.144	3.78	2471.12	2.25	64.352	0.000	64.352	287	384	450	HDPE	174	1000	0.010	0.66	76.93	0.84	1.12	0.70	OK	0.74	OK	0.03	0.00	0.54	0.540	0.51	4.78	4.63
782	ONHRDM6	ONHRDM7	C		30.00		19629.00	5.144	5.325	3.78	2474.90	2.25	64.451	0.000	64.451	287	384	450	HDPE	-166	1000	0.010	0.66	76.93	0.84	1.12	0.70	OK	0.74	OK	0.03	0.00	0.51		0.48	4.63	4.85
783	ONHRDM7	ONHRDM8	C		30.00		19659.00	5.325	5.350	3.78	2478.69	2.25	64.549	0.000	64.549	287	384	450	HDPE	-1200	1000	0.010	0.66	76.93	0.84	1.12	0.70	OK	0.74	OK	0.03	0.00	0.48		0.45	4.85	4.90
784	ONHRDM8	AHRDM1	C		9.00		19668.00	5.350	5.143	1.13	2479.82	2.25	64.579	0.000	64.579	287	384	450	HDPE	43	1000	0.010	0.66	76.93	0.84	1.12	0.70	OK	0.74	OK	0.01	0.00	0.45		0.44	4.90	4.70
785	AHRDM2	AHRDM1	H		30.00		30.00	5.170	5.143	3.78	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	1111	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	4.07		3.89	1.10	1.25
786	AHRDM1	ONHRDM9	J		30.00		19728.00	5.143	5.082	3.78	2487.39	2.25	64.776	0.000	64.776	288	384	450	HDPE	492	1000	0.010	0.66	76.93	0.84	1.12	0.70	OK	0.74	OK	0.03	0.00	0.44	0.440	0.41	4.70	4.67
787	ONHRDM9	ONHRDM4.1	C		10.00		19738.00	5.082	5.029	1.26	2488.65	2.25	64.808	0.000	64.808	288	384	450	HDPE	189	1000	0.010	0.66	76.93	0.84	1.12	0.70	OK	0.74	OK	0.01	0.00	0.41		0.40	4.67	4.63
788	ONHRDM4.7	ONHRDM4.6	H		27.00		27.00	4.123	4.312	3.40	3.40	2.25	0.089	0.000	0.089	11	200	200	DWC	-143	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	3.02		2.87	1.10	1.44
789	ONHRDM4.6	ONHRDM4.5	C		17.00		44.00	4.312	4.430	2.14	5.55	2.25	0.144	0.000	0.144	14	200	200	DWC	-144	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.10	0.00	2.87		2.77	1.44	1.66
790	ONHRDM4.5	ONHRDM4.4	C		20.00		64.00	4.430	4.564	2.52	8.07	2.25	0.210	0.000	0.210	17	200	200	DWC	-149	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	2.77		2.66	1.66	1.90
791	ONHRDM4.4	ONHRDM4.3	C		30.00		94.00	4.564	4.776	3.78	11.85	2.25	0.309	0.000	0.309	20	200	200	DWC	-142	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	2.66		2.49	1.90	2.29
792	ONHRDM4.3	ONHRDM4.2	C		12.00		106.00	4.776	4.859	1.51	13.36	2.25	0.348	0.000	0.348	22	200	200	DWC	-145	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.04	0.00	2.49		2.45	2.29	2.41
793	ONHRDM4.2	ONHRDM4.1	C		33.00		139.00	4.859	5.029	4.16	17.53	2.25	0.456	0.000	0.456	25	200	200	DWC	-194	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.11	0.00	2.45		2.34	2.41	2.69
794	ONHRDM4.1	ONHRDM10	J		30.00		19907.00	5.029	5.204	3.78	2509.95	2.25	65.363	0.000	65.363	289	384	450	HDPE	-171	1000	0.010	0.66	76.93	0.85	1.12	0.71	OK	0.74	OK	0.03	0.00	0.40	0.400	0.37	4.63	4.83
795	ONHRDM10	ONHRDM11	C		30.00		19937.00	5.204	5.077	3.78	2513.74	2.25	65.462	0.000	65.462	289	384	450	HDPE	236	1000	0.010	0.66	76.93	0.85	1.12	0.71	OK	0.74	OK	0.03	0.00	0.37		0.34	4.83	4.74
796	ONHRDM11	ONHRDM5.1	C		30.00		19967.00	5.077	4.904	3.78	2517.52	2.25	65.560	0.000	65.560	289	384	450	HDPE	173	1000	0.010	0.66	76.93	0.85	1.12	0.71	OK	0.74	OK	0.03	0.00	0.34		0.31	4.74	4.59
797	ONHRDM5.9	ONHRDM5.8	H		22.00		22.00	4.004	4.118	2.77	2.77	2.25	0.072	0.000	0.072	10	200	200	DWC	-193	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.13	0.00	2.90		2.77	1.10	1.35
798	ONHRDM5.8	ONHRDM5.7	C		30.00		52.00	4.118	4.264	3.78	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	-205	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.77		2.59	1.35	1.67
799	ONHRDM5.7	ONHRDM5.6	C		30.00		82.00	4.264	4.410	3.78	10.34	2.25	0.269	0.000	0.269	19	200	200	DWC	-205	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	2.59		2.41	1.67	2.00
800	ONHRDM5.6	ONHRDM5.5	C		19.00		101.00	4.410	4.503	2.40	12.73	2.25	0.332	0.000	0.332	21	200	200	DWC	-204	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.11	0.00	2.41		2.30	2.00	2.20
801	ONHRDM5.5	ONHRDM5.4	C		10.00		111.00	4.503	4.551	1.26	14.00	2.25	0.364	0.000	0.364	22	200	200	DWC	-208	300	0.010	0.78	24.67	0.01	0.30	0.07	OK	0.24	Check	0.03	0.00	2.30		2.27	2.20	2.28
802	ONHRDM5.4	ONHRDM5.3	C		17.00		128.00	4.551	4.634	2.14	16.14	2.25	0.420	0.000	0.420	24	200	200	DWC	-205	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.06	0.00	2.27		2.21	2.28	2.42
803	ONHRDM5.3	ONHRDM5.2	C		21.00		149.00	4.634	4.733	2.65	18.79	2.25	0.489	0.000	0.489	25	200	200	DWC	-212	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.07	0.00	2.21		2.14	2.42	2.59
804	ONHRDM5.2	ONHRDM5.1	C		34.00		183.00	4.733	4.904	4.29	23.07	2.25	0.601	0.000	0.601	28	200	200	DWC	-199	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.09	0.00	2.14		2.05	2.59	2.85
805	ONHRDM5.1	ONHRDM6.1	J		16.00		20166.00	4.904	4.950	2.02	2542.61	2.25	66.214	0.000	66.214	291	384	450	HDPE	-348	1000	0.010	0.66	76.93	0.86	1.12	0.72	OK	0.74	OK	0.02	0.00	0.31	0.310	0.29	4.59	4.66
806	ONHRDM6.6	ONHRDM6.5	H		13.00		13.00	5.223	5.193	1.64	1.64	2.25	0.043	0.000	0.043	8	200	200	DWC	433	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.07	0.00	4.12		4.05	1.10	1.14
807	ONHRDM6.5	ONHRDM6.4	C		17.00		30.00	5.193	5.155	2.14	3.78	2.25	0.099	0.000	0.099	12	200	200	DWC	447	175	0.010	1.03	32.29	0.00	0.30	0.07	OK	0.31	OK	0.10	0.00	4.05		3.95	1.14	1.21
808	ONHRDM6.4	ONHRDM6.3	C		30.00		60.00	5.155	5.090	3.78	7.57	2.25	0.197	0.000	0.197	16	200	200	DWC	461	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.95		3.78	1.21	1.31
809	ONHRDM6.3	ONHRDM6.2	C		30.00		90.00	5.090	5.023	3.78	11.35	2.25	0.296	0.000	0.296	20	200	200	DWC	448	175	0.010	1.03	32.29	0.01	0.30	0.07	OK	0.31	OK	0.17	0.00	3.78		3.61	1.31	1.41
810	ONHRDM6.2	ONHRDM6.1	C		34.00		124.00	5.023	4.950	4.29	15.63	2.25	0.407	0.000	0.407	23	200	200	DWC	466	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.11	0.00	3.61		3.50	1.41	1.45
811	ONHRDM6.1	ONHRDM12	J		30.00		20320.00	4.950	4.904	3.78	2562.03	2.25	66.719	0.000	66.719	292	384	450	HDPE	652	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	0.29	0.290	0.26	4.66	4.64
812	ONHRDM12	ONHRDM13	C		30.00		20350.00	4.904	4.921	3.78	2565.81	2.25	66.818	0.000	66.818	292	384	450	HDPE	-1765	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	0.26		0.23	4.64	4.69
813	ONHRDM13	ONHRDM14	C		30.00		20380.00	4.921	4.963	3.78	2569.59	2.25	66.916	0.000	66.916	292	384	450	HDPE	-714	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	0.23		0.20	4.69	4.76
814	ONHRDM14	ONHRDM15	C		30.00		20410.00	4.963	5.093	3.78	2573.37	2.25	67.015	0.000	67.015	293	384	450	HDPE	-231	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	0.20		0.17	4.76	4.92
815	ONHRDM15	ONHRDM16	C		30.00		20440.00	5.093	5.154	3.78	2577.16	2.25	67.113	0.000	67.113	293	384	450	HDPE	-492	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	0.17		0.14	4.92	5.01
816	ONHRDM16	ONHRDM17	C		30.00		20470.00	5.154	5.287	3.78	2580.94	2.25	67.212	0.000	67.212	293	384	450	HDPE	-226	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	0.14		0.11	5.01	5.18
817	ONHRDM17	ONHRDM18	C		14.00		20484.00	5.287	5.630	1.77	2582.70	2.25	67.258	0.000	67.258	293	384	450	HDPE	-41	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.01	0.00	0.11		0.10	5.18	5.53
818	ONHRDM18	ONHRDM19	C		30.00		20514.00	5.630	4.963	3.78	2586.49	2.25	67.356	0.000	67.356	293	384	450	HDPE	45	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	0.10		0.07	5.53	4.89
819	ONHRDM19	RSRDM1	C		18.00		20532.00	4.963	4.872	2.27	2588.76	2.25	67.416	0.000	67.416	294	384	450	HDPE	198	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.02	0.00	0.07		0.05	4.89	4.82
820	RSRDM1	RSRDM2	C		12.00		20544.00	4.872	4.524	1.51	2590.27	2.25	67.455	0.000	67.455	294	384	450	HDPE	34	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.01	0.00	0.05		0.04	4.82	4.48
821	RSRDM2	RSRDM3	C		30.00		20574.00	4.524	4.176	3.78	2594.05	2.25	67.553	0.000	67.553	294	384	450	HDPE	86	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	0.04		0.01	4.48	4.17
822	RSRDM3	RSRDM4	C		30.00		20604.00	4.176	3.829	3.78	2597.83	2.25	67.652	0.000	67.652	294	384	450	HDPE	86	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	0.01		-0.02	4.17	3.85
823	RSRDM4	RSRDM5	C		30.00		20634.00	3.829	3.481	3.78	2601.62	2.25	67.750	0.000	67.750	294	384	450	HDPE	86	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-0.02		-0.05	3.85	3.53
824	RSRDM5	RSRDM6	C		30.00		20664.00	3.481	3.134	3.78	2605.40	2.25	67.849	0.000	67.849	294	384	450	HDPE	86	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-0.05		-0.08	3.53	3.21
825	RSRDM6	RSRDM7	C		30.00		20694.00	3.134	2.786	3.78	2609.18	2.25	67.947	0.000	67.947	295	384	450	HDPE	86	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-0.08		-0.11	3.21	2.90
826	RSRDM7	RSRDM8	C		30.00		20724.00	2.786	2.438	3.78	2612.96	2.25	68.046	0.000	68.046	295	384	450	HDPE	86	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-0.11		-0.14	2.90	2.58

Sl. No.	Man Holes		Manhole Type	Manhole Type	Length in m	Cumulative length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To						Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole
827	RSRDM8	RSRDM9	C		30.00		20754.00	2.438	2.091	3.78	2616.75	2.25	68.144	0.000	68.144	295	384	450	HDPE	86	1000	0.010	0.66	76.93	0.89	1.13	0.74	OK	0.75	OK	0.03	0.00	-0.14		-0.17	2.58	2.26
828	RSRDM9	RSRDM10	C		30.00		20784.00	2.091	1.763	3.78	2620.53	2.25	68.243	0.000	68.243	295	384	450	HDPE	91	1000	0.010	0.66	76.93	0.89	1.13	0.74	OK	0.75	OK	0.03	0.00	-0.17		-0.20	2.26	1.96
829	RSRDM10	RSRDM11	C		28.00		20812.00	1.763	1.650	3.53	2624.06	2.25	68.335	0.000	68.335	296	384	450	HDPE	248	1000	0.010	0.66	76.93	0.89	1.13	0.74	OK	0.75	OK	0.03	0.00	-0.20		-0.23	1.96	1.88
830	RSRDM11	RSRDM12	C		10.00		20822.00	1.650	1.300	1.26	2625.32	2.25	68.368	0.000	68.368	296	384	450	HDPE	29	1000	0.010	0.66	76.93	0.89	1.13	0.74	OK	0.75	OK	0.01	0.00	-0.23		-0.24	1.88	1.54
831	RSRDM12	RSRDM13	C		30.00		20852.00	1.300	1.300	3.78	2629.10	2.25	68.466	0.000	68.466	296	384	450	HDPE	0	1000	0.010	0.66	76.93	0.89	1.13	0.74	OK	0.75	OK	0.03	0.00	-0.24		-0.27	1.54	1.57
832	RSRDM33	RSRDM32	H		29.00		29.00	1.474	1.444	3.66	3.66	2.25	0.095	0.000	0.095	12	200	200	DWC	967	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.17	0.00	0.37		0.20	1.10	1.24
833	RSRDM32	RSRDM31	C		23.00		52.00	1.444	1.418	2.90	6.56	2.25	0.171	0.000	0.171	15	200	200	DWC	885	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.14	0.00	0.20		0.06	1.24	1.36
834	RSRDM31	RSRDM30	C		21.00		73.00	1.418	1.395	2.65	9.20	2.25	0.240	0.000	0.240	18	200	200	DWC	913	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.12	0.00	0.06		-0.06	1.36	1.46
835	RSRDM30	RSRDM29	C		30.00		103.00	1.395	1.363	3.78	12.99	2.25	0.338	0.000	0.338	21	200	200	DWC	937	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	-0.06		-0.24	1.46	1.60
836	RSRDM29	RSRDM28	C		21.00		124.00	1.363	1.340	2.65	15.63	2.25	0.407	0.000	0.407	23	200	200	DWC	913	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.07	0.00	-0.24		-0.31	1.60	1.65
837	RSRDM28	RSRDM27	C		23.00		147.00	1.340	1.255	2.90	18.53	2.25	0.483	0.000	0.483	25	200	200	DWC	271	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.08	0.00	-0.31		-0.39	1.65	1.65
838	RSRDM27	RSRDM26	C		10.00		157.00	1.255	1.205	1.26	19.80	2.25	0.515	0.000	0.515	26	200	200	DWC	200	300	0.010	0.78	24.67	0.02	0.40	0.10	OK	0.31	OK	0.03	0.00	-0.39		-0.42	1.65	1.63
839	RSRDM26	RSRDM25	C		20.00		177.00	1.205	1.470	2.52	22.32	2.25	0.581	0.000	0.581	28	200	200	DWC	-75	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.04	0.00	-0.42		-0.46	1.63	1.93
840	RSRDM25	RSRDM24	C		20.00		197.00	1.470	1.232	2.52	24.84	2.25	0.647	0.000	0.647	29	200	200	DWC	84	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.04	0.00	-0.46		-0.50	1.93	1.73
841	RSRDM24	RSRDM23	C		10.00		207.00	1.232	1.315	1.26	26.10	2.25	0.680	0.000	0.680	30	200	200	DWC	-120	470	0.010	0.63	19.71	0.03	0.46	0.13	OK	0.29	Check	0.02	0.00	-0.50		-0.52	1.73	1.84
842	RSRDM23	RSRDM22	C		26.00		233.00	1.315	1.717	3.28	29.38	2.25	0.765	0.000	0.765	32	200	200	DWC	-65	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	-0.52		-0.58	1.84	2.30
843	RSRDM22	RSRDM21	C		30.00		263.00	1.717	1.240	3.78	33.16	2.25	0.864	0.000	0.864	34	200	200	DWC	63	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	-0.58		-0.64	2.30	1.88
844	RSRDM21	RSRDM20	C		10.00		273.00	1.240	1.330	1.26	34.42	2.25	0.896	0.000	0.896	34	200	200	DWC	-111	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.02	0.00	-0.64		-0.66	1.88	1.99
845	RSRDM20	RSRDM19	C		30.00		303.00	1.330	1.545	3.78	38.20	2.25	0.995	0.000	0.995	36	200	200	DWC	-140	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.06	0.00	-0.66		-0.72	1.99	2.27
846	RSRDM19	RSRDM18	C		30.00		333.00	1.545	1.560	3.78	41.99	2.25	1.093	0.000	1.093	38	200	200	DWC	-2000	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	-0.72		-0.78	2.27	2.34
847	RSRDM18	RSRDM17	C		14.00		347.00	1.560	1.720	1.77	43.75	2.25	1.139	0.000	1.139	39	200	200	DWC	-88	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.03	0.00	-0.78		-0.81	2.34	2.53
848	RSRDM17	RSRDM16	C		30.00		377.00	1.720	1.840	3.78	47.53	2.25	1.238	0.000	1.238	40	200	200	DWC	-250	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.06	0.00	-0.81		-0.87	2.53	2.71
849	RSRDM16	RSRDM15	C		15.00		392.00	1.840	1.665	1.89	49.42	2.25	1.287	0.000	1.287	41	200	200	DWC	86	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.03	0.00	-0.87		-0.90	2.71	2.57
850	RSRDM15	RSRDM14	C		15.00		407.00	1.665	1.330	1.89	51.32	2.25	1.336	0.000	1.336	42	200	200	DWC	45	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.03	0.00	-0.90		-0.93	2.57	2.26
851	RSRDM14	RSRDM13	C		15.00		422.00	1.330	1.300	1.89	53.21	2.25	1.386	0.000	1.386	43	200	200	DWC	500	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.03	0.00	-0.93		-0.96	2.26	2.26
852	RSRDM13	RC	J	L	15.00		21289.00	1.300		1.89	2684.20	2.25	69.901	0.000	69.901	299	384	450	HDPE	12	1000	0.010	0.66	76.93	0.91	1.13	0.75	OK	0.75	OK	0.02	0.00	-0.96	-0.960	-0.98	2.26	
					19938.00		19938.00			2513.86	2513.86		0.000	0.000	0.000	0																					

SEWER NETWORK DESIGN _MUTTAR_ Block 4

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
1	VPRDM1	VPRDM2	0	1	H		30.00		30.00	5.640	5.581	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	508	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.54		4.37	1.10	1.21	OK
2	VPRDM2	VPRDM3	1	1	C		30.00		60.00	5.581	5.462	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	252	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.37		4.20	1.21	1.26	OK
3	VPRDM3	VPRDM4	1	1	C		30.00		90.00	5.462	5.343	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	252	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.20		4.03	1.26	1.31	OK
4	VPRDM4	VPVKRDM5	1	1	C		28.00		118.00	5.343	5.224	3.93	16.58	2.25	0.432	0.000	0.432	24	200	200	DWC	235	330	0.010	0.75	23.52	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	4.03		3.95	1.31	1.27	OK
5	VKRDM7	VKRDM6	0	1	H		25.00		25.00	6.230	5.650	3.51	3.51	2.25	0.091	0.000	0.091	11	200	200	DWC	43	43	0.010	2.07	65.15	0.00	0.30	0.07	OK	0.62	OK	0.58	0.00	5.13		4.55	1.10	1.10	OK
6	VKRDM6	VKRDM5	1	1	C		30.00		55.00	5.650	5.123	4.22	7.73	2.25	0.201	0.000	0.201	17	200	200	DWC	57	57	0.010	1.80	56.59	0.00	0.30	0.07	OK	0.54	OK	0.53	0.00	4.55		4.02	1.10	1.10	OK
7	VKRDM5	VKRDM4	1	1	C		18.00		73.00	5.123	5.074	2.53	10.26	2.25	0.267	0.000	0.267	19	200	200	DWC	367	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	4.02		3.92	1.10	1.15	OK
8	VKRDM4	VKRDM3	1	1	C		30.00		103.00	5.074	5.025	4.22	14.47	2.25	0.377	0.000	0.377	22	200	200	DWC	612	330	0.010	0.75	23.52	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.92		3.83	1.15	1.20	OK
9	VKRDM3	VKRDM2	1	1	C		23.00		126.00	5.025	5.074	3.23	17.71	2.25	0.461	0.000	0.461	25	200	200	DWC	-469	330	0.010	0.75	23.52	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	3.83		3.76	1.20	1.31	OK
10	VKRDM2	VKRDM1	1	1	C		30.00		156.00	5.074	5.174	4.22	21.92	2.25	0.571	0.000	0.571	27	200	200	DWC	-300	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	3.76		3.69	1.31	1.48	OK
11	VKRDM1	VPVKRDM5	1	1	C		28.00		184.00	5.174	5.224	3.93	25.86	2.25	0.673	0.000	0.673	30	200	200	DWC	-560	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	3.69		3.62	1.48	1.60	OK
12	VPVKRDM5	VPRDM6	2	1	J		30.00		332.00	5.224	5.327	4.22	46.65	2.25	1.215	0.000	1.215	40	200	200	DWC	-291	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	3.62	3.62	3.56	1.60	1.77	OK
13	VPRDM6	VPRDM7	1	1	C		30.00		362.00	5.327	5.430	4.22	50.87	2.25	1.325	0.000	1.325	42	200	200	DWC	-291	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	3.56		3.50	1.77	1.93	OK
14	VPRDM7	VPRDM8	1	1	C		30.00		392.00	5.430	5.533	4.22	55.09	2.25	1.435	0.000	1.435	43	200	200	DWC	-291	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	3.50		3.44	1.93	2.09	OK
15	VPRDM8	VPMNRDM9	1	1	C		30.00		422.00	5.533	5.636	4.22	59.30	2.25	1.544	0.000	1.544	45	200	200	DWC	-291	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	3.44		3.38	2.09	2.26	OK
16	MNRDM12.5	MNRDM12.4	0	1	H		30.00		30.00	2.390	2.440	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-600	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.29		1.12	1.10	1.32	OK
17	MNRDM12.4	MNRDM12.3	1	1	C		17.00		47.00	2.440	2.510	2.39	6.60	2.25	0.172	0.000	0.172	15	200	200	DWC	-243	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	1.12		1.03	1.32	1.48	OK
18	MNRDM12.3	MNRDM12.2	1	1	C		16.00		63.00	2.510	3.610	2.25	8.85	2.25	0.231	0.000	0.231	18	200	200	DWC	-15	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	1.03		0.94	1.48	2.67	OK
19	MNRDM12.2	MNRDM12.1	1	1	C		18.00		81.00	3.610	3.940	2.53	11.38	2.25	0.296	0.000	0.296	20	200	200	DWC	-55	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.94		0.84	2.67	3.10	OK
20	MNRDM12.1	MNRDM12	1	1	C		17.00		98.00	3.940	5.999	2.39	13.77	2.25	0.359	0.000	0.359	22	200	200	DWC	-8	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.84		0.75	3.10	5.25	OK
21	MNRDM15	MNRDM14	0	1	H		20.00		20.00	5.410	5.673	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-76	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	4.31		4.20	1.10	1.47	OK
22	MNRDM14	MNRDM13	1	1	C		30.00		50.00	5.673	5.940	4.22	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	-112	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.20		4.03	1.47	1.91	OK
23	MNRDM13	MNRDM12	1	1	C		30.00		80.00	5.940	5.999	4.22	11.24	2.25	0.293	0.000	0.293	20	200	200	DWC	-508	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.03		3.86	1.91	2.14	OK
24	MNRDM12	MNRDM11	2	1	J		13.00		191.00	5.999	5.741	1.83	26.84	2.25	0.699	0.000	0.699	30	200	200	DWC	50	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	0.75	0.75	0.72	5.25	5.02	OK
25	MNRDM11.1	MNRDM11	0	1	H		24.00		24.00	6.280	5.741	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	45	45	0.010	2.03	64.04	0.00	0.30	0.07	OK	0.61	OK	0.54	0.00	5.18		4.64	1.10	1.10	OK
26	MNRDM11	MNRDM10	2	0	J	L	15.00		230.00	5.741	5.586	2.11	32.32	2.25	0.842	0.000	0.842	33	200	200	DWC	97	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	0.72	0.72	0.69	5.02	4.90	OK
27	MNRDM10L	MNRDM9	0	1	H		20.00	230	250.00	5.586	5.432	2.81	35.13	2.25	0.915	0.000	0.915	35	200	200	DWC	130	125	0.010	1.21	38.21	0.02	0.40	0.10	OK	0.49	OK	0.16	0.00	4.49		4.33	1.10	1.10	FALSE
28	MNRDM9.2	MNRDM9.1	0	1	H		30.00		30.00	6.060	5.745	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	95	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.32	0.00	4.96		4.64	1.10	1.11	OK
29	MNRDM9.1	MNRDM9	1	1	C		20.00		50.00	5.745	5.432	2.81	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	64	64	0.010	1.70	53.40	0.00	0.30	0.07	OK	0.51	OK	0.31	0.00	4.64		4.33	1.11	1.10	OK
30	MNRDM9	MNRDM8	2	1	J		9.00		309.00	5.432	5.410	1.26	43.42	2.25	1.131	0.000	1.131	38	200	200	DWC	409	300	0.010	0.78	24.67	0.05	0.53	0.16	OK	0.42	OK	0.03	0.00	4.33	4.33	4.30	1.10	1.11	OK
31	MNRDM8.5	MNRDM8.4	0	1	H		9.00		9.00	6.011	5.763	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	36	36	0.010	2.26	71.20	0.00	0.30	0.07	OK	0.68	OK	0.25	0.00	4.91		4.66	1.10	1.10	OK
32	MNRDM8.4	MNRDM8.3	1	1	C		29.00		38.00	5.763	5.020	4.08	5.34	2.25	0.139	0.000	0.139	14	200	200	DWC	39	39	0.010	2.17	68.41	0.00	0.30	0.07	OK	0.65	OK	0.74	0.00	4.66		3.92	1.10	1.10	OK
33	MNRDM8.3	MNRDM8.2	1	1	C		30.00		68.00	5.020	5.119	4.22	9.56	2.25	0.249	0.000	0.249	18	200	200	DWC	-303	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.92		3.75	1.10	1.37	OK
34	MNRDM8.2	MNRDM8.1	1	1	C		30.00		98.00	5.119	5.320	4.22	13.77	2.25	0.359	0.000	0.359	22	200	200	DWC	-149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.75		3.58	1.37	1.74	OK
35	MNRDM8.1	MNRDM8	1	1	C		30.00		128.00	5.320	5.410	4.22	17.99	2.25	0.468	0.000	0.468	25	200	200	DWC	-333	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	3.58		3.49	1.74	1.92	OK
36	MNRDM8	MNRDM7	2	1	J		30.00		467.00	5.410	5.622	4.22	65.62	2.25	1.709	0.000	1.709	47	200	200	DWC	-142	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	3.49	3.49	3.43	1.92	2.19	OK
37	MNRDM7	MNKMRDM6	1	1	C		30.00		497.00	5.622	5.835	4.22	69.84	2.25	1.819	0.000	1.819	49	200	200	DWC	-141	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	3.43		3.37	2.19	2.47	OK
38	KMRDM9	KMRDM8	0	1	H		20.00		20.00	6.022	6.177	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-129	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	4.92		4.81	1.10	1.37	OK
39	KMRDM8	KMRDM7	1	1	C		18.00		38.00	6.177	6.488	2.53	5.34	2.25	0.139	0.000	0.139	14	200	200	DWC	-58	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	4.81		4.71	1.37	1.78	OK
40	KMRDM7	KMRDM6	1	1	C		30.00		68.00	6.488	6.644	4.22	9.56	2.25	0.249	0.000	0.249	18	200	200	DWC	-192	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.71		4.54	1.78	2.10	OK
41	KMRDM6	KMRDM5	1	1	C		10.00		78.00	6.644	6.577	1.41	10.96	2.25	0.285	0.000	0.285	20	200	200	DWC	149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	4.54		4.48	2.10	2.10	OK
42	KMRDM5	KMRDM4	1	1	C		30.00		108.00	6.580	6.511	4.22	15.18	2.25	0.395	0.000	0.395	23	200	200	DWC	435	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	4.48		4.39	2.10	2.12	OK
43	KMRDM4	KMRDM3	1	1	C		30.00		138.00	6.511	6.445	4.22	19.39	2.25	0.505	0.000	0.505	26	200	200	DWC	455	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	4.39		4.30	2.12	2.15	OK
44	KMRDM3	KMRDM2	1	1	C		30.00		168.00	6.445	6.378	4.22	23.61	2.25	0.615	0.000	0.615	28	200	200	DWC	448	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	4.30		4.23	2.15	2.15	OK
45	KMRDM2.3	KMRDM2.2	0	1	H		25.00		25.00	6.470	6.220	3.51	3.51	2.25	0.091	0.000	0.091	11	200	200	DWC	100	100	0.010	1.36	42.72	0.00	0.30	0.07	OK	0.41	OK	0.25	0.00	5.37		5.12	1.10	1.10	OK
46	KMRDM2.2	KMRDM2.1	1	1	C		18.00		43.00	6.220	6.298	2.53	6.04	2.25	0.157	0.000	0.157	15	200	200	DWC	-231	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	5.12		5.02	1.10	1.28	OK
47	KMRDM2.1	KMRDM2	1	1	C		20.00		63.00	6.298	6.378	2.81	8.85	2.25	0.231	0.000	0.231	18	200	200	DWC	-250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	5.02		4.91	1.28	1.47	OK
48	KMRDM2	KMRDM1	2	1	J		22.00		253.00	6.378	6.106	3.09	35.55	2.25	0.926	0.000	0.926	35	200	200	DWC	81	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	4.23	4.23	4.19	2.15	1.92	OK
49	KMRDM1	MNKMRDM6	1	1	C		30.00		283.00	6.106	5.835	4.22	39.77	2.25	1.036	0.000	1.036	37	200	200	DWC	111	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	4.19		4.13	1.92	1.71	OK
50	MNKMRDM6.	MNKMRDM6.	0	1	H		11.00		11.00	6.180	6.093	1.55	1.55	2.25	0.040	0.000	0.040	8	200	200	DWC	126	126	0.010	1.21	38.06	0.00	0.30	0.07	OK	0.36	OK	0.09	0.00	5.08		4.99	1.10	1.10	OK
51	MNKMRDM6.	MNKMRDM6.	0	1	H		20.00		20.00	6.090	6.093	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-6667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	4.99		4.88	1.10	1.21	OK
52	MNKMRDM6.	MNKMRDM6.	2	1	J		10.00		41.00	6.093	6.029	1.41	5.76	2.25	0.150	0.000	0.150	14	200	200	DWC	156	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	4.88	4.88	4.82	1.21	1.21	OK
53	MNKMRDM6.	MNKMRDM6.	1	1	C		30.00		71.00	6.029	5.899	4.22	9.98	2.25	0.260	0.000	0.260	19	200	200	DWC	231	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	4.82		4.65	1.21	1.25	OK
54	MNKMRDM6.	MNKMRDM6	1	1	C		7.00		78.00	5.899	5.835	0.98	10.96	2.25	0.285	0.000	0.285	20	200	200	DWC	109	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	4.65		4.61	1.25	1.23	OK
55	MNKMRDM6	MNRDM5	3	1	J		14.00		872.00	5.835	5.814	1.97	122.54	2.25	3.191	0.000	3.191	64	200	200	DWC	667	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.03	0.00	4.13	4.13	4.10	1.71	1.71	OK
56	MNRDM5	MNRDM4	1	1	C		20.00		892.00	5.814	5.785	2.81	125.35	2.25	3.264	0.000	3.264	65	200	200	DWC	690	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.04	0.00	4.10		4.06	1.71	1.73	OK
57	MNRDM4	MNRDM3	1	1	C		20.00		912.00	5.785	5.756	2.81	128.16	2.25	3.337	0.000	3.337	66	200	200	DWC	690	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	4.06		4.02	1.73	1.74	OK
58	MNRDM3	MNRDM2	1	1	C		28.00		940.00	5.756	5.715	3.93	132.09	2.25	3.440	0.000	3.440	67	200	200	DWC	683	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.05	0.00	4.02		3.97	1.74	1.75	OK
59	MNRDM2	MNRDM1	1	1	C		25.00		965.00	5.715	5.679	3.51	135.60	2.25	3.531	0.000	3.531	68	200	200	DWC	694	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.05	0.00	3.97		3.92	1.75	1.76	OK
60	MNRDM1	VPMNRDM9	1	1	C		30.00		995.00	5.679	5.636	4.22	139.82	2.25	3.641	0.000	3.641	69	200	200	DWC	698	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	3.92		3.86	1.76	1.78	OK
61	VPMNRDM9	VPRDM10	2	1	J		25.00		1442.00	5.636	5.707	3.51	202.63	2.25	5.277	0.000	5.277	82	200	200	DWC	-352	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.05	0.00	3.38	3.38	3.33	2.26	2.38	OK
62	VPRDM10	VPGGRDM11	1	1	C		15.00		1457.00	5.707	5.778	2.11	204.74	2.25	5.332	0.000	5.332	83	200	200	DWC	-211	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.03	0.00	3.33		3.30	2.38	2.48	OK
63	GGRDM5	GGRDM4	0	1	H		15.33		15.33	6.440	6.392	2.15	2.15	2.25	0.056	0.000	0.056	9	200	200	DWC	319	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	5.34		5.25	1.10	1.14	OK
64	GGRDM4	GGRDM3	1	1	C		30.00		45.33	6.392	6.345	4.22	6.37	2.25	0.166	0.000	0.166	15	200	200	DWC	638	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.25		5.08	1.14	1.27	OK
65	GGRDM3.3	GGRDM3.2	0	1	H		30.00		30.00	6.590	6.597	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-4286	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	5.49		5.32	1.10	1.28	OK
66	GGRDM3.2	GGRDM3.1	1	1	C		16.00		46.00	6.597	6.471	2.25	6.46	2.25	0.168	0.000	0.168	15	200	200	DWC	127	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	5.32		5.23	1.28	1.24	OK
67	GGRDM3.1	GGRDM3	1	1	C		30.00		76.00	6.471	6.345	4.22	10.68	2.25	0.278	0.000	0.278	19	200	200	DWC	238	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.23		5.06	1.24	1.29	OK
68	GGRDM3	GGRDM2	2	1	J		28.00		149.33	6.345	6.204	3.93	20.98	2.25	0.546	0.000	0.546	27	200	200	DWC	199	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	5.06	5.06	4.99	1.29	1.21	OK

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
69	GGRDM2	GGRDM1	1	1	C		30.00		179.33	6.204	5.920	4.22	25.20	2.25	0.656	0.000	0.656	29	200	200	DWC	106	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	4.99		4.82	1.21	1.10	OK
70	GGRDM1	VPGGRDM11	1	1	C		30.00		209.33	5.920	5.780	4.22	29.42	2.25	0.766	0.000	0.766	32	200	200	DWC	214	220	0.010	0.92	28.80	0.03	0.46	0.13	OK	0.42	OK	0.14	0.00	4.82		4.68	1.10	1.10	OK
71	VPGGRDM11	VPRDM12	2	1	J		30.00		1696.33	5.780	5.783	4.22	238.37	2.25	6.208	0.000	6.208	89	200	200	DWC	-10000	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.06	0.00	3.30	3.30	3.24	2.48	2.54	OK
72	VPRDM12	VPRDM13	1	1	C		30.00		1726.33	5.783	5.791	4.22	242.59	2.25	6.317	0.000	6.317	90	200	200	DWC	-3750	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.06	0.00	3.24		3.18	2.54	2.61	OK
73	VPRDM13	VPRDM14	1	1	C		30.00		1756.33	5.791	5.799	4.22	246.81	2.25	6.427	0.000	6.427	91	200	200	DWC	-3750	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.06	0.00	3.18		3.12	2.61	2.68	OK
74	VPRDM14	VPRDM15	1	1	C		30.00		1786.33	5.799	5.804	4.22	251.02	2.25	6.537	0.000	6.537	92	200	200	DWC	-6000	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	3.12		3.06	2.68	2.74	OK
75	VPRDM15	VPRDM16	1	1	C		30.00		1816.33	5.804	5.810	4.22	255.24	2.25	6.647	0.000	6.647	93	200	200	DWC	-5000	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	3.06		3.00	2.74	2.81	OK
76	BRRDM20	BRRDM19	0	1	H		25.00		25.00	8.751	8.380	3.51	3.51	2.25	0.091	0.000	0.091	11	200	200	DWC	67	67	0.010	1.66	52.19	0.00	0.30	0.07	OK	0.50	OK	0.37	0.00	7.65		7.28	1.10	1.10	OK
77	BRRDM19	BRRDM18	1	1	C		17.00		42.00	8.380	8.130	2.39	5.90	2.25	0.154	0.000	0.154	14	200	200	DWC	68	68	0.010	1.65	51.81	0.00	0.30	0.07	OK	0.49	OK	0.25	0.00	7.28		7.03	1.10	1.10	OK
78	BRRDM18	BRRDM17	1	1	C		30.00		72.00	8.130	7.681	4.22	10.12	2.25	0.263	0.000	0.263	19	200	200	DWC	67	67	0.010	1.66	52.19	0.01	0.30	0.07	OK	0.50	OK	0.45	0.00	7.03		6.58	1.10	1.10	OK
79	BRRDM17.2	BRRDM17.1	0	1	H		30.00		30.00	7.710	7.690	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	1500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	6.61		6.44	1.10	1.25	OK
80	BRRDM17.1	BRRDM17	1	1	C		8.00		38.00	7.690	7.681	1.12	5.34	2.25	0.139	0.000	0.139	14	200	200	DWC	889	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	6.44		6.40	1.25	1.28	OK
81	BRRDM17	BRRDM16	2	1	J		15.00		125.00	7.681	7.529	2.11	17.57	2.25	0.457	0.000	0.457	25	200	200	DWC	99	330	0.010	0.75	23.52	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	6.40	6.40	6.35	1.28	1.18	OK
82	BRRDM16	BRRDM15	1	1	C		30.00		155.00	7.529	7.377	4.22	21.78	2.25	0.567	0.000	0.567	27	200	200	DWC	197	400	0.010	0.68	21.36	0.03	0.46	0.13	OK	0.31	OK	0.08	0.00	6.35		6.27	1.18	1.11	OK
83	BRRDM15.11	BRRDM15.10	0	1	H		30.00		30.00	8.322	8.033	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	104	104	0.010	1.33	41.89	0.00	0.30	0.07	OK	0.40	OK	0.29	0.00	7.22		6.93	1.10	1.10	OK
84	BRRDM15.10	BRRDM15.9	1	1	C		30.00		60.00	8.033	7.745	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	104	104	0.010	1.33	41.89	0.01	0.30	0.07	OK	0.40	OK	0.29	0.00	6.93		6.64	1.10	1.11	OK
85	BRRDM15.9.1	BRRDM15.9	0	1	H		18.00		18.00	7.830	7.745	2.53	2.53	2.25	0.066	0.000	0.066	10	200	200	DWC	212	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	6.73		6.63	1.10	1.12	OK
86	BRRDM15.9	BRRDM15.8	2	1	J		17.00		95.00	7.745	7.821	2.39	13.35	2.25	0.348	0.000	0.348	22	200	200	DWC	-224	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	6.63	6.63	6.54	1.12	1.28	OK
87	BRRDM15.8.2	BRRDM15.8.1	0	1	H		15.91		15.91	8.384	8.102	2.24	2.24	2.25	0.058	0.000	0.058	9	200	200	DWC	56	56	0.010	1.81	57.09	0.00	0.30	0.07	OK	0.54	OK	0.28	0.00	7.28		7.00	1.10	1.10	OK
88	BRRDM15.8.1	BRRDM15.8	1	1	C		30.00		45.91	8.102	7.821	4.22	6.45	2.25	0.168	0.000	0.168	15	200	200	DWC	107	107	0.010	1.31	41.30	0.00	0.30	0.07	OK	0.39	OK	0.28	0.00	7.00		6.72	1.10	1.10	OK
89	BRRDM15.8	BRRDM15.7	2	1	J		30.00		170.91	7.821	7.714	4.22	24.02	2.25	0.625	0.000	0.625	29	200	200	DWC	280	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	6.54	6.54	6.47	1.28	1.24	OK
90	BRRDM15.7	BRRDM15.6	1	1	C		25.00		195.91	7.714	7.370	3.51	27.53	2.25	0.717	0.000	0.717	31	200	200	DWC	73	120	0.010	1.24	39.00	0.02	0.40	0.10	OK	0.50	OK	0.21	0.00	6.47		6.26	1.24	1.11	OK
91	BRRDM15.6	BRRDM15.5	1	1	C		17.00		212.91	7.370	7.435	2.39	29.92	2.25	0.779	0.000	0.779	32	200	200	DWC	-262	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	6.26		6.23	1.11	1.21	OK
92	BRRDM17.3	BRRDM17.4	0	1	H		30.00		30.00	7.730	7.641	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	337	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	6.63		6.46	1.10	1.18	OK
93	BRRDM17.4	BRRDM17.5	1	1	C		30.00		60.00	7.641	7.552	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.46		6.29	1.18	1.26	OK
94	BRRDM17.5	BRRDM17.6	1	1	C		10.00		70.00	7.552	7.523	1.41	9.84	2.25	0.256	0.000	0.256	19	200	200	DWC	345	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	6.29		6.23	1.26	1.29	OK
95	BRRDM17.6	BRRDM15.5	1	1	C		30.00		100.00	7.523	7.430	4.22	14.05	2.25	0.366	0.000	0.366	22	200	200	DWC	323	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.23		6.06	1.29	1.37	OK
96	BRRDM15.5	BRRDM15.4	2	1	J		11.00		323.91	7.430	7.391	1.55	45.52	2.25	1.185	0.000	1.185	39	200	200	DWC	282	470	0.010	0.63	19.71	0.06	0.55	0.17	OK	0.34	OK	0.02	0.00	6.06	6.06	6.04	1.37	1.35	OK
97	BRRDM15.4	BRRDM15.3	1	1	C		30.00		353.91	7.391	7.300	4.22	49.73	2.25	1.295	0.000	1.295	41	200	200	DWC	330	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	6.04		5.98	1.35	1.32	OK
98	BRRDM15.3	BRRDM15.2	1	1	C		30.00		383.91	7.310	7.291	4.22	53.95	2.25	1.405	0.000	1.405	43	200	200	DWC	1579	470	0.010	0.63	19.71	0.07	0.59	0.19	OK	0.37	OK	0.06	0.00	5.98		5.92	1.33	1.37	OK
99	BRRDM15.2	BRRDM15.1	1	1	C		30.00		413.91	7.291	7.348	4.22	58.16	2.25	1.515	0.000	1.515	44	200	200	DWC	-526	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	5.92		5.86	1.37	1.49	OK
100	BRRDM15.1	BRRDM15	1	1	C		30.00		443.91	7.348	7.377	4.22	62.38	2.25	1.624	0.000	1.624	46	200	200	DWC	-1034	470	0.010	0.63	19.71	0.08	0.61	0.20	OK	0.38	OK	0.06	0.00	5.86		5.80	1.49	1.58	OK
101	BRRDM15	BRRDM14	2	1	J		24.00		622.91	7.377	7.445	3.37	87.53	2.25	2.280	0.000	2.280	54	200	200	DWC	-353	470	0.010	0.63	19.71	0.12	0.69	0.24	OK	0.43	OK	0.05	0.00	5.80	5.80	5.75	1.58	1.70	OK
102	BRRDM14.3	BRRDM14.2	0	1	H		16.00		16.00	7.770	7.688	2.25	2.25	2.25	0.059	0.000	0.059	9	200	200	DWC	195	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	6.67		6.58	1.10	1.11	OK
103	BRRDM14.2	BRRDM14.1	1	1	C		25.00		41.00	7.688	7.569	3.51	5.76	2.25	0.150	0.000	0.150	14	200	200	DWC	210	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	6.58		6.44	1.11	1.13	OK
104	BRRDM14.1	BRRDM14	1	1	C		26.00		67.00	7.569	7.445	3.65	9.42	2.25	0.245	0.000	0.245	18	200	200	DWC	210	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	6.44		6.30	1.13	1.15	OK
105	BRRDM14	BRRDM13	2	1	J		8.00		697.91	7.445	7.454	1.12	98.07	2.25	2.554	0.000	2.554	58	200	200	DWC	-889	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.02	0.00	5.75	5.75	5.73	1.70	1.72	OK
106	BRRDM13	BRRDM12	1	1	C		12.00		709.91	7.454	7.464	1.69	99.76	2.25	2.598	0.000	2.598	58	200	200	DWC	-1200	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.02	0.00	5.73		5.71	1.72	1.75	OK
107	BRRDM12.3	BRRDM12.2	0	1	H		12.00		12.00	6.693	6.886	1.69	1.69	2.25	0.044	0.000	0.044	8	200	200	DWC	-62	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	5.59		5.52	1.10	1.37	OK
108	BRRDM12.2	BRRDM12.1	1	1	C		30.00		42.00	6.886	7.272	4.22	5.90	2.25	0.154	0.000	0.154	14	200	200	DWC	-78	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	5.52		5.35	1.37	1.92	OK
109	BRRDM12.1	BRRDM12	1	1	C		30.00		72.00	7.272	7.464	4.22	10.12	2.25	0.263	0.000	0.263	19	200	200	DWC	-156	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.35		5.18	1.92	2.28	OK
110	BRRDM12	BRRDM11	2	1	J		10.00		791.91	7.464	7.484	1.41	111.28	2.25	2.898	0.000	2.898	61	200	200	DWC	-500	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.02	0.00	5.18	5.18	5.16	2.28	2.32	OK
111	BRRDM11	BRRDM10	1	1	C		30.00		821.91	7.484	7.430	4.22	115.50	2.25	3.008	0.000	3.008	62	200	200	DWC	556	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	5.16		5.10	2.32	2.33	OK
112	BRRDM10	BRRDM9	1	1	C		30.00		851.91	7.430	7.620	4.22	119.71	2.25	3.118	0.000	3.118	64	200	200	DWC	-158	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	5.10		5.04	2.33	2.58	OK
113	BRRDM9	BRRDM8	1	1	C		30.00		881.91	7.620	7.492	4.22	123.93	2.25	3.227	0.000	3.227	65	200	200	DWC	234	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	5.04		4.98	2.58	2.51	OK
114	BRRDM8	BRRDM7	1	1	C		15.00		896.91	7.492	7.385	2.11	126.04	2.25	3.282	0.000	3.282	65	200	200	DWC	140	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.03	0.00	4.98		4.95	2.51	2.44	OK
115	BRRDM7	BRRDM6	1	1	C		25.00		921.91	7.385	7.307	3.51	129.55	2.25	3.374	0.000	3.374	66	200	200	DWC	321	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.05	0.00	4.95		4.90	2.44	2.41	OK
116	BRRDM6	BRRDM5	1	1	C		30.00		951.91	7.307	7.229	4.22	133.77	2.25	3.483	0.000	3.483	67	200	200	DWC	385	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	4.90		4.84	2.41	2.39	OK
117	BRRDM5	BRRDM4	1	1	C		17.00		968.91	7.229	7.163	2.39	136.15	2.25	3.546	0.000	3.546	68	200	200	DWC	258	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.03	0.00	4.84		4.81	2.39	2.35	OK
118	BRRDM4	BRRDM3	1	1	C		7.00		975.91	7.163	7.163	0.98	137.14	2.25	3.571	0.000	3.571	68	200	200	DWC	0	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.01	0.00	4.81		4.80	2.35	2.36	OK
119	BRRDM3	BRRDM2	1	1	C		30.00		1005.91	7.163	6.646	4.22	141.35	2.25	3.681	0.000	3.681	69	200	200	DWC	58	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	4.80		4.74	2.36	1.91	OK
120	BRRDM2	BRRDM1	1	1	C		18.00		1023.91	6.646	6.336	2.53	143.88	2.25	3.747	0.000	3.747	70	200	200	DWC	58	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.03	0.00	4.74		4.71	1.91	1.63	OK
121	BRRDM1	VPBRRDM17	1	1	C		30.00		1053.91	6.336	5.820	4.22	148.10	2.25	3.857	0.000	3.857	71	200	200	DWC	58	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.06	0.00	4.71		4.65	1.63	1.17	OK
122	VPBRRDM17	VPRDM16	1	1	C		30.00		1083.91	5.820	5.963	4.22	152.31	2.25	3.967	0.000	3.967	72	200	200	DWC	-210	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.06	0.00	4.65		4.59	1.17	1.37	OK
123	VPRDM16	VPRDM18	2	1	J		30.00		2930.24	5.810	5.963	4.22	411.77	2.25	10.723	0.000	10.723	117	200	200	DWC	-196	520	0.010	0.60	18.73	0.57	1.03	0.54	OK	0.61	OK	0.06	0.00	3.00	3.00	2.94	2.81	3.02	OK
124	VPRDM18	VPRDM19	1	1	C		30.00		2960.24	5.963	6.106	4.22	415.98	2.25	10.833	0.000	10.833	118	200	200	DWC	-210	520	0.010	0.60	18.73	0.58	1.03	0.55	OK	0.61	OK	0.06	0.00	2.94		2.88	3.02	3.23	OK
125	VPRDM19	VPRDM20	1	1	C		30.00		2990.24	6.106	6.249	4.22	420.20	2.25	10.943	0.000	10.943	119	200	200	DWC	-210	520	0.010	0.60	18.73	0.58	1.03	0.55	OK	0.61	OK	0.06	0.00	2.88		2.82	3.23	3.43	OK
126	VPRDM20	VPRDM21L	1	0	C	L	25.00		3015.24	6.250	6.369	3.51	423.71	2.25	11.034	0.000	11.034	119	200	200	DWC	-210	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.05	0.00	2.82		2.77	3.43	3.60	OK
127	VPRDM21	VPRDM22	0	1	H		30.00	3015.24	3045.24	6.370	6.670	4.22	427.93	2.25	11.144	0.000	11.144	120	200	200	DWC	-100	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.06	0.00	5.27		5.21	1.10	1.46	OK
128	VPRDM22	VPRDM23	1	1	C		24.00		3069.24	6.670	6.944	3.37	431.30	2.25	11.232	0.000	11.232	120	200	200	DWC	-88	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.05	0.00	5.21		5.16	1.46	1.78	OK
129	VPRDM23.2	VPRDM23.1	0	1	H		21.12		21.12	7.034	6.989	2.97	2.97	2.25	0.077	0.000	0.077	10	200	200	DWC	469	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	5.93		5.81	1.10	1.18	OK
130	VPRDM23.1	VPRDM23	1	1	C		30.00		51.12	6.989	6.944	4.22	7.18	2.25	0.187	0.000	0.187	16	200	200	DWC	667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.81		5.64	1.18	1.30	OK
131	VPRDM23	VPRDM24	2	1	J		16.68		3137.04	6.944	7.052	2.34	440.83	2.25	11.480	0.000	11.480	121	200	200	DWC	-154	520	0.010	0.60	18.73	0.61	1.05	0.57	OK	0.62	OK	0.03	0.00	5.16	5.16	5.13	1.78	1.92	OK
132	VPRDM24	VPRDM25	1	1	C		30.00		3167.04	7.052	7.159	4.22	445.04	2.25	11.590	0.000	11.590	122	200	200	DWC	-280	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.06	0.00	5.13		5.07	1.92	2.09	OK
133	VPRDM25	VPRDM26	1	1	C		30.00		3197.04	7.159	7.245	4.22	449.26	2.25	11.699	0.000	11.699	123	200	200	DWC	-349	520	0.010	0.60	18.73	0.62	1.05	0.57	OK	0.62	OK	0.06	0.00	5.07		5.01	2.09	2.24	OK
134	VPRDM26	VPDMRDM27	1	1	C		30.00		3227.04	7.245	7.331	4.22	453.47	2.25	11.809	0.000	11.809	123	200	200	DWC	-349	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.06	0.00	5.01		4.95	2.24	2.38	OK
135	DMRDM30	DMRDM29	0	1	H		30.00		30.00	12.003	12.720	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-42	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	10.90		10.73	1.10	1.99	OK
136	DMRDM29	DMRDM28	1	1	C		30.00		60.00	12.720	13.438	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	-42	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	10.73		10.56	1.99	2.88	OK
137	DMRDM28	DMRDM27	1	1	C		10.00		70.00	13.440	13.677	1.41	9.84	2.25	0.256	0.000	0.256	19	200	200	DWC	-42	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	10.56		10.50	2.88	3.18	OK
138	DMRDM27	DMRDM26	1	1	C		30.00		100.00	13.677	14.395	4.22	14.05	2.25	0.366	0.000	0.366	22	200	200	DWC	-42	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	10.50		10.33	3.18	4.07	OK
139	DMRDM26	DMRDM25	1	1	C		12.00		112.00	14.395	13.974	1.69	15.74	2.25	0.410	0.000	0.410	23	200	200	DWC	29	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	10.33		10.29	4.07	3.68	OK

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
140	DMRDM25	DMRDM24	1	1	C		20.00		132.00	13.974	13.274	2.81	18.55	2.25	0.483	0.000	0.483	25	200	200	DWC	29	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	10.29		10.23	3.68	3.04	OK
141	DMRDM24	DMRDM23	1	1	C		30.00		162.00	13.274	12.223	4.22	22.76	2.25	0.593	0.000	0.593	28	200	200	DWC	29	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	10.23		10.14	3.04	2.08	OK
142	DMRDM23	DMRDM22	1	1	C		30.00		192.00	12.223	11.173	4.22	26.98	2.25	0.703	0.000	0.703	30	200	200	DWC	29	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	10.14		10.07	2.08	1.10	OK
143	DMRDM22	DMRDM21	1	1	C		30.00		222.00	11.173	10.123	4.22	31.20	2.25	0.812	0.000	0.812	33	200	200	DWC	29	29	0.010	2.54	80.03	0.01	0.30	0.07	OK	0.76	OK	1.05	0.00	10.07		9.02	1.10	1.10	OK
144	DMRDM21.4	DMRDM21.3	0	1	H		19.27		19.27	12.994	12.374	2.71	2.71	2.25	0.071	0.000	0.071	10	200	200	DWC	31	31	0.010	2.44	76.73	0.00	0.30	0.07	OK	0.73	OK	0.62	0.00	11.89		11.27	1.10	1.10	OK
145	DMRDM21.3	DMRDM21.2	1	1	C		30.00		49.27	12.374	11.557	4.22	6.92	2.25	0.180	0.000	0.180	16	200	200	DWC	37	37	0.010	2.25	70.71	0.00	0.30	0.07	OK	0.67	OK	0.82	0.00	11.27		10.45	1.10	1.11	OK
146	DMRDM21.2	DMRDM21.1	1	1	C		30.00		79.27	11.557	10.840	4.22	11.14	2.25	0.290	0.000	0.290	20	200	200	DWC	42	42	0.010	2.09	65.92	0.00	0.30	0.07	OK	0.63	OK	0.71	0.00	10.45		9.74	1.11	1.10	OK
147	DMRDM21.1	DMRDM21	1	1	C		30.00		109.27	10.840	10.123	4.22	15.35	2.25	0.400	0.000	0.400	23	200	200	DWC	42	42	0.010	2.11	66.32	0.01	0.30	0.07	OK	0.63	OK	0.72	0.00	9.74		9.02	1.10	1.10	OK
148	DMRDM21	DMRDM20	2	1	J		30.00		361.27	10.123	9.445	4.22	50.77	2.25	1.322	0.000	1.322	42	200	200	DWC	44	45	0.010	2.02	63.69	0.02	0.40	0.10	OK	0.81	OK	0.67	0.00	9.02	9.02	8.35	1.10	1.10	FALSE
149	DMRDM20	DMRDM19	1	1	C		30.00		391.27	9.445	8.770	4.22	54.98	2.25	1.432	0.000	1.432	43	200	200	DWC	44	44	0.010	2.05	64.41	0.02	0.40	0.10	OK	0.82	OK	0.68	0.00	8.35		7.67	1.10	1.10	FALSE
150	DMRDM19.3	DMRDM19.2	0	1	H		8.26		8.26	8.910	8.890	1.16	1.16	2.25	0.030	0.000	0.030	7	200	200	DWC	413	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.05	0.00	7.81		7.76	1.10	1.13	OK
151	DMRDM19.2	DMRDM19.1	1	1	C		30.00		38.26	8.890	8.838	4.22	5.38	2.25	0.140	0.000	0.140	14	200	200	DWC	577	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	7.76		7.59	1.13	1.25	OK
152	DMRDM19.1	DMRDM19	1	1	C		30.00		68.26	8.838	8.768	4.22	9.59	2.25	0.250	0.000	0.250	18	200	200	DWC	429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	7.59		7.42	1.25	1.35	OK
153	DMRDM19	DMRDM18	2	1	J		9.00		468.53	8.768	8.600	1.26	65.84	2.25	1.715	0.000	1.715	47	200	200	DWC	54	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.02	0.00	7.42	7.42	7.40	1.35	1.20	OK
154	DMRDM18	DMRDM17	1	1	C		30.00		498.53	8.600	8.400	4.22	70.06	2.25	1.824	0.000	1.824	49	200	200	DWC	150	300	0.010	0.78	24.67	0.07	0.59	0.19	OK	0.46	OK	0.10	0.00	7.40		7.30	1.20	1.10	OK
155	DMRDM17	DMPPRDM16	1	1	C		8.00		506.53	8.400	8.354	1.12	71.18	2.25	1.854	0.000	1.854	49	200	200	DWC	174	180	0.010	1.01	31.84	0.06	0.55	0.17	OK	0.56	OK	0.04	0.00	7.30		7.26	1.10	1.09	FALSE
156	PPRDM10.2	PPRDM10.1	0	1	H		15.00		15.00	12.370	12.270	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	150	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.10	0.00	11.27		11.17	1.10	1.10	OK
157	PPRDM10.1	PPRDM10	1	1	C		13.00		28.00	12.270	12.170	1.83	3.93	2.25	0.102	0.000	0.102	12	200	200	DWC	130	130	0.010	1.19	37.47	0.00	0.30	0.07	OK	0.36	OK	0.10	0.00	11.17		11.07	1.10	1.10	OK
158	PPRDM10	PPRDM9	1	1	C		20.00		48.00	12.170	12.116	2.81	6.75	2.25	0.176	0.000	0.176	15	200	200	DWC	370	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	11.07		10.96	1.10	1.16	OK
159	PPRDM9.2	PPRDM9.1	0	1	H		22.00		22.00	12.251	12.184	3.09	3.09	2.25	0.081	0.000	0.081	11	200	200	DWC	328	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	11.15		11.03	1.10	1.15	OK
160	PPRDM9.1	PPRDM9	1	1	C		30.00		52.00	12.184	12.116	4.22	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	441	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	11.03		10.86	1.15	1.26	OK
161	PPRDM9	PPRDM8	2	1	J		10.00		110.00	12.116	11.333	1.41	15.46	2.25	0.403	0.000	0.403	23	200	200	DWC	13	16	0.010	3.39	106.81	0.00	0.30	0.07	OK	1.02	OK	0.63	0.00	10.86	10.86	10.23	1.26	1.10	OK
162	PPRDM8	PPRDM7	1	1	C		30.00		140.00	11.333	9.190	4.22	19.67	2.25	0.512	0.000	0.512	26	200	200	DWC	14	14	0.010	3.63	114.18	0.00	0.30	0.07	OK	1.09	OK	2.14	0.00	10.23		8.09	1.10	1.10	OK
163	PPRDM7.4	PPRDM7.3	0	1	H		10.00		10.00	8.504	8.624	1.41	1.41	2.25	0.037	0.000	0.037	7	200	200	DWC	-83	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	7.40		7.34	1.10	1.28	OK
164	PPRDM7.3	PPRDM7.2	1	1	C		30.00		40.00	8.624	8.866	4.22	5.62	2.25	0.146	0.000	0.146	14	200	200	DWC	-124	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	7.34		7.17	1.28	1.70	OK
165	PPRDM7.2	PPRDM7.1	1	1	C		13.00		53.00	8.866	8.926	1.83	7.45	2.25	0.194	0.000	0.194	16	200	200	DWC	-217	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	7.17		7.10	1.70	1.83	OK
166	PPRDM7.1	PPRDM7	1	1	C		8.00		61.00	8.926	8.987	1.12	8.57	2.25	0.223	0.000	0.223	17	200	200	DWC	-131	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	7.10		7.06	1.83	1.93	OK
167	PPRDM7	PPRDM6	2	1	J		18.00		219.00	9.190	8.964	2.53	30.77	2.25	0.801	0.000	0.801	32	200	200	DWC	80	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	7.06	7.06	7.03	2.13	1.93	OK
168	PPRDM6	PPRDM5	1	1	C		30.00		249.00	8.964	8.941	4.22	34.99	2.25	0.911	0.000	0.911	35	200	200	DWC	1304	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	7.03		6.97	1.93	1.97	OK
169	PPRDM5	PPRDM4	1	1	C		30.00		279.00	8.941	8.856	4.22	39.21	2.25	1.021	0.000	1.021	37	200	200	DWC	353	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	6.97		6.91	1.97	1.95	OK
170	PPRDM4	PPRDM3	1	1	C		30.00		309.00	8.856	8.772	4.22	43.42	2.25	1.131	0.000	1.131	38	200	200	DWC	357	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	6.91		6.85	1.95	1.92	OK
171	PPRDM3	PPRDM2	1	1	C		30.00		339.00	8.772	8.648	4.22	47.64	2.25	1.241	0.000	1.241	40	200	200	DWC	242	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	6.85		6.79	1.92	1.86	OK
172	PPRDM2	PPRDM1	1	1	C		30.00		369.00	8.648	8.501	4.22	51.85	2.25	1.350	0.000	1.350	42	200	200	DWC	204	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	6.79		6.73	1.86	1.77	OK
173	PPRDM1	DMPPRDM16	1	1	C		30.00		399.00	8.501	8.354	4.22	56.07	2.25	1.460	0.000	1.460	44	200	200	DWC	204	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	6.73		6.67	1.77	1.68	OK
174	DMPPRDM16	DMRDM15	2	1	J		20.00		925.53	8.354	8.229	2.81	130.06	2.25	3.387	0.000	3.387	66	200	200	DWC	160	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	6.67	6.67	6.63	1.68	1.60	OK
175	DMRDM15	DMRDM14	1	1	C		30.00		955.53	8.229	8.043	4.22	134.27	2.25	3.497	0.000	3.497	67	200	200	DWC	161	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	6.63		6.57	1.60	1.47	OK
176	DMRDM14	DMRDM13	1	1	C		20.00		975.53	8.043	7.918	2.81	137.08	2.25	3.570	0.000	3.570	68	200	200	DWC	160	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	6.57		6.53	1.47	1.39	OK
177	DMRDM13	DMCPRDM12	1	1	C		10.00		985.53	7.918	7.856	1.41	138.49	2.25	3.607	0.000	3.607	68	200	200	DWC	161	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.02	0.00	6.53		6.51	1.39	1.35	OK
178	CPRDM4	CPRDM3	0	1	H		30.00		30.00	6.960	7.131	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-175	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	5.86		5.69	1.10	1.44	OK
179	CPRDM3	CPRDM2	1	1	C		30.00		60.00	7.131	7.406	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	-109	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.69		5.52	1.44	1.89	OK
180	CPRDM2	CPRDM1	1	1	C		30.00		90.00	7.410	7.631	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	-136	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.52		5.35	1.89	2.28	OK
181	CPRDM1	DMCPRDM12	1	1	C		30.00		120.00	7.631	7.856	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	-133	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	5.35		5.26	2.28	2.60	OK
182	DMCPRDM12	DMRDM11	2	1	J		11.00		1116.53	7.856	7.723	1.55	156.90	2.25	4.086	0.000	4.086	73	200	200	DWC	83	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.02	0.00	5.26	5.26	5.24	2.60	2.48	OK
183	DMRDM11	DMRDM10	1	1	C		19.00		1135.53	7.723	7.591	2.67	159.57	2.25	4.155	0.000	4.155	73	200	200	DWC	144	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.04	0.00	5.24		5.20	2.48	2.39	OK
184	DMRDM10	DMRDM9	1	1	C		30.00		1165.53	7.591	7.326	4.22	163.78	2.25	4.265	0.000	4.265	74	200	200	DWC	113	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.06	0.00	5.20		5.14	2.39	2.19	OK
185	DMRDM9	DMRDM8	1	1	C		20.00		1185.53	7.326	7.150	2.81	166.59	2.25	4.338	0.000	4.338	75	200	200	DWC	114	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.04	0.00	5.14		5.10	2.19	2.05	OK
186	DMRDM8.8	DMRDM8.7	0	1	H		21.00		21.00	6.871	6.914	2.95	2.95	2.25	0.077	0.000	0.077	10	200	200	DWC	-488	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	5.77		5.65	1.10	1.26	OK
187	DMRDM8.7	DMRDM8.6	1	1	C		5.00		26.00	6.914	6.924	0.70	3.65	2.25	0.095	0.000	0.095	12	200	200	DWC	-500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	5.65		5.62	1.26	1.30	OK
188	DMRDM8.6	DMRDM8.5	1	1	C		15.00		41.00	6.924	6.955	2.11	5.76	2.25	0.150	0.000	0.150	14	200	200	DWC	-484	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	5.62		5.54	1.30	1.42	OK
189	DMRDM8.5	DMRDM8.4	1	1	C		30.00		71.00	6.955	7.196	4.22	9.98	2.25	0.260	0.000	0.260	19	200	200	DWC	-124	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.54		5.37	1.42	1.83	OK
190	DMRDM8.4.2	DMRDM8.4.1	0	1	H		15.00		15.00	7.124	7.227	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	-146	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	6.02		5.94	1.10	1.29	OK
191	DMRDM8.4.1	DMRDM8.4	1	1	C		5.00		20.00	7.227	7.196	0.70	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	161	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	5.94		5.91	1.29	1.29	OK
192	DMRDM8.4.7	DMRDM8.4.6	0	1	H		25.00		25.00	7.081	7.110	3.51	3.51	2.25	0.091	0.000	0.091	11	200	200	DWC	-862	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	5.98		5.84	1.10	1.27	OK
193	DMRDM8.4.6	DMRDM8.4.5	1	1	C		30.00		55.00	7.110	7.145	4.22	7.73	2.25	0.201	0.000	0.201	17	200	200	DWC	-857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.84		5.67	1.27	1.48	OK
194	DMRDM8.4.5	DMRDM8.4.4	1	1	C		7.00		62.00	7.145	7.153	0.98	8.71	2.25	0.227	0.000	0.227	18	200	200	DWC	-875	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	5.67		5.63	1.48	1.52	OK
195	DMRDM8.4.4	DMRDM8.4.3	1	1	C		6.00		68.00	7.153	7.160	0.84	9.56	2.25	0.249	0.000	0.249	18	200	200	DWC	-857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.03	0.00	5.63		5.60	1.52	1.56	OK
196	DMRDM8.4.3	DMRDM8.4	1	1	C		30.00		98.00	7.160	7.196	4.22	13.77	2.25	0.359	0.000	0.359	22	200	200	DWC	-833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.60		5.43	1.56	1.77	OK
197	DMRDM8.4	DMRDM8.3	3	1	J		20.00		209.00	7.180	7.225	2.81	29.37	2.25	0.765	0.000	0.765	32	200	200	DWC	-444	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	5.37	5.37	5.33	1.81	1.90	OK
198	DMRDM8.3.2	DMRDM8.3.1	0	1	H		15.00		15.00	7.250	7.235	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	6.15		6.07	1.10	1.17	OK
199	DMRDM8.3.1	DMRDM8.3	1	1	C		20.00		35.00	7.235	7.225	2.81	4.92	2.25	0.128	0.000	0.128	13	200	200	DWC	2000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	6.07		5.96	1.17	1.27	OK
200	DMRDM8.3	DMRDM8.2	2	1	J		13.00		257.00	7.225	7.206	1.83	36.11	2.25	0.940	0.000	0.940	35	200	200	DWC	684	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	5.33	5.33	5.30	1.90	1.91	OK
201	DMRDM8.2	DMRDM8.1	1	1	C		30.00		287.00	7.206	7.168	4.22	40.33	2.25	1.050	0.000	1.050	37	200	200	DWC	789	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	5.30		5.24	1.91	1.93	OK
202	DMRDM8.1	DMRDM8	1	1	C		15.00		302.00	7.168	7.150	2.11	42.44	2.25	1.105	0.000	1.105	38	200	200	DWC	833	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	5.24		5.21	1.93	1.94	OK
203	DMRDM8	DMRDM7	2	1	J		20.00		1507.53	7.150	7.119	2.81	211.84	2.25	5.517	0.000	5.517	84	200	200	DWC	645	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.04	0.00	5.10	5.10	5.06	2.05	2.06	OK
204	DMRDM7	DMRDM6	1	1	C		10.00		1517.53	7.119	7.154	1.41	213.25	2.25	5.553	0.000	5.553	85	200	200	DWC	-286	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.02	0.00	5.06		5.04	2.06	2.11	OK
205	DMRDM6	DMEMRDM5	1	1	C		25.00		1542.53	7.154	7.189	3.51	216.76	2.25	5.645	0.000	5.645	85	200	200	DWC	-714	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.05	0.00	5.04		4.99	2.11	2.20	OK
206	EMRDM10	EMRDM9	0	1	H		14.13		14.13	5.130	5.232	1.99	1.99	2.25	0.052	0.000	0.052	9	200	200	DWC	-139	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	4.03		3.95	1.10	1.28	OK
207	EMRDM9	EMRDM8	1	1	C		30.00		44.13	5.232	5.442	4.22	6.20	2.25	0.161	0.000	0.161	15	200	200	DWC	-143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.95		3.78	1.28	1.66	OK
208	EMRDM8	EMRDM7	1	1	C		30.00		74.13	5.442	5.712	4.22	10.42	2.25	0.271	0.000	0.271	19	200	200	DWC	-111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.78		3.61	1.66	2.10	OK
209	EMRDM7	EMRDM6	1	1	C		30.00		104.13	5.712	5.877	4.22	14.63	2.25	0.381	0.000	0.381	23	200	200	DWC	-182	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.61		3.44	2.10	2.44	OK
210	EMRDM6.3	EMRDM6.2	0	1	H		15.00		15.00	6.584	6.407	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	85	85	0.010	1.47	46.34	0.00	0.30	0.07	OK	0.44	OK	0.18	0.00	5.48		5.30	1.10	1.11	OK

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
211	EMRDM6.2	EMRDM6.1	1	1	C		30.00		45.00	6.407	6.053	4.22	6.32	2.25	0.165	0.000	0.165	15	200	200	DWC	85	85	0.010	1.47	46.34	0.00	0.30	0.07	OK	0.44	OK	0.35	0.00	5.30		4.95	1.11	1.10	OK
212	EMRDM6.1	EMRDM6	1	1	C		5.00		50.00	6.053	5.880	0.70	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	29	30	0.010	2.48	78.00	0.00	0.30	0.07	OK	0.74	OK	0.17	0.00	4.95		4.78	1.10	1.10	OK
213	EMRDM6	EMRDM5	2	1	J		8.00		162.13	5.877	5.985	1.12	22.78	2.25	0.593	0.000	0.593	28	200	200	DWC	-74	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	3.44	3.44	3.42	2.44	2.57	OK
214	EMRDM5	EMRDM4	1	1	C		22.00		184.13	5.985	6.311	3.09	25.87	2.25	0.674	0.000	0.674	30	200	200	DWC	-67	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	3.42		3.37	2.57	2.94	OK
215	DMRDM7.1	DMRDM7.2	0	1	H		14.00		14.00	6.830	6.684	1.97	1.97	2.25	0.051	0.000	0.051	9	200	200	DWC	96	96	0.010	1.39	43.60	0.00	0.30	0.07	OK	0.42	OK	0.15	0.00	5.73		5.58	1.10	1.10	OK
216	DMRDM7.2	DMRDM7.3	1	1	C		22.00		36.00	6.684	6.462	3.09	5.06	2.25	0.132	0.000	0.132	13	200	200	DWC	99	99	0.010	1.36	42.94	0.00	0.30	0.07	OK	0.41	OK	0.22	0.00	5.58		5.36	1.10	1.10	OK
217	DMRDM7.3	DMRDM7.4	1	1	C		23.00		59.00	6.462	6.230	3.23	8.29	2.25	0.216	0.000	0.216	17	200	200	DWC	99	99	0.010	1.36	42.94	0.01	0.30	0.07	OK	0.41	OK	0.23	0.00	5.36		5.13	1.10	1.10	OK
218	DMRDM7.4	EMRDM4	1	1	C		24.07		83.07	6.230	6.311	3.38	11.67	2.25	0.304	0.000	0.304	20	200	200	DWC	-297	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	5.13		5.00	1.10	1.31	OK
219	EMRDM4	EMRDM3	2	1	J		8.00		275.20	6.311	6.370	1.12	38.67	2.25	1.007	0.000	1.007	36	200	200	DWC	-136	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	3.37	3.37	3.35	2.94	3.02	OK
220	EMRDM3	EMRDM2	1	1	C		30.00		305.20	6.370	6.750	4.22	42.89	2.25	1.117	0.000	1.117	38	200	200	DWC	-79	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	3.35		3.29	3.02	3.46	OK
221	EMRDM2	EMRDM1	1	1	C		30.00		335.20	6.750	7.189	4.22	47.10	2.25	1.227	0.000	1.227	40	200	200	DWC	-68	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	3.29		3.23	3.46	3.96	OK
222	EMRDM1	DMEMRDM5	1	1	C		17.00		352.20	7.189	7.189	2.39	49.49	2.25	1.289	0.000	1.289	41	200	200	DWC	0	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	3.23		3.20	3.96	3.99	OK
223	DMEMRDM5	DMRDM4	2	1	J		11.00		1905.73	7.189	7.180	1.55	267.80	2.25	6.974	0.000	6.974	95	200	200	DWC	1222	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.02	0.00	3.20	3.20	3.18	3.99	4.00	OK
224	DMRDM4	DMRDM3	1	1	C		30.00		1935.73	7.180	7.413	4.22	272.01	2.25	7.084	0.000	7.084	95	200	200	DWC	-129	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	3.18		3.12	4.00	4.29	OK
225	DMRDM3	DMRDM2	1	1	C		30.00		1965.73	7.413	7.628	4.22	276.23	2.25	7.194	0.000	7.194	96	200	200	DWC	-140	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	3.12		3.06	4.29	4.57	OK
226	DMRDM2	DMRDM1	1	1	C		30.00		1995.73	7.628	7.479	4.22	280.45	2.25	7.303	0.000	7.303	97	200	200	DWC	201	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.06	0.00	3.06		3.00	4.57	4.48	OK
227	DMRDM1	VPDMRDM27	1	1	C		30.00		2025.73	7.479	7.331	4.22	284.66	2.25	7.413	0.000	7.413	98	200	200	DWC	203	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.06	0.00	3.00		2.94	4.48	4.39	OK
228	VPDMRDM27	VPRDM28	2	1	J		22.14		5274.91	7.331	7.287	3.11	741.25	2.25	19.303	0.000	19.303	157	250	250	DWC	503	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.03	0.00	2.94	2.94	2.91	4.39	4.38	OK
229	VPRDM28	VPRDM29	1	1	C		30.00		5304.91	7.287	7.199	4.22	745.46	2.25	19.413	0.000	19.413	158	250	250	DWC	341	700	0.010	0.60	29.28	0.66	1.07	0.60	OK	0.64	OK	0.04	0.00	2.91		2.87	4.38	4.33	OK
230	VPRDM29	VPNNRDM30	1	1	C		20.00		5324.91	7.199	7.155	2.81	748.27	2.25	19.486	0.000	19.486	158	250	250	DWC	455	700	0.010	0.60	29.28	0.67	1.07	0.60	OK	0.64	OK	0.03	0.00	2.87		2.84	4.33	4.32	OK
231	VPRDM36	VPRDM35	0	1	H		15.00		15.00	4.214	4.214	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.11		3.03	1.10	1.18	OK
232	VPRDM35	VPRDM34	1	1	C		15.00		30.00	4.214	4.868	2.11	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-23	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.03		2.95	1.18	1.92	OK
233	VPRDM34	VPRDM33	1	1	C		30.00		60.00	4.868	5.521	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	-46	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.95		2.78	1.92	2.74	OK
234	VPRDM33	VPRDM32	1	1	C		15.00		75.00	5.521	5.584	2.11	10.54	2.25	0.274	0.000	0.274	19	200	200	DWC	-238	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	2.78		2.70	2.74	2.88	OK
235	VPRDM32	VPRDM31	1	1	C		30.00		105.00	5.584	6.501	4.22	14.75	2.25	0.384	0.000	0.384	23	200	200	DWC	-33	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.70		2.61	2.88	3.89	OK
236	VPRDM31	VPNNRDM30	1	1	C		30.00		135.00	6.501	7.155	4.22	18.97	2.25	0.494	0.000	0.494	26	200	200	DWC	-46	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.61		2.52	3.89	4.64	OK
237	VPNNRDM30	NNRDM1	2	1	J		20.00		5479.91	7.155	6.923	2.81	770.05	2.25	20.053	0.000	20.053	160	250	250	DWC	86	700	0.010	0.60	29.28	0.68	1.07	0.61	OK	0.64	OK	0.03	0.00	2.52	2.52	2.49	4.64	4.43	OK
238	NNRDM1	NNRDM2	1	1	C		20.00		5499.91	6.923	6.692	2.81	772.86	2.25	20.127	0.000	20.127	161	250	250	DWC	87	700	0.010	0.60	29.28	0.69	1.08	0.61	OK	0.64	OK	0.03	0.00	2.49		2.46	4.43	4.23	OK
239	NNRDM2	NNRDM3	1	1	C		12.00		5511.91	6.692	6.553	1.69	774.55	2.25	20.171	0.000	20.171	161	250	250	DWC	86	700	0.010	0.60	29.28	0.69	1.08	0.61	OK	0.64	OK	0.02	0.00	2.46		2.44	4.23	4.11	OK
240	NNRDM3	NNRDM4	1	1	C		25.00		5536.91	6.553	6.264	3.51	778.06	2.25	20.262	0.000	20.262	161	250	250	DWC	87	700	0.010	0.60	29.28	0.69	1.08	0.61	OK	0.64	OK	0.04	0.00	2.44		2.40	4.11	3.86	OK
241	NNRDM4	NNRDM5	1	1	C		30.00		5566.91	6.264	5.981	4.22	782.28	2.25	20.372	0.000	20.372	162	250	250	DWC	106	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.04	0.00	2.40		2.36	3.86	3.62	OK
242	NNRDM5	NNRDM6	1	1	C		20.00		5586.91	5.981	5.835	2.81	785.09	2.25	20.445	0.000	20.445	162	250	250	DWC	137	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.03	0.00	2.36		2.33	3.62	3.51	OK
243	NNRDM6	NNRDM7	1	1	C		30.00		5616.91	5.835	5.616	4.22	789.31	2.25	20.555	0.000	20.555	162	250	250	DWC	137	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.04	0.00	2.33		2.29	3.51	3.33	OK
244	NNRDM7	NNRDM8	1	1	C		23.00		5639.91	5.616	5.448	3.23	792.54	2.25	20.639	0.000	20.639	163	250	250	DWC	137	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.03	0.00	2.29		2.26	3.33	3.19	OK
245	NNRDM8.1	NNRDM8	0	1	H		30.00		30.00	5.770	5.450	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	94	94	0.010	1.40	44.06	0.00	0.30	0.07	OK	0.42	OK	0.32	0.00	4.67		4.35	1.10	1.10	OK
246	NNRDM8	NNRDM9	2	1	J		20.00		5689.91	5.448	5.481	2.81	799.56	2.25	20.822	0.000	20.822	163	250	250	DWC	-606	700	0.010	0.60	29.28	0.71	1.08	0.63	OK	0.64	OK	0.03	0.00	2.26	2.26	2.23	3.19	3.25	OK
247	NNRDM9	NNRDM10	1	1	C		20.00		5709.91	5.481	5.514	2.81	802.37	2.25	20.895	0.000	20.895	164	250	250	DWC	-606	700	0.010	0.60	29.28	0.71	1.08	0.63	OK	0.64	OK	0.03	0.00	2.23		2.20	3.25	3.31	OK
248	NNRDM10	NNLNRDM11	1	1	C		15.00		5724.91	5.514	5.539	2.11	804.48	2.25	20.950	0.000	20.950	164	250	250	DWC	-600	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.02	0.00	2.20		2.18	3.31	3.36	OK
249	NNLNRDM11	NNLNRDM11	0	1	H		30.00		30.00	5.290	5.539	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-120	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.19		4.02	1.10	1.52	OK
250	NNLNRDM11	LNRDM1	2	1	J		16.00		5770.91	5.539	5.483	2.25	810.95	2.25	21.118	0.000	21.118	165	250	250	DWC	286	630	0.010	0.63	30.86	0.68	1.07	0.61	OK	0.67	OK	0.03	0.00	2.18	2.18	2.15	3.36	3.33	OK
251	LNRDM1.2	LNRDM1.1	0	1	H		30.00		30.00	5.271	5.430	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-189	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.17		4.00	1.10	1.43	OK
252	LNRDM1.1	LNRDM1	1	1	C		12.00		42.00	5.430	5.483	1.69	5.90	2.25	0.154	0.000	0.154	14	200	200	DWC	-226	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.07	0.00	4.00		3.93	1.43	1.55	OK
253	LNRDM1	LNRDM2	2	1	J		21.00		5833.91	5.483	5.530	2.95	819.80	2.25	21.349	0.000	21.349	165	250	250	DWC	-447	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.03	0.00	2.15	2.15	2.12	3.33	3.41	OK
254	LNRDM2.2	LNRDM2.1	0	1	H		20.00		20.00	5.053	5.292	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-84	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	3.95		3.84	1.10	1.45	OK
255	LNRDM2.1	LNRDM2	1	1	C		30.00		50.00	5.292	5.530	4.22	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	-126	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.84		3.67	1.45	1.86	OK
256	LNRDM2	LNRDM3	2	1	J		30.00		5913.91	5.530	5.007	4.22	831.04	2.25	21.642	0.000	21.642	167	250	250	DWC	57	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.04	0.00	2.12	2.12	2.08	3.41	2.93	OK
257	LNRDM3	LNRDM4	1	1	C		30.00		5943.91	5.007	4.741	4.22	835.26	2.25	21.751	0.000	21.751	167	250	250	DWC	113	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.04	0.00	2.08		2.04	2.93	2.70	OK
258	LNRDM4	LNL8RDM5	1	1	C		20.00		5963.91	4.741	4.480	2.81	838.07	2.25	21.825	0.000	21.825	167	250	250	DWC	77	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.03	0.00	2.04		2.01	2.70	2.47	OK
259	LNL8RDM5.4	LNL8RDM5.3	0	1	H		15.00		15.00	5.160	5.040	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	125	125	0.010	1.21	38.21	0.00	0.30	0.07	OK	0.36	OK	0.12	0.00	4.06		3.94	1.10	1.10	OK
260	LNL8RDM5.3	LNL8RDM5.2	1	1	C		30.00		45.00	5.040	4.800	4.22	6.32	2.25	0.165	0.000	0.165	15	200	200	DWC	125	125	0.010	1.21	38.21	0.00	0.30	0.07	OK	0.36	OK	0.24	0.00	3.94		3.70	1.10	1.10	OK
261	LNL8RDM5.2	LNL8RDM5.1	1	1	C		30.00		75.00	4.800	4.560	4.22	10.54	2.25	0.274	0.000	0.274	19	200	200	DWC	125	125	0.010	1.21	38.21	0.01	0.30	0.07	OK	0.36	OK	0.24	0.00	3.70		3.46	1.10	1.10	OK
262	LNL8RDM5.1	LNL8RDM5	1	1	C		10.00		85.00	4.560	4.480	1.41	11.94	2.25	0.311	0.000	0.311	20	200	200	DWC	125	130	0.010	1.19	37.47	0.01	0.30	0.07	OK	0.36	OK	0.08	0.00	3.46		3.38	1.10	1.10	OK
263	LNRDM10	LNRDM9	0	1	H		15.00		15.00	4.250	4.245	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	3000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.15		3.07	1.10	1.18	OK
264	LNRDM9	LNRDM8	1	1	C		15.00		30.00	4.245	4.303	2.11	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-259	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	3.07		2.99	1.18	1.31	OK
265	LNRDM8	LNRDM7	1	1	C		30.00		60.00	4.303	4.360	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	-526	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.99		2.82	1.31	1.54	OK
266	LNRDM7	LNRDM6	1	1	C		30.00		90.00	4.360	4.417	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	-526	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.82		2.65	1.54	1.77	OK
267	LNRDM6	LNL8RDM5	1	1	C		30.00		120.00	4.417	4.475	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	-517	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	2.65		2.56	1.77	1.92	OK
268	LNL8RDM5	L8RDM1	3	1	J		14.00		6182.91	4.475	4.453	1.97	868.84	2.25	22.626	0.000	22.626	170	250	250	DWC	636	700	0.010	0.60	29.28	0.77	1.10	0.66	OK	0.65	OK	0.02	0.00	2.56	2.56	2.54	1.92	1.91	OK
269	L8RDM1	L8RDM2	1	1	C		30.00		6212.91	4.453	4.420	4.22	873.06	2.25	22.736	0.000	22.736	171	250	250	DWC	909	700	0.010	0.60	29.28	0.78	1.10	0.67	OK	0.65	OK	0.04	0.00	2.54		2.50	1.91	1.92	OK
270	L8RDM2	L8RDM3	1	1	C		7.97		6220.88	4.420	4.409	1.12	874.18	2.25	22.765	0.000	22.765	171	250	250	DWC	725	700	0.010	0.60	29.28	0.78	1.10	0.67	OK	0.65	OK	0.01	0.00	2.50		2.49	1.92	1.92	OK
271	L8RDM3	L8RDM4	1	1	C		30.00		6250.88	4.409	4.409	4.22	878.39	2.25	22.875	0.000	22.875	171	250	250	DWC	0	700	0.010	0.60	29.28	0.78	1.10	0.67	OK	0.65	OK	0.04	0.00	2.49		2.45	1.92	1.96	OK
272	L8RDM4	L8RDM5	1	1	C		30.00		6280.88	4.409	4.409	4.22	882.61	2.25	22.985	0.000	22.985	172	250	250	DWC	0	700	0.010	0.60	29.28	0.79	1.10	0.67	OK	0.65	OK	0.04	0.00	2.45		2.41	1.96	2.00	OK
273	L8RDM5	KTRDM17	1	1	C		40.00		6320.88	4.409	4.739	5.62	888.23	2.25	23.131	0.000	23.131	172	250	250	DWC	-121	700	0.010	0.60	29.28	0.79	1.10	0.67	OK	0.65	OK	0.06	0.00	2.41		2.35	2.00	2.39	OK
274	KTRDM17	KTRDM16	1	1	C		9.00		6329.88	4.739	4.959	1.26	889.49	2.25	23.164	0.000	23.164	172	250	250	DWC	-41	700	0.010	0.60	29.28	0.79	1.10	0.67	OK	0.65	OK	0.01	0.00	2.35		2.34	2.39	2.62	OK
275	KTRDM16	KTRDM15	1	1	C		20.00		6349.88	4.959	5.087	2.81	892.31	2.25	23.237	0.000	23.237	173	250	250	DWC	-156	700	0.010	0.60	29.28	0.79	1.10	0.67	OK	0.65	OK	0.03	0.00	2.34		2.31	2.62	2.78	OK
276	KTRDM15	KTRDM14	1	1	C		41.00		6390.88	5.087	5.080	5.76	898.07	2.25	23.387	0.000	23.387	173	250	250	DWC	5857	700	0.010	0.60	29.28	0.80	1.11	0.68	OK	0.66	OK	0.06	0.00	2.31		2.25	2.78	2.83	OK
277	KTRDM14	KTRDM13	1	1	C		30.00		6420.88	5.080	5.342	4.22	902.28	2.25	23.497	0.000	23.497	174	250	250	DWC	-115	700	0.010	0.60	29.28	0.80	1.11	0.68	OK	0.66	OK	0.04	0.00	2.25		2.21	2.83	3.13	OK
278	KTRDM13	KTRDM12	1	1	C		28.00		6448.88	5.342	5.540	3.93	906.22	2.25	23.599	0.000	23.599	174	250	250	DWC	-141	700	0.010	0.60	29.28	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	2.21		2.17	3.13	3.37	OK
279	KTRDM12	KTRDM11	1	1	C		30.00		6478.88	5.540	5.943	4.22	910.43	2.25	23.709	0.000	23.709	174	250	250	DWC	-74	700	0.010	0.60	29.28	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	2.17		2.13	3.37	3.81	OK
280	KTRDM11	KTRDM10	1	1	C		30.00		6508.88	5.943	6.306	4.22	914.65	2.25	23.819	0.000	23.819	175	250	250	DWC	-83	700	0.010	0.60	29.28	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	2.13		2.09	3.81	4.22	OK
281	KTRDM10	KTRDM9	1	1	C		18.00		6526.88	6.306	6.314	2.53	917.18	2.25	23.885	0.000	23.885	175	250	250	DWC	-2250	700	0.010	0.60	29.28	0.82	1.11	0.69	OK	0.66	OK	0.03	0.00	2.09		2.06	4.22	4.25	OK

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
282	KTRDM9.2	KTRDM9.1	0	1	H		25.00		25.00	6.530	6.456	3.51	3.51	2.25	0.091	0.000	0.091	11	200	200	DWC	338	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	5.43		5.29	1.10	1.17	OK
283	KTRDM9.1	KTRDM9	1	1	C		12.00		37.00	6.456	6.314	1.69	5.20	2.25	0.135	0.000	0.135	14	200	200	DWC	85	160	0.010	1.07	33.77	0.00	0.30	0.07	OK	0.32	OK	0.08	0.00	5.29		5.21	1.17	1.10	OK
284	KTRDM9	KTRDM8	2	1	J		17.00		6580.88	6.314	6.210	2.39	924.77	2.25	24.082	0.000	24.082	176	250	250	DWC	163	700	0.010	0.60	29.28	0.82	1.11	0.69	OK	0.66	OK	0.02	0.00	2.06	2.06	2.04	4.25	4.17	OK
285	KTRDM8	KTKKRDM7	1	1	C		30.00		6610.88	6.210	6.110	4.22	928.98	2.25	24.192	0.000	24.192	176	250	250	DWC	300	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.04	0.00	2.04		2.00	4.17	4.11	OK
286	KTKKRDM7	KTRDM7	1	1	C		4.00		6614.88	6.110	6.014	0.56	929.54	2.25	24.207	0.000	24.207	176	250	250	DWC	42	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.01	0.00	2.00		1.99	4.11	4.02	OK
287	KTRDM7.3	KTRDM7.2	0	1	H		17.00		17.00	4.791	5.061	2.39	2.39	2.25	0.062	0.000	0.062	9	200	200	DWC	-63	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	3.69		3.60	1.10	1.46	OK
288	KTRDM7.2	KTRDM7.1	1	1	C		30.00		47.00	5.061	5.537	4.22	6.60	2.25	0.172	0.000	0.172	15	200	200	DWC	-63	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.60		3.43	1.46	2.11	OK
289	KTRDM7.1	KTRDM7	1	1	C		30.00		77.00	5.537	6.014	4.22	10.82	2.25	0.282	0.000	0.282	19	200	200	DWC	-63	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.43		3.26	2.11	2.75	OK
290	KTRDM7	KTRDM6	2	1	J		23.00		6714.88	6.01	6.03	3.23	943.60	2.25	24.573	0.000	24.573	177	250	250	DWC	-1353	700	0.010	0.60	29.28	0.84	1.12	0.70	OK	0.67	OK	0.03	0.00	1.99	1.99	1.96	4.02	4.07	OK
291	KTRDM6	KTRDM5	1	1	C		30.00		6744.88	6.03	6.05	4.22	947.81	2.25	24.683	0.000	24.683	178	250	250	DWC	-1765	700	0.010	0.60	29.28	0.84	1.12	0.70	OK	0.67	OK	0.04	0.00	1.96		1.92	4.07	4.13	OK
292	KTRDM5	KTRDM4	1	1	C		17.00		6761.88	6.04	6.07	2.39	950.20	2.25	24.745	0.000	24.745	178	250	250	DWC	-680	700	0.010	0.60	29.28	0.85	1.12	0.71	OK	0.67	OK	0.02	0.00	1.92		1.90	4.12	4.17	OK
293	KTRDM4	KTRDM3	1	1	C		27.00		6788.88	6.06	6.08	3.79	953.99	2.25	24.844	0.000	24.844	178	250	250	DWC	-1227	700	0.010	0.60	29.28	0.85	1.12	0.71	OK	0.67	OK	0.04	0.00	1.90		1.86	4.16	4.22	OK
294	KTRDM3	KTRDM2	1	1	C		30.00		6818.88	6.08	5.89	4.22	958.21	2.25	24.953	0.000	24.953	179	250	250	DWC	154	700	0.010	0.60	29.28	0.85	1.12	0.71	OK	0.67	OK	0.04	0.00	1.86		1.82	4.22	4.07	OK
295	KTRDM2	KTRDM1	1	1	C		30.00		6848.88	5.89	5.69	4.22	962.43	2.25	25.063	0.000	25.063	179	250	250	DWC	154	700	0.010	0.60	29.28	0.86	1.12	0.72	OK	0.67	OK	0.04	0.00	1.82		1.78	4.07	3.91	OK
296	KTRDM1	VPKTRDM45	1	1	C		30.00		6878.88	5.69	5.50	4.22	966.64	2.25	25.173	0.000	25.173	180	250	250	DWC	154	700	0.010	0.60	29.28	0.86	1.12	0.72	OK	0.67	OK	0.04	0.00	1.78		1.74	3.91	3.76	OK
297	VPRDM37	VPRDM38	0	1	H		30.00		30.00	3.08	2.88	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	149	150	0.010	1.11	34.88	0.00	0.30	0.07	OK	0.33	OK	0.20	0.00	1.98		1.78	1.10	1.10	OK
298	VPRDM38	VPRDM39	1	1	C		16.00		46.00	2.88	3.26	2.25	6.46	2.25	0.168	0.000	0.168	15	200	200	DWC	-42	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.09	0.00	1.78		1.69	1.10	1.57	OK
299	VPRDM39.11	VPRDM39.10	0	1	H		15.00		15.00	6.34	6.26	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	183	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	5.24		5.15	1.10	1.11	OK
300	VPRDM39.10	VPRDM39.9	1	1	C		7.00		22.00	6.26	6.22	0.98	3.09	2.25	0.081	0.000	0.081	11	200	200	DWC	189	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.04	0.00	5.15		5.11	1.11	1.11	OK
301	VPRDM39.9	VPRDM39.8	1	1	C		30.00		52.00	6.22	6.06	4.22	7.31	2.25	0.190	0.000	0.190	16	200	200	DWC	186	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	5.11		4.93	1.11	1.13	OK
302	VPRDM39.8	VPRDM39.7	1	1	C		30.00		82.00	6.06	5.90	4.22	11.52	2.25	0.300	0.000	0.300	20	200	200	DWC	186	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	4.93		4.75	1.13	1.15	OK
303	VPRDM39.7	VPRDM39.6	1	1	C		30.00		112.00	5.90	5.74	4.22	15.74	2.25	0.410	0.000	0.410	23	200	200	DWC	186	250	0.010	0.86	27.02	0.02	0.40	0.10	OK	0.34	OK	0.12	0.00	4.75		4.63	1.15	1.11	OK
304	VPRDM39.6	VPRDM39.5	1	1	C		30.00		142.00	5.74	5.59	4.22	19.95	2.25	0.520	0.000	0.520	26	200	200	DWC	199	200	0.010	0.96	30.21	0.02	0.40	0.10	OK	0.38	OK	0.15	0.00	4.63		4.48	1.11	1.11	OK
305	VPRDM39.5	VPRDM39.4	1	1	C		30.00		172.00	5.59	5.45	4.22	24.17	2.25	0.629	0.000	0.629	29	200	200	DWC	221	220	0.010	0.92	28.80	0.02	0.40	0.10	OK	0.37	OK	0.14	0.00	4.48		4.34	1.11	1.11	OK
306	VPRDM39.4	VPRDM39.3	1	1	C		30.00		202.00	5.45	5.32	4.22	28.39	2.25	0.739	0.000	0.739	31	200	200	DWC	226	226	0.010	0.90	28.42	0.03	0.46	0.13	OK	0.42	OK	0.13	0.00	4.34		4.21	1.11	1.11	OK
307	VPRDM39.3	VPRDM39.2	1	1	C		30.00		232.00	5.32	5.18	4.22	32.60	2.25	0.849	0.000	0.849	33	200	200	DWC	216	240	0.010	0.88	27.58	0.03	0.46	0.13	OK	0.40	OK	0.13	0.00	4.21		4.08	1.11	1.10	OK
308	VPRDM39.2	VPRDM39.1	1	1	C		12.00		244.00	5.18	5.13	1.69	34.29	2.25	0.893	0.000	0.893	34	200	200	DWC	235	250	0.010	0.86	27.02	0.03	0.46	0.13	OK	0.39	OK	0.05	0.00	4.08		4.03	1.10	1.10	OK
309	VPRDM39.1	VPRDM39	1	1	C		11.00		255.00	5.13	3.26	1.55	35.83	2.25	0.933	0.000	0.933	35	200	200	DWC	6	5	0.010	6.07	191.06	0.00	0.30	0.07	OK	1.82	OK	2.20	0.00	4.03		1.83	1.10	1.43	OK
310	VPRDM39	VPRDM40	2	1	J		16.00		317.00	3.259	3.664	2.25	44.55	2.25	1.160	0.000	1.160	39	200	200	DWC	-40	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	1.69	1.69	1.66	1.57	2.00	OK
311	VPRDM40	VPRDM41	1	1	C		30.00		347.00	3.664	4.424	4.22	48.76	2.25	1.270	0.000	1.270	41	200	200	DWC	-39	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.66		1.60	2.00	2.82	OK
312	VPRDM41	VPRDM42	1	1	C		30.00		377.00	4.424	4.921	4.22	52.98	2.25	1.380	0.000	1.380	42	200	200	DWC	-60	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.60		1.54	2.82	3.38	OK
313	VPRDM42	VPRDM43	1	1	C		30.00		407.00	4.921	5.155	4.22	57.19	2.25	1.489	0.000	1.489	44	200	200	DWC	-128	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.54		1.48	3.38	3.68	OK
314	VPRDM43	VPVMRDM44	1	1	C		30.00		437.00	5.155	5.390	4.22	61.41	2.25	1.599	0.000	1.599	46	200	200	DWC	-128	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.48		1.42	3.68	3.97	OK
315	VPRDM66.30.	VPRDM66.30.	0	1	H		30.00	2556.38	2586.38	19.35	21.36	4.22	363.45	2.25	9.465	0.000	9.465	110	200	200	DWC	-15	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.06	0.00	18.25		18.19	1.10	3.17	OK
316	VPRDM66.30.	VPRDM66.30	1	1	C		30.00		2616.38	21.36	22.32	4.22	367.66	2.25	9.575	0.000	9.575	111	200	200	DWC	-31	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.06	0.00	18.19		18.13	3.17	4.19	OK
317	VPRDM66.30	VPRDM66.29	1	1	C		24.00	1285.30	3925.68	22.32	22.20	3.37	551.65	2.25	14.366	0.000	14.366	136	200	200	DWC	200	520	0.010	0.60	18.73	0.77	1.10	0.66	OK	0.65	OK	0.05	0.00	18.13		18.08	4.19	4.12	OK
318	VPRDM66.29	VPRDM66.28	1	1	C		30.00		3955.68	22.20	22.10	4.22	555.86	2.25	14.476	0.000	14.476	136	200	200	DWC	300	520	0.010	0.60	18.73	0.77	1.10	0.66	OK	0.65	OK	0.06	0.00	18.08		18.02	4.12	4.08	OK
319	VPRDM66.28	VPRDM66.27	1	1	C		20.00		3975.68	22.10	23.37	2.81	558.68	2.25	14.549	0.000	14.549	137	200	200	DWC	-16	520	0.010	0.60	18.73	0.78	1.10	0.67	OK	0.65	OK	0.04	0.00	18.02		17.98	4.08	5.39	OK
320	VPRDM66.27.	VPRDM66.27	0	1	H		15.00		15.00	22.29	23.37	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	-14	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	21.19		21.11	1.10	2.26	OK
321	VPRDM66.27	VPRDM66.26	2	1	J		30.00		4020.68	23.37	22.84	4.22	565.00	2.25	14.714	0.000	14.714	137	200	200	DWC	57	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.06	0.00	17.98	17.98	17.92	5.39	4.92	OK
322	VPRDM66.26	VPRDM66.25	1	1	C		18.00		4038.68	22.84	22.52	2.53	567.53	2.25	14.779	0.000	14.779	138	200	200	DWC	57	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.03	0.00	17.92		17.89	4.92	4.63	OK
323	VPRDM66.25	VPVMRDM66.	1	1	C		12.00		4050.68	22.52	22.31	1.69	569.21	2.25	14.823	0.000	14.823	138	200	200	DWC	57	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.02	0.00	17.89		17.87	4.63	4.44	OK
324	VPRDM66.18	VPRDM66.19	0	1	H		30.00		30.00	23.04	22.99	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	600	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	21.94		21.77	1.10	1.22	OK
325	VPRDM66.19	VPRDM66.20	1	1	C		30.00		60.00	22.99	22.85	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	207	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	21.77		21.60	1.22	1.25	OK
326	VPRDM66.20	VPRDM66.21	1	1	C		30.00		90.00	22.85	22.70	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	205	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	21.60		21.43	1.25	1.27	OK
327	VPRDM66.21	VPRDM66.22	1	1	C		30.00		120.00	22.70	22.55	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	207	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	21.43		21.34	1.27	1.21	OK
328	VPRDM66.22	VPRDM66.23	1	1	C		30.00		150.00	22.55	22.41	4.22	21.08	2.25	0.549	0.000	0.549	27	200	200	DWC	207	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	21.34		21.27	1.21	1.14	OK
329	VPRDM66.23	VPVMRDM66.	1	1	C		21.00		171.00	22.41	22.31	2.95	24.03	2.25	0.626	0.000	0.626	29	200	200	DWC	208	320	0.010	0.76	23.88	0.03	0.46	0.13	OK	0.35	OK	0.07	0.00	21.27		21.20	1.14	1.11	OK
330	VPVMRDM66.	VMRDM20.24	2	1	J		8.00		4229.68	22.31	21.99	1.12	594.37	2.25	15.478	0.000	15.478	141	200	200	DWC	25	480	0.010	0.62	19.50	0.79	1.10	0.67	OK	0.68	OK	0.02	0.00	17.87	17.87	17.85	4.44	4.14	OK
331	VMRDM20.24	VMRDM20.23	1	1	C		25.00		4254.68	21.99	20.99	3.51	597.88	2.25	15.570	0.000	15.570	141	200	200	DWC	25	480	0.010	0.62	19.50	0.80	1.11	0.68	OK	0.69	OK	0.05	0.00	17.85		17.80	4.14	3.19	OK
332	VMRDM20.23	VMRDM20.22	1	1	C		30.00		4284.68	20.99	19.79	4.22	602.10	2.25	15.680	0.000	15.680	142	200	200	DWC	25	480	0.010	0.62	19.50	0.80	1.11	0.68	OK	0.69	OK	0.06	0.00	17.80		17.74	3.19	2.05	OK
333	VMRDM20.22	VMRDM20.21	1	1	C		30.00		4314.68	19.79	18.60	4.22	606.31	2.25	15.789	0.000	15.789	142	200	200	DWC	25	120	0.010	1.24	39.00	0.40	0.94	0.44	OK	1.16	OK	0.25	0.00	17.74		17.49	2.05	1.11	OK
334	VMRDM20.21	VMRDM20.20	1	1	C		15.00	228.00	4557.68	18.60	18.92	2.11	640.46	2.25	16.679	0.000	16.679	146	200	200	DWC	-47	520	0.010	0.60	18.73	0.89	1.13	0.74	OK	0.67	OK	0.03	0.00	17.49		17.46	1.11	1.46	OK
335	VMRDM20.20	VMRDM20.19	1	1	C		30.00		4587.68	18.92	19.16	4.22	644.68	2.25	16.788	0.000	16.788	147	200	200	DWC	-124	520	0.010	0.60	18.73	0.90	1.13	0.74	OK	0.67	OK	0.06	0.00	17.46		17.40	1.46	1.76	OK
336	VMRDM20.19	VMRDM20.18	1	1	C		8.00		4595.68	19.16	19.24	1.12	645.80	2.25	16.818	0.000	16.818	147	200	200	DWC	-100	520	0.010	0.60	18.73	0.90	1.13	0.74	OK	0.67	OK	0.02	0.00	17.40		17.38	1.76	1.86	OK
337	VMRDM20.18	VMRDM20.17	1	1	C		30.00		4625.68	19.24	17.15	4.22	650.02	2.25	16.927	0.000	16.927	147	200	200	DWC	14	23	0.010	2.86	90.07	0.19	0.77	0.30	OK	2.20	OK	1.33	0.00	17.38		16.05	1.86	1.10	OK
338	VMRDM20.17	VMRDM20.16	1	1	C		30.00		4655.68	17.15	15.07	4.22	654.23	2.25	17.037	0.000	17.037	148	200	200	DWC	14	14	0.010	3.63	114.18	0.15	0.73	0.27	OK	2.65	OK	2.14	0.00	16.05		13.91	1.10	1.16	OK
339	VMRDM20.16	VMRDM20.15	1	1	C		30.00		4685.68	15.07	14.12	4.22	658.45	2.25	17.147	0.000	17.147	148	200	200	DWC	32	33	0.010	2.36	74.37	0.23	0.81	0.33	OK	1.91	OK	0.91	0.00	13.91		13.00	1.16	1.12	OK
340	VMRDM20.15	VMRDM20.13	1	1	C		40.00		4725.68	14.12	12.91	5.62	664.07	2.25	17.293	0.000	17.293	149	200	200	DWC	33	33	0.010	2.36	74.37	0.23	0.81	0.33	OK	1.91	OK	1.21	0.00	13.00		11.79	1.12	1.12	OK
341	VMRDM20.13	VMRDM20.12	1	1	C		13.00		4738.68	12.91	12.22	1.83	665.89	2.25	17.341	0.000	17.341	149	200	200	DWC	19	19	0.010	3.11	98.01	0.18	0.76	0.30	OK	2.37	OK	0.68	0.00	11.79		11.11	1.12	1.11	OK
342	VMRDM20.12	VMRDM20.12	0	1	H		9.00		9.00	12.56	12.53	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	290	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.05	0.00	11.46		11.41	1.10	1.12	OK
343	VMRDM20.12	VMRDM20.12	1	1	C		30.00		39.00	12.53	12.43	4.22	5.48	2.25	0.143	0.000	0.143	14	200	200	DWC	288	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	11.41		11.24	1.12	1.19	OK
344	VMRDM20.12	VMRDM20.12	1	1	C		30.00		69.00	12.43	12.32	4.22	9.70	2.25	0.253	0.000	0.253	18	200	200	DWC	283	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	11.24		11.07	1.19	1.25	OK
345	VMRDM20.12	VMRDM20.12	1	1	C		30.00		99.00	12.32	12.22	4.22	13.91	2.25	0.362	0.000	0.362	22	200	200	DWC	300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	11.07		10.90	1.25	1.32	OK
346	VMRDM20.12	VMRDM20.11	2	1	J		22.00		4859.68	12.22	12.42	3.09	682.90	2.25	17.784	0.000	17.784	151	200	200	DWC	-111	520	0.010	0.60	18.73	0.95	1.14	0.78	OK	0.68	OK	0.04	0.00	10.90	10.90	10.86	1.32	1.56	OK
347	VMRDM20.11	VMRDM20.11	0	1	H		40.00		40.00	9.72	11.07	5.62	5.62	2.25	0.146	0.000	0.146	14	200	200	DWC	-30	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	8.62		8.40	1.10	2.67	OK
348	VMRDM20.11	VMRDM20.10	2	1	J		22.00		4921.68	11.07	12.42	3.09	691.61	2.25	18.011	0.000	18.011	152	200	200	DWC	-16	520	0.010	0.60	18.73	0.96	1.14	0.79	OK	0.68	OK	0.04	0.00	8.40	8.40	8.36	2.67	4.06	OK
349	VMRDM20.10	VMRDM20.9L	1	0	C	L	22.00		4943.68	12.42	13.31	3.09	694.70	2.25	18.091	0.000	18.091	152	200	200	DWC	-25	520	0.010	0.60	18.73	0.97	1.14	0.80	OK	0.68	OK	0.04	0.00	8.36		8.32	4.06	4.99	OK
350	VMRDM20.9	VMRDM20.8	0	1	H		21.00	4943.68	4964.68	13.31	14.21	2.95	697.65	2.25	18.168	0.000	18.168	153	200	200	DWC	-23	520	0.010	0.60	18.73	0.97	1.14	0.80	OK	0.68	OK	0.04	0.00	12.21		12.17	1.10	2.04	OK
351	VMRDM20.8	VMRDM20.7	1	1	C		17.00		4981.68	14.21	15.06	2.39	700.04	2.25	18.230	0.000	18.230	153	200	200	DWC	-20	520	0.010	0.60	18.73	0.97	1.14	0.80	OK	0.68	OK	0.03	0.00	12.17		12.14	2.04	2.92	OK
352	VMRDM20.7	VMRDM20.6	1	1	C		30.00		5011.68	15.06	15.46	4.22	704.26	2.25	18.340	0.000	18.340	153	200	200	DWC	-75	520	0.010	0.60	18.73	0.98	1.14	0.80	OK	0.68	OK	0.06	0.00	12.14		12.08	2.92	3.38	OK

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
353	VMRDM20.6	VMRDM20.5	1	1	C		20.00		5031.68	15.46	15.66	2.81	707.07	2.25	18.413	0.000	18.413	154	200	200	DWC	-102	520	0.010	0.60	18.73	0.98	1.14	0.80	OK	0.68	OK	0.04	0.00	12.08		12.04	3.38	3.62	OK
354	VMRDM20.5	VMRDM20.4	1	1	C		30.00		5061.68	15.66	15.86	4.22	711.28	2.25	18.523	0.000	18.523	154	250	250	DWC	-150	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.04	0.00	12.04		12.00	3.62	3.86	OK
355	VMRDM20.4	VMRDM20.3	1	1	C		30.00		5091.68	15.86	14.69	4.22	715.50	2.25	18.633	0.000	18.633	155	250	250	DWC	26	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	12.00		11.96	3.86	2.73	OK
356	VMRDM20.3	VMRDM20.2	1	1	C		30.00		5121.68	14.69	13.53	4.22	719.71	2.25	18.743	0.000	18.743	155	250	250	DWC	26	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	11.96		11.92	2.73	1.61	OK
357	VMRDM20.2	VMRDM20.1	1	1	C		30.00		5151.68	13.53	12.36	4.22	723.93	2.25	18.852	0.000	18.852	155	250	250	DWC	26	42	0.010	2.43	119.52	0.16	0.74	0.28	OK	1.80	OK	0.71	0.00	11.92		11.21	1.61	1.15	OK
358	VMRDM20.1	VMRDM20	1	1	C		30.00		5181.68	12.36	11.20	4.22	728.15	2.25	18.962	0.000	18.962	156	250	250	DWC	26	26	0.010	3.12	153.39	0.12	0.69	0.24	OK	2.15	OK	1.18	0.00	11.21		10.03	1.15	1.17	OK
359	VMRDM20	VMRDM19	1	1	C		30.00	693.39	5905.07	11.20	9.76	4.22	829.80	2.25	21.609	0.000	21.609	166	250	250	DWC	21	21	0.010	3.44	169.03	0.13	0.70	0.25	OK	2.41	OK	1.43	0.00	10.03		8.60	1.17	1.16	OK
360	VMRDM19	VMRDM18A	1	1	C		25.00		5930.07	9.76	9.55	3.51	833.31	2.25	21.701	0.000	21.701	167	250	250	DWC	120	121	0.010	1.43	70.42	0.31	0.88	0.39	OK	1.26	OK	0.21	0.00	8.60		8.39	1.16	1.16	OK
361	VMRDM18A	VMRDM18	1	1	C		10.00		5940.07	9.55	9.48	1.41	834.72	2.25	21.737	0.000	21.737	167	250	250	DWC	145	150	0.010	1.29	63.25	0.34	0.91	0.41	OK	1.17	OK	0.07	0.00	8.39		8.32	1.16	1.16	OK
362	VMRDM18.2	VMRDM18.1	0	1	H		26.00		26.00	10.26	9.87	3.65	3.65	2.25	0.095	0.000	0.095	12	200	200	DWC	66	66	0.010	1.68	52.79	0.00	0.30	0.07	OK	0.50	OK	0.40	0.00	9.16		8.76	1.10	1.11	OK
363	VMRDM18.1	VMRDM18	1	1	C		30.00		56.00	9.87	9.48	4.22	7.87	2.25	0.205	0.000	0.205	17	200	200	DWC	78	80	0.010	1.52	47.76	0.00	0.30	0.07	OK	0.46	OK	0.38	0.00	8.76		8.38	1.11	1.10	OK
364	VMRDM18	VMRDM17	2	1	J		30.00		6026.07	9.48	9.20	4.22	846.80	2.25	22.052	0.000	22.052	168	250	250	DWC	107	108	0.010	1.52	74.54	0.30	0.88	0.38	OK	1.33	OK	0.28	0.00	8.32	8.32	8.04	1.16	1.16	OK
365	VMRDM17	VMRDM16	1	1	C		15.00		6041.07	9.20	9.11	2.11	848.91	2.25	22.107	0.000	22.107	168	250	250	DWC	163	163	0.010	1.23	60.67	0.36	0.92	0.42	OK	1.13	OK	0.09	0.00	8.04		7.95	1.16	1.16	OK
366	VMRDM16.7.5	VMRDM16.7.4	0	1	H		13.00		13.00	18.30	17.87	1.83	1.83	2.25	0.048	0.000	0.048	8	200	200	DWC	30	30	0.010	2.48	78.00	0.00	0.30	0.07	OK	0.74	OK	0.43	0.00	17.20		16.77	1.10	1.10	OK
367	VMRDM16.7.4	VMRDM16.7.3	1	1	C		30.00		43.00	17.87	16.78	4.22	6.04	2.25	0.157	0.000	0.157	15	200	200	DWC	28	28	0.010	2.59	81.47	0.00	0.30	0.07	OK	0.78	OK	1.09	0.00	16.77		15.68	1.10	1.10	OK
368	VMRDM16.7.3	VMRDM16.7.2	1	1	C		30.00		73.00	16.78	15.73	4.22	10.26	2.25	0.267	0.000	0.267	19	200	200	DWC	28	28	0.010	2.56	80.74	0.00	0.30	0.07	OK	0.77	OK	1.07	0.00	15.68		14.61	1.10	1.12	OK
369	VMRDM16.7.2	VMRDM16.7.1	1	1	C		20.00		93.00	15.73	15.02	2.81	13.07	2.25	0.340	0.000	0.340	21	200	200	DWC	28	28	0.010	2.56	80.74	0.00	0.30	0.07	OK	0.77	OK	0.71	0.00	14.61		13.90	1.12	1.12	OK
370	VMRDM16.7.1	VMRDM16.7	1	1	C		30.00		123.00	15.02	13.97	4.22	17.28	2.25	0.450	0.000	0.450	24	200	200	DWC	28	29	0.010	2.54	80.03	0.01	0.30	0.07	OK	0.76	OK	1.05	0.00	13.90		12.85	1.12	1.12	OK
371	VMRDM16.7	VMRDM16.6	1	1	C		6.00		129.00	13.97	13.48	0.84	18.13	2.25	0.472	0.000	0.472	25	200	200	DWC	12	13	0.010	3.84	120.84	0.00	0.30	0.07	OK	1.15	OK	0.48	0.00	12.85		12.37	1.12	1.11	OK
372	VMRDM16.6	VMRDM16.5	1	1	C		30.00		159.00	13.48	11.02	4.22	22.34	2.25	0.582	0.000	0.582	28	200	200	DWC	12	12	0.010	3.92	123.33	0.00	0.30	0.07	OK	1.18	OK	2.50	0.00	12.37		9.87	1.11	1.15	OK
373	VMRDM16.5	VMRDM16.4	1	1	C		6.00		165.00	11.02	10.53	0.84	23.19	2.25	0.604	0.000	0.604	28	200	200	DWC	12	12	0.010	3.92	123.33	0.00	0.30	0.07	OK	1.18	OK	0.50	0.00	9.87		9.37	1.15	1.16	OK
374	VMRDM16.4	VMRDM16.3	1	1	C		18.00		183.00	10.53	9.06	2.53	25.72	2.25	0.670	0.000	0.670	30	200	200	DWC	12	12	0.010	3.92	123.33	0.01	0.30	0.07	OK	1.18	OK	1.50	0.00	9.37		7.87	1.16	1.19	OK
375	VMRDM16.3.2	VMRDM16.3.1	0	1	H		20.00		20.00	9.83	9.44	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	52	52	0.010	1.89	59.53	0.00	0.30	0.07	OK	0.57	OK	0.39	0.00	8.73		8.34	1.10	1.10	OK
376	VMRDM16.3.1	VMRDM16.3	1	1	C		30.00		50.00	9.44	9.06	4.22	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	78	77	0.010	1.55	48.69	0.00	0.30	0.07	OK	0.46	OK	0.39	0.00	8.34		7.95	1.10	1.11	OK
377	VMRDM16.3	VMRDM16.2	2	1	J		18.00		251.00	9.06	9.07	2.53	35.27	2.25	0.919	0.000	0.919	35	200	200	DWC	-1636	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	7.87	7.87	7.84	1.19	1.23	OK
378	VMRDM16.2	VMRDM16.1	1	1	C		30.00		281.00	9.07	9.09	4.22	39.49	2.25	1.028	0.000	1.028	37	200	200	DWC	-1579	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	7.84		7.78	1.23	1.31	OK
379	VMRDM16.1	VMRDM16	1	1	C		30.00		311.00	9.09	9.11	4.22	43.70	2.25	1.138	0.000	1.138	39	200	200	DWC	-1500	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	7.78		7.72	1.31	1.39	OK
380	VMRDM16	VMRDM15	2	1	J		30.00		6382.07	9.11	8.70	4.22	896.83	2.25	23.355	0.000	23.355	173	250	250	DWC	73	170	0.010	1.21	59.41	0.39	0.94	0.44	OK	1.14	OK	0.18	0.00	7.72	7.72	7.54	1.39	1.16	OK
381	VMRDM15	VMRDM14	1	1	C		30.00		6412.07	8.70	8.29	4.22	901.04	2.25	23.465	0.000	23.465	173	250	250	DWC	74	75	0.010	1.82	89.44	0.26	0.84	0.35	OK	1.53	OK	0.40	0.00	7.54		7.14	1.16	1.15	OK
382	VMRDM14	VMRDM13	1	1	C		30.00		6442.07	8.29	7.88	4.22	905.26	2.25	23.574	0.000	23.574	174	250	250	DWC	73	73	0.010	1.84	90.66	0.26	0.84	0.35	OK	1.55	OK	0.41	0.00	7.14		6.73	1.15	1.15	OK
383	VMRDM13	VMRDM12	1	1	C		24.00		6466.07	7.88	7.47	3.37	908.63	2.25	23.662	0.000	23.662	174	250	250	DWC	59	59	0.010	2.05	100.85	0.23	0.81	0.33	OK	1.66	OK	0.41	0.00	6.73		6.32	1.15	1.15	OK
384	VMRDM12	VMRDM11	1	1	C		23.00		6489.07	7.47	7.30	3.23	911.86	2.25	23.746	0.000	23.746	174	250	250	DWC	132	135	0.010	1.36	66.67	0.36	0.92	0.42	OK	1.25	OK	0.17	0.00	6.32		6.15	1.15	1.15	OK
385	VMRDM11	VMRDM10	1	1	C		9.00		6498.07	7.30	7.23	1.26	913.13	2.25	23.779	0.000	23.779	175	250	250	DWC	132	132	0.010	1.37	67.42	0.35	0.92	0.41	OK	1.26	OK	0.07	0.00	6.15		6.08	1.15	1.15	OK
386	VMRDM10	VMRDM9	1	1	C		30.00		6528.07	7.23	7.01	4.22	917.35	2.25	23.889	0.000	23.889	175	250	250	DWC	132	132	0.010	1.37	67.42	0.35	0.92	0.41	OK	1.26	OK	0.23	0.00	6.08		5.85	1.15	1.16	OK
387	VMRDM9	VMRDM8	1	1	C		30.00		6558.07	7.01	6.78	4.22	921.56	2.25	23.999	0.000	23.999	175	250	250	DWC	132	132	0.010	1.37	67.42	0.36	0.92	0.42	OK	1.26	OK	0.23	0.00	5.85		5.62	1.16	1.16	OK
388	VMRDM8	VMRDM7	1	1	C		18.00		6576.07	6.78	6.64	2.53	924.09	2.25	24.065	0.000	24.065	176	250	250	DWC	133	133	0.010	1.37	67.17	0.36	0.92	0.42	OK	1.26	OK	0.14	0.00	5.62		5.48	1.16	1.16	OK
389	VMRDM7	VMRDM6	1	1	C		30.00		6606.07	6.64	6.70	4.22	928.31	2.25	24.175	0.000	24.175	176	250	250	DWC	-500	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.04	0.00	5.48		5.44	1.16	1.26	OK
390	VMRDM6	VMRDM5	1	1	C		27.00		6633.07	6.70	6.65	3.79	932.10	2.25	24.273	0.000	24.273	176	250	250	DWC	482	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.04	0.00	5.44		5.40	1.26	1.25	OK
391	VMRDM5	VMRDM4	1	1	C		30.00		6663.07	6.65	6.59	4.22	936.32	2.25	24.383	0.000	24.383	177	250	250	DWC	545	700	0.010	0.60	29.28	0.83	1.12	0.70	OK	0.67	OK	0.04	0.00	5.40		5.36	1.25	1.23	OK
392	VMRDM4	VMRDM3	1	1	C		19.00		6682.07	6.59	6.38	2.67	938.99	2.25	24.453	0.000	24.453	177	250	250	DWC	88	140	0.010	1.33	65.47	0.37	0.93	0.43	OK	1.24	OK	0.14	0.00	5.36		5.22	1.23	1.16	OK
393	VMRDM3	VMRDM2	1	1	C		30.00		6712.07	6.38	6.04	4.22	943.20	2.25	24.563	0.000	24.563	177	250	250	DWC	88	88	0.010	1.68	82.57	0.30	0.88	0.38	OK	1.48	OK	0.34	0.00	5.22		4.88	1.16	1.16	OK
394	VMRDM2	VMRDM1	1	1	C		30.00		6742.07	6.04	5.70	4.22	947.42	2.25	24.672	0.000	24.672	178	250	250	DWC	88	88	0.010	1.68	82.57	0.30	0.88	0.38	OK	1.48	OK	0.34	0.00	4.88		4.54	1.16	1.16	OK
395	VMRDM1	VPVMRDM44	1	1	C		27.00		6769.07	5.70	5.39	3.79	951.21	2.25	24.771	0.000	24.771	178	250	250	DWC	88	88	0.010	1.68	82.57	0.30	0.88	0.38	OK	1.48	OK	0.31	0.00	4.54		4.23	1.16	1.16	OK
396	VPVMRDM44	VPKTRDM45	2	1	J		8.00		7214.07	5.390	5.497	1.12	1013.74	2.25	26.400	0.000	26.400	184	250	250	DWC	-75	610	0.010	0.64	31.36	0.84	1.12	0.70	OK	0.71	OK	0.01	0.00	1.42	1.42	1.41	3.97	4.09	OK
397	VPKTRDM45	VPRDM46	2	1	J		30.00		14122.95	5.497	5.41	4.22	1984.60	2.25	51.682	0.000	51.682	257	342	400	HDPE	333	1000	0.010	0.61	56.49	0.91	1.13	0.75	OK	0.69	OK	0.03	0.00	1.41	1.41	1.38	4.09	4.03	OK
398	VPRDM46	VPRDM47	1	1	C		30.00		14152.95	5.41	5.32	4.22	1988.82	2.25	51.792	0.000	51.792	257	342	400	HDPE	333	1000	0.010	0.61	56.49	0.92	1.14	0.76	OK	0.70	OK	0.03	0.00	1.38		1.35	4.03	3.97	OK
399	VPRDM47	VPRDM48	1	1	C		30.00		14182.95	5.32	5.23	4.22	1993.03	2.25	51.902	0.000	51.902	258	342	400	HDPE	337	1000	0.010	0.61	56.49	0.92	1.14	0.76	OK	0.70	OK	0.03	0.00	1.35		1.32	3.97	3.91	OK
400	VPRDM48	VPRDM49	1	1	C		30.00		14212.95	5.23	4.89	4.22	1997.25	2.25	52.012	0.000	52.012	258	342	400	HDPE	88	1000	0.010	0.61	56.49	0.92	1.14	0.76	OK	0.70	OK	0.03	0.00	1.32		1.29	3.91	3.60	OK
401	VPRDM49	VPRDM50	1	1	C		30.00		14242.95	4.89	4.67	4.22	2001.46	2.25	52.121	0.000	52.121	258	342	400	HDPE	136	1000	0.010	0.61	56.49	0.92	1.14	0.76	OK	0.70	OK	0.03	0.00	1.29		1.26	3.60	3.41	OK
402	VPRDM50	VPRDM51	1	1	C		30.00		14272.95	4.67	4.46	4.22	2005.68	2.25	52.231	0.000	52.231	258	342	400	HDPE	145	1000	0.010	0.61	56.49	0.92	1.14	0.76	OK	0.70	OK	0.03	0.00	1.26		1.23	3.41	3.23	OK
403	VPRDM51	VPRDM52	1	1	C		30.00		14302.95	4.46	4.50	4.22	2009.90	2.25	52.341	0.000	52.341	259	342	400	HDPE	-750	1000	0.010	0.61	56.49	0.93	1.14	0.77	OK	0.70	OK	0.03	0.00	1.23		1.20	3.23	3.30	OK
404	VPRDM52	VPRDM53	1	1	C		23.00		14325.95	4.50	4.54	3.23	2013.13	2.25	52.425	0.000	52.425	259	342	400	HDPE	-575	1000	0.010	0.61	56.49	0.93	1.14	0.77	OK	0.70	OK	0.02	0.00	1.20		1.18	3.30	3.36	OK
405	VPRDM53	VPRDM54	1	1	C		12.00		14337.95	4.54	4.57	1.69	2014.81	2.25	52.469	0.000	52.469	259	342	400	HDPE	-387	1000	0.010	0.61	56.49	0.93	1.14	0.77	OK	0.70	OK	0.01	0.00	1.18		1.17	3.36	3.40	OK
406	VPRDM54	VPVTRDM55	1	1	C		12.00		14349.95	4.57	4.59	1.69	2016.50	2.25	52.513	0.000	52.513	259	342	400	HDPE	-750	1000	0.010	0.61	56.49	0.93	1.14	0.77	OK	0.70	OK	0.01	0.00	1.17		1.16	3.40	3.43	OK
407	VPRDM64	VPRDM63	0	1	H		30.00		30.00	6.23	5.711	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	58	58	0.010	1.78	56.10	0.00	0.30	0.07	OK	0.53	OK	0.52	0.00	5.13		4.61	1.10	1.10	OK
408	VPRDM63	VPRDM62	1	1	C		30.00		60.00	5.711	5.196	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	58	58	0.010	1.78	56.10	0.00	0.30	0.07	OK	0.53	OK	0.52	0.00	4.61		4.09	1.10	1.11	OK
409	VPRDM62.3	VPRDM62.2	0	1	H		24.00		24.00	4.26	4.525	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	-91	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	3.16		3.03	1.10	1.50	OK
410	VPRDM62.2	VPRDM62.1	1	1	C		30.00		54.00	4.525	4.86	4.22	7.59	2.25	0.198	0.000	0.198	16	200	200	DWC	-90	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	3.03		2.86	1.50	2.00	OK
411	VPRDM62.1	VPRDM62	1	1	C		30.00		84.00	4.86	5.196	4.22	11.80	2.25	0.307	0.000	0.307	20	200	200	DWC	-89	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.86		2.69	2.00	2.51	OK
412	VPRDM62	VPRDM61	2	1	J		26.00		170.00	5.196	4.968	3.65	23.89	2.25	0.622	0.000	0.622	29	200	200	DWC	114	520	0.010	0.60	18.73	0.03	0.46	0.13	OK	0.27	Check	0.05	0.00	2.69	2.69	2.64	2.51	2.33	OK
413	VPRDM61	VPRDM60	1	1	C		30.00		200.00	4.968	4.74	4.22	28.10	2.25	0.732	0.000	0.732	31	200	200	DWC	132	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.64		2.58	2.33	2.16	OK
414	VPRDM60	VPRDM59A	1	1	C		22.84		222.84	4.74	4.537	3.21	31.31	2.25	0.815	0.000	0.815	33	200	200	DWC	113	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	2.58		2.54	2.16	2.00	OK
415	VPRDM59A	VPRDM59	1	1	C		13.52		236.36	4.537	4.512	1.90	33.21	2.25	0.865	0.000	0.865	34	200	200	DWC	541	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	2.54		2.51	2.00	2.00	OK
416	VPRDM59	VPRDM58	1	1	C		30.00		266.36	4.51	4.29	4.22	37.43	2.25	0.975	0.000	0.975	36	200	200	DWC	132	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	2.51		2.45	2.00	1.84	OK
417	VPRDM58	VPRDM57	1	1	C		30.00		296.36	4.29	4.39	4.22	41.65	2.25	1.085	0.000	1.085	38	200	200	DWC	-300	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.45		2.39	1.84	2.00	OK
418	VPRDM57	VPRDM56	1	1	C		30.00		326.36	4.39	4.49	4.22	45.86	2.25	1.194	0.000	1.194	40	200	200	DWC	-297	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	2.39		2.33	2.00	2.16	OK
419	VPRDM56	VPVTRDM55	1	1	C		30.00		356.36	4.49	4.59	4.22	50.08	2.25	1.304	0.000	1.304	41	200	200	DWC	-297	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	2.33		2.27	2.16	2.32	OK
420	VPVTRDM55	VTRDM1	2	1	J		15.00		14721.31	4.59	4.59	2.11	2068.69	2.25	53.872	0.000	53.872	262	342	400	HDPE	0	1000	0.010	0.61	56.49	0.95	1.14	0.78	OK	0.70	OK	0.02	0.00	1.16	1.16	1.14	3.43	3.45	OK
421	VTRDM1	VTRDM2	1	1	C		30.00		14751.31	4.59	4.59	4.22	2072.90	2.25	53.982	0.000	53.982	263	342	400	HDPE	-30000	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.03	0.00	1.14		1.11	3.45	3.48	OK
422	VTRDM2	VTRDM3	1	1	C		30.00		14781.31	4.59	4.59	4.22	2077.12	2.25	54.092	0.000	54.092	263	342	400	HDPE	-15000	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.03	0.00	1.11		1.08	3.48	3.51	OK
423	VTRDM3	VTRDM4	1	1	C		30.00		14811.31	4.59	5.46	4.22	2081.33	2.25	54.201	0.000	54.201	263	342	400	HDPE	-34	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.03	0.00	1.08		1.05	3.51	4.41	OK

Sl. No.	Man Holes									Ground Levels				FLOWS LPS					Proposed Size of Sewer in mm						As per Manning Table			At Ultimate peak flow									Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumalitive flow in cum/day	Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From		To	Starting Manhole	Ending manhole	
424	VTRDM4	VTRDM5	1	1	C		30.00		14841.31	5.46	5.81	4.22	2085.55	2.25	54.311	0.000	54.311	264	342	400	HDPE	-86	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.03	0.00	1.05		1.02	4.41	4.79	OK
425	VTRDM5	TVVTRDM6	1	1	C		12.00		14853.31	5.81	6.69	1.69	2087.23	2.25	54.355	0.000	54.355	264	342	400	HDPE	-14	1000	0.010	0.61	56.49	0.96	1.14	0.79	OK	0.70	OK	0.01	0.00	1.02		1.01	4.79	5.68	OK
426	KKRDM1	KKRDM2	0	1	H		30.00		30.00	6.031	5.953	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	385	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	4.93		4.76	1.10	1.19	OK
427	KKRDM2	KKRDM3	1	1	C		21.00		51.00	5.953	5.899	2.95	7.17	2.25	0.187	0.000	0.187	16	200	200	DWC	389	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	4.76		4.64	1.19	1.26	OK
428	KKRDM3.2	KKRDM3.1	0	1	H		19.00		19.00	6.432	6.165	2.67	2.67	2.25	0.070	0.000	0.070	10	200	200	DWC	71	70	0.010	1.62	51.06	0.00	0.30	0.07	OK	0.49	OK	0.27	0.00	5.33		5.06	1.10	1.11	OK
429	KKRDM3.1	KKRDM3	1	1	C		30.00		49.00	6.165	5.899	4.22	6.89	2.25	0.179	0.000	0.179	16	200	200	DWC	113	110	0.010	1.29	40.73	0.00	0.30	0.07	OK	0.39	OK	0.27	0.00	5.06		4.79	1.11	1.11	OK
430	KKRDM3	KKRDM4	2	1	J		30.00		130.00	5.899	6.068	4.22	18.27	2.25	0.476	0.000	0.476	25	200	200	DWC	-178	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	4.64	4.64	4.55	1.26	1.52	OK
431	KKRDM4	KKRDM5	1	1	C		30.00		160.00	6.068	6.240	4.22	22.48	2.25	0.586	0.000	0.586	28	200	200	DWC	-174	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	4.55		4.48	1.52	1.76	OK
432	KKRDM5	KKRDM6	1	1	C		21.00		181.00	6.240	6.355	2.95	25.43	2.25	0.662	0.000	0.662	30	200	200	DWC	-183	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	4.48		4.43	1.76	1.93	OK
433	KKRDM6	KKRDM7	1	1	C		20.00		201.00	6.355	6.468	2.81	28.25	2.25	0.736	0.000	0.736	31	200	200	DWC	-177	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	4.43		4.39	1.93	2.08	OK
434	KKRDM7	KKRDM8	1	1	C		27.00		228.00	6.468	6.620	3.79	32.04	2.25	0.834	0.000	0.834	33	200	200	DWC	-178	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	4.39		4.34	2.08	2.28	OK
435	KKRDM8	KKVTRDM7	1	1	C		7.00		235.00	6.620	6.660	0.98	33.02	2.25	0.860	0.000	0.860	34	200	200	DWC	-175	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.01	0.00	4.34		4.33	2.28	2.33	OK
436	KKVTRDM7	TVVTRDM6	1	1	C		10.00		245.00	6.660	6.69	1.41	34.43	2.25	0.897	0.000	0.897	34	200	200	DWC	-333	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	4.33		4.31	2.33	2.38	OK
437	TVVTRDM6	TVRDM1	2	1	J		30.00		15128.31	6.69	5.904	4.22	2125.88	2.25	55.361	0.000	55.361	266	342	400	HDPE	38	1000	0.010	0.61	56.49	0.98	1.14	0.80	OK	0.70	OK	0.03	0.00	1.01	1.01	0.98	5.68	4.92	OK
438	TVRDM1	TVKSRDM2	1	1	C		38.00		15166.31	5.90	5.64	5.34	2131.22	2.25	55.500	0.000	55.500	266	342	400	HDPE	145	1000	0.010	0.61	56.49	0.98	1.14	0.80	OK	0.70	OK	0.04	0.00	0.98		0.94	4.92	4.70	OK
439	KSRDM1	TVKSRDM2	0	1	H		20.00		20.00	5.19	5.64	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-45	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.12	0.00	4.09		3.97	1.10	1.67	OK
440	TVKSRDM2	TVRDM3	2	1	J		17.00		15203.31	5.64	5.67	2.39	2136.42	2.25	55.636	0.000	55.636	267	342	400	HDPE	-630	990	0.010	0.62	56.78	0.98	1.14	0.80	OK	0.70	OK	0.02	0.00	0.94	0.94	0.92	4.70	4.75	OK
441	TVRDM3	TVRDM4	1	1	C		12.00		15215.31	5.67	5.69	1.69	2138.10	2.25	55.680	0.000	55.680	267	342	400	HDPE	-600	990	0.010	0.62	56.78	0.98	1.14	0.80	OK	0.70	OK	0.01	0.00	0.92		0.91	4.75	4.78	OK
442	TVRDM4	TVRDM5	1	1	C		14.00		15229.31	5.69	5.71	1.97	2140.07	2.25	55.731	0.000	55.731	267	342	400	HDPE	-636	990	0.010	0.62	56.78	0.98	1.14	0.80	OK	0.70	OK	0.01	0.00	0.91		0.90	4.78	4.81	OK
443	TVRDM5	TVRDM6	1	1	C		16.00		15245.31	5.71	5.72	2.25	2142.32	2.25	55.790	0.000	55.790	267	342	400	HDPE	-2286	990	0.010	0.62	56.78	0.98	1.14	0.80	OK	0.70	OK	0.02	0.00	0.90		0.88	4.81	4.84	OK
444	TVRDM6	TVRDM7	1	1	C		30.00		15275.31	5.72	5.15	4.22	2146.53	2.25	55.899	0.000	55.899	267	342	400	HDPE	53	990	0.010	0.62	56.78	0.98	1.14	0.80	OK	0.70	OK	0.03	0.00	0.88		0.85	4.84	4.30	OK
445	TVRDM7	TVRDM8	1	1	C		15.00		15290.31	5.15	4.82	2.11	2148.64	2.25	55.954	0.000	55.954	267	342	400	HDPE	45	980	0.010	0.62	57.06	0.98	1.14	0.80	OK	0.71	OK	0.02	0.00	0.85		0.83	4.30	3.99	OK
446	TVRDM8	TVRDM9	1	1	C		30.00		15320.31	4.82	3.82	4.22	2152.86	2.25	56.064	0.000	56.064	268	342	400	HDPE	30	980	0.010	0.62	57.06	0.98	1.14	0.80	OK	0.71	OK	0.03	0.00	0.83		0.80	3.99	3.02	OK
447	TVRDM9	TVRDM10	1	1	C		13.00		15333.31	3.82	3.40	1.83	2154.69	2.25	56.112	0.000	56.112	268	342	400	HDPE	31	980	0.010	0.62	57.06	0.98	1.14	0.80	OK	0.71	OK	0.01	0.00	0.80		0.79	3.02	2.61	OK
448	TVRDM10.1	TVRDM10	0	1	H		23.00		23.00	2.87	3.40	3.23	3.23	2.25	0.084	0.000	0.084	11	200	200	DWC	-44	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.77		1.64	1.10	1.76	OK
449	TVRDM10	TVRDM11	2	1	J		15.00		15371.31	3.40	3.36	2.11	2160.03	2.25	56.251	0.000	56.251	268	342	400	HDPE	357	970	0.010	0.62	57.36	0.98	1.14	0.80	OK	0.71	OK	0.02	0.00	0.79	0.79	0.77	2.61	2.59	OK
450	TVRDM11	TVRDM12	1	1	C		16.00		15387.31	3.36	3.32	2.25	2162.27	2.25	56.309	0.000	56.309	268	342	400	HDPE	457	970	0.010	0.62	57.36	0.98	1.14	0.80	OK	0.71	OK	0.02	0.00	0.77		0.75	2.59	2.57	OK
451	TVRDM12	TVRDM13	1	1	C		30.00		15417.31	3.32	3.26	4.22	2166.49	2.25	56.419	0.000	56.419	269	342	400	HDPE	455	970	0.010	0.62	57.36	0.98	1.14	0.80	OK	0.71	OK	0.03	0.00	0.75		0.72	2.57	2.54	OK
452	TVRDM13	TVRDM14	1	1	C		30.00		15447.31	3.26	3.19	4.22	2170.70	2.25	56.529	0.000	56.529	269	342	400	HDPE	462	960	0.010	0.63	57.66	0.98	1.14	0.80	OK	0.71	OK	0.03	0.00	0.72		0.69	2.54	2.50	OK
453	TVRDM14	TVRDM15	1	1	C		12.00		15459.31	3.19	3.17	1.69	2172.39	2.25	56.573	0.000	56.573	269	342	400	HDPE	462	960	0.010	0.63	57.66	0.98	1.14	0.80	OK	0.71	OK	0.01	0.00	0.69		0.68	2.50	2.49	OK
454	TVRDM15.1	TVRDM15	0	1	H		30.00		30.00	3.11	3.17	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-556	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.01		1.84	1.10	1.33	OK
455	TVRDM15	TVRDM16	2	1	J		20.00		15509.31	3.17	3.45	2.81	2179.42	2.25	56.756	0.000	56.756	269	342	400	HDPE	-71	960	0.010	0.63	57.66	0.98	1.14	0.80	OK	0.71	OK	0.02	0.00	0.68	0.68	0.66	2.49	2.79	OK
456	TVRDM16	TVRDM17	1	1	C		12.00		15521.31	3.45	3.74	1.69	2181.10	2.25	56.800	0.000	56.800	269	342	400	HDPE	-42	950	0.010	0.63	57.96	0.98	1.14	0.80	OK	0.72	OK	0.01	0.00	0.66		0.65	2.79	3.09	OK
457	TVRDM17.1	TVRDM17	0	1	H		26.00		26.00	3.76	3.74	3.65	3.65	2.25	0.095	0.000	0.095	12	200	200	DWC	1300	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.15	0.00	2.66		2.51	1.10	1.23	OK
458	TVRDM17	TVRDM18	2	1	J		25.00		15572.31	3.74	3.77	3.51	2188.27	2.25	56.986	0.000	56.986	270	342	400	HDPE	-1000	950	0.010	0.63	57.96	0.98	1.14	0.80	OK	0.72	OK	0.03	0.00	0.65	0.65	0.62	3.09	3.15	OK
459	TVRDM18	MKTVRDM9	1	1	C		28.00		15600.31	3.77	3.79	3.93	2192.20	2.25	57.089	0.000	57.089	270	342	400	HDPE	-1077	950	0.010	0.63	57.96	0.98	1.14	0.80	OK	0.72	OK	0.03	0.00	0.62		0.59	3.15	3.20	OK
460	VPRDM66.15	VPRDM66.14	0	1	H		12.00		12.00	18.26	17.96	1.69	1.69	2.25	0.044	0.000	0.044	8	200	200	DWC	40	40	0.010	2.15	67.55	0.00	0.30	0.07	OK	0.64	OK	0.30	0.00	17.16		16.86	1.10	1.10	OK
461	VPRDM66.14	VPRDM66.13	1	1	C		30.00		42.00	17.96	17.21	4.22	5.90	2.25	0.154	0.000	0.154	14	200	200	DWC	40	40	0.010	2.15	67.55	0.00	0.30	0.07	OK	0.64	OK	0.75	0.00	16.86		16.11	1.10	1.10	OK
462	VPRDM66.13	VPRDM66.12	1	1	C		30.00		72.00	17.21	16.46	4.22	10.12	2.25	0.263	0.000	0.263	19	200	200	DWC	40	40	0.010	2.16	67.98	0.00	0.30	0.07	OK	0.65	OK	0.76	0.00	16.11		15.35	1.10	1.11	OK
463	VPRDM66.12	VPRDM66.11	1	1	C		30.00		102.00	16.46	15.70	4.22	14.33	2.25	0.373	0.000	0.373	22	200	200	DWC	39	39	0.010	2.17	68.41	0.01	0.30	0.07	OK	0.65	OK	0.77	0.00	15.35		14.58	1.11	1.12	OK
464	VPRDM66.11	VPRDM66.10	1	1	C		30.00		132.00	15.70	14.91	4.22	18.55	2.25	0.483	0.000	0.483	25	200	200	DWC	38	39	0.010	2.17	68.41	0.01	0.30	0.07	OK	0.65	OK	0.77	0.00	14.58		13.81	1.12	1.10	OK
465	VPRDM66.10	VPRDM66.9	1	1	C		30.00		162.00	14.91	14.12	4.22	22.76	2.25	0.593	0.000	0.593	28	200	200	DWC	38	38	0.010	2.20	69.30	0.01	0.30	0.07	OK	0.66	OK	0.79	0.00	13.81		13.02	1.10	1.10	OK
466	VPRDM66.9	VPVMRDM66.	1	1	C		30.00		192.00	14.12	13.34	4.22	26.98	2.25	0.703	0.000	0.703	30	200	200	DWC	39	39	0.010	2.19	68.85	0.01	0.30	0.07	OK	0.66	OK	0.78	0.00	13.02		12.24	1.10	1.10	OK
467	VPVMRDM66.	VPRDM66.7	1	1	C		30.00	1565.440	1787.44	13.34	14.06	4.22	251.18	2.25	6.541	0.000	6.541	92	200	200	DWC	-42	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	12.24		12.18	1.10	1.88	OK
468	VPRDM66.7	VPRDM66.6	1	1	C		30.00		1817.44	14.06	14.78	4.22	255.39	2.25	6.651	0.000	6.651	93	200	200	DWC	-42	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	12.18		12.12	1.88	2.66	OK
469	VPRDM66.6	VPRDM66.5	1	1	C		25.00		1842.44	14.78	15.02	3.51	258.91	2.25	6.742	0.000	6.742	93	200	200	DWC	-104	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.05	0.00	12.12		12.07	2.66	2.95	OK
470	VPRDM66.5	VPRDM66.4	1	1	C		14.00		1856.44	15.02	14.75	1.97	260.87	2.25	6.794	0.000	6.794	94	200	200	DWC	52	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.03	0.00	12.07		12.04	2.95	2.71	OK
471	VPRDM66.4	VPRDM66.3	1	1	C		30.00		1886.44	14.75	12.77	4.22	265.09	2.25	6.903	0.000	6.903	94	200	200	DWC	15	80	0.010	1.52	47.76	0.14	0.71	0.26	OK	1.08	OK	0.38	0.00	12.04		11.66	2.71	1.11	OK
472	VPRDM66.3	VPRDM66.2	1	1	C		30.00		1916.44	12.77	10.79	4.22	269.30	2.25	7.013	0.000	7.013	95	200	200	DWC	15	15	0.010	3.50	110.31	0.06	0.55	0.17	OK	1.93	OK	2.00	0.00	11.66		9.66	1.11	1.13	OK
473	VPRDM66.2	VPRDM66.1	1	1	C		23.00		1939.44	10.79	9.14	3.23	272.54	2.25	7.097	0.000	7.097	96	200	200	DWC	14	14	0.010	3.63	114.18	0.06	0.55	0.17	OK	2.00	OK	1.64	0.00	9.66		8.02	1.13	1.12	OK
474	VPRDM66.1	VPRDM66	1	1	C		30.00		1969.44	9.14	7.17	4.22	276.75	2.25	7.207	0.000	7.207	96	200	200	DWC	15	15	0.010	3.50	110.31	0.07	0.59	0.19	OK	2.07	OK	2.00	0.00	8.02		6.02	1.12	1.15	OK
475	VPRDM75	VPRDM74	0	1	H		30.00		30.00	8.59	7.932	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	46	46	0.010	2.01	63.34	0.00	0.30	0.07	OK	0.60	OK	0.66	0.00	7.49		6.83	1.10	1.10	OK
476	VPRDM74	VPRDM73	1	1	C		30.00		60.00	7.932	7.733	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	151	150	0.010	1.11	34.88	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	6.83		6.63	1.10	1.10	OK
477	VPRDM73	VPRDM72	1	1	C		30.00		90.00	7.733	7.534	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	151	151	0.010	1.10	34.77	0.01	0.30	0.07	OK	0.33	OK	0.20	0.00	6.63		6.43	1.10	1.10	OK
478	VPRDM72	VPRDM71	1	1	C		30.00		120.00	7.534	7.34	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	155	155	0.010	1.09	34.32	0.01	0.30	0.07	OK	0.33	OK	0.19	0.00	6.43		6.24	1.10	1.10	OK
479	VPRDM71	VPRDM70	1	1	C		24.00		144.00	7.34	7.253	3.37	20.24	2.25	0.527	0.000	0.527	26	200	200	DWC	276	250	0.010	0.86	27.02	0.02	0.40	0.10	OK	0.34	OK	0.10	0.00	6.24		6.14	1.10	1.11	OK
480	VPRDM70	VPRDM69	1	1	C		30.00		174.00	7.253	7.227	4.22	24.45	2.25	0.637	0.000	0.637	29	200	200	DWC	1154	450	0.010	0.64	20.14	0.03	0.46	0.13	OK	0.29	OK	0.07	0.00	6.14		6.07	1.11	1.16	OK
481	VPRDM69	VPRDM68	1	1	C		30.00		204.00	7.227	7.2	4.22	28.67	2.25	0.747	0.000	0.747	31	200	200	DWC	1111	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	6.07		6.01	1.16	1.19	OK
482	VPRDM68	VPRDM67	1	1	C		30.00		234.00	7.2	7.174	4.22	32.88	2.25	0.856	0.000	0.856	34	200	200	DWC	1154	470	0.010	0.63	19.71	0.04	0.51	0.15	OK	0.32	OK	0.06	0.00	6.01		5.95	1.19	1.22	OK
483	VPRDM67	VPRDM66	1	1	C		10.00		244.00	7.174	7.166	1.41	34.29	2.25	0.893	0.000	0.893	34	200	200	DWC	1250	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.02	0.00	5.95		5.93	1.22	1.24	OK
484	VPRDM66	VPMKRDM65	2	1	J		15.00		2228.44	7.166	6.61	2.11	313.15	2.25	8.155	0.000	8.155	102	200	200	DWC	27	35	0.010	2.29	72.21	0.11	0.67	0.23	OK	1.54	OK	0.43	0.00	5.93	5.93	5.50	1.24	1.11	OK
485	VPMKRDM65	MKRDM1	1	1	C		7.00		2235.44	6.61	6.411	0.98	314.13	2.25	8.180	0.000	8.180	103	200	200	DWC	35	35	0.010	2.29	72.21	0.11	0.67	0.23	OK	1.54	OK	0.20	0.00	5.50		5.30	1.11	1.11	OK
486	MKRDM1	MKRDM2	1	1	C		28.00		2263.44	6.411	5.64	3.93	318.07	2.25	8.283	0.000	8.283	103	200	200	DWC	36	37	0.010	2.23	70.23	0.12	0.69	0.24	OK	1.54	OK	0.76	0.00	5.30		4.54	1.11	1.10	OK
487	MKRDM2	MKRDM3	1	1	C		30.00		2293.44	5.64	4.81	4.22	322.28	2.25	8.393	0.000	8.393	104	200	200	DWC	36	36	0.010	2.26	71.20	0.12	0.69	0.24	OK	1.56	OK	0.83	0.00	4.54		3.71	1.10	1.10	OK
488	MKRDM3	MKRDM4	1	1	C		12.00		2305.44	4.81	4.71	1.69	323.97	2.25	8.437	0.000	8.437	104	200	200	DWC	120	126	0.010	1.21	38.06	0.22	0.80	0.33	OK	0.97	OK	0.10	0.00	3.71		3.61	1.10	1.10	OK
489	MKRDM4	MKRDM4A	1	1	C		12.00		2317.44	4.71	4.615	1.69	325.65	2.25	8.481	0.000	8.481	104	200	200	DWC	126	126	0.010	1.21	38.06	0.22	0.80	0.33	OK	0.97	OK	0.10	0.00	3.61		3.51	1.10	1.11	OK
490	MKRDM4A	MKRDM5	1	1	C		9.00		2326.44	4.615	4.544	1.26	326.92	2.25	8.514	0.000	8.514	105	200	200	DWC	127	127	0.010	1.20	37.91	0.22	0.80	0.33	OK	0.96	OK	0.07	0.00	3.51		3.44	1.11	1.10	OK
491	MKRDM5	MKRDM6	1	1	C		30.00		2356.44	4.544	4.307	4.22	331.13	2.25	8.623	0.000	8.623	105	200	200	DWC	127	127	0.010	1.20	37.91	0.23	0.81	0.33	OK	0.98	OK	0.24	0.00	3.44		3.20	1.10	1.11	OK
492	MKRDM6.1	MKRDM6	0	1	H		40.00		40.00	4.09	4.307	5.62	5.62	2.25	0.146	0.000	0.146	14	200	200	DWC	-184	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	2.99		2.77	1.10	1.54	OK
493	MKRDM6	MKRDM7	2	1	J		26.00		2422.44	4.307	4.125	3.65	340.41	2.25	8.865	0.000	8.865	107	200	200	DWC	143	520	0.010	0.60	18.73	0.47	0.99	0.48	OK	0.59	OK	0.05	0.00	2.77	2.77	2.72	1.54	1.41	OK
494	MKRDM7	MKRDM8	1	1	C		20.00		2442.44	4.125	3.986	2.81	343.22	2.25	8.938	0.000	8.938	107	200	200	DWC	144	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.04	0.00	2.72		2.68	1.41	1.31	OK

Sl. No.	Man Holes									Ground Levels				FLOWS LPS					Proposed Size of Sewer in mm						As per Manning Table			At Ultimate peak flow														Check Depth of cutting
	From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumalitive flow in cum/day	Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From		To	Starting Manhole	Ending manhole	
495	MKRDM8	MKTVRDM9	1	1	C		28.00		2470.44	3.986	3.791	3.93	347.15	2.25	9.040	0.000	9.040	108	200	200	DWC	144	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.05	0.00	2.68		2.63	1.31	1.16	OK
496	MKTVRDM9	MKRDM10	2	1	J		25.00		18095.75	3.79	3.79	3.51	2542.87	2.25	66.221	0.000	66.221	291	384	450	HDPE	5000	1000	0.010	0.66	76.93	0.86	1.12	0.72	OK	0.74	OK	0.03	0.00	0.59	0.59	0.56	3.20	3.23	OK
497	MKRDM10	MKRDM11	1	1	C		21.00		18116.75	3.79	3.78	2.95	2545.82	2.25	66.297	0.000	66.297	291	384	450	HDPE	7000	1000	0.010	0.66	76.93	0.86	1.12	0.72	OK	0.74	OK	0.02	0.00	0.56		0.54	3.23	3.24	OK
498	MKRDM11	MKRDM12	1	1	C		15.00		18131.75	3.79	3.79	2.11	2547.93	2.25	66.352	0.000	66.352	291	384	450	HDPE	3000	1000	0.010	0.66	76.93	0.86	1.12	0.72	OK	0.74	OK	0.02	0.00	0.54		0.52	3.25	3.27	OK
499	MKRDM12	MKRDM13	1	1	C		25.00		18156.75	3.79	3.78	3.51	2551.44	2.25	66.444	0.000	66.444	291	384	450	HDPE	8333	1000	0.010	0.66	76.93	0.86	1.12	0.72	OK	0.74	OK	0.03	0.00	0.52		0.49	3.27	3.29	OK
500	MKRDM13	MKRDM14	1	1	C		46.00		18202.75	3.78	2.00	6.46	2557.91	2.25	66.612	0.000	66.612	292	384	450	HDPE	26	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.05	1.00	-0.51		-0.56	4.29	2.56	OK
501	MKRDM14	MKRDM15	1	1	C		46.00		18248.75	2.00	1.56	6.46	2564.37	2.25	66.781	0.000	66.781	292	384	450	HDPE	105	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.05	0.00	-0.56		-0.61	2.56	2.17	OK
502	MKRDM15	MKRDM16	1	1	C		46.00		18294.75	1.56	1.56	6.46	2570.84	2.25	66.949	0.000	66.949	293	384	450	HDPE	0	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.05	0.00	-0.61		-0.66	2.17	2.22	OK
503	MKRDM16	STP	1	0	C	L	10.00		18304.75	1.56	2.00	1.41	2572.24	2.25	66.985	0.000	66.985	293	384	450	HDPE	-23	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.01	0.00	-0.66		-0.67	2.22	2.67	OK
							11976.24		11976.24			1682.94																														

SEWER NETWORK DESIGN _MUTTAR_ Block 4-LS5

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow		Check Velocity (> 0.6m/s)	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Velocity (V)m/s	check (d/D<0.8)	Actual Velocity (v1) m/s		From		To	Starting Manhole	Ending manhole
1	VMRDM12.24	VMRDM12.23	0	1	H		30		30.00	12.94	12.27	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	45	45	2.02	OK	0.61	OK	11.84		11.17	1.10	1.10
2	VMRDM12.23	VMRDM12.22	1	1	C		20		50.00	12.27	11.83	2.81	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	45	45	2.02	OK	0.61	OK	11.17		10.73	1.10	1.10
3	VMRDM12.22	VMRDM12.21	1	1	C		30		80.00	11.83	10.32	4.22	11.24	2.25	0.293	0.000	0.293	20	200	200	DWC	20	20	3.07	OK	0.92	OK	10.73		9.19	1.10	1.13
4	VMRDM12.21	VMKBRDM12.20A	1	1	C		18.16		98.16	10.32	8.91	2.55	13.79	2.25	0.359	0.000	0.359	22	200	200	DWC	13	13	3.76	OK	1.13	OK	9.19		7.79	1.13	1.12
5	VMRDM16.8	VMRDM16.9	0	1	H		27		27.00	13.18	12.47	3.79	3.79	2.25	0.099	0.000	0.099	12	200	200	DWC	38	38	2.20	OK	0.66	OK	12.08		11.37	1.10	1.10
6	VMRDM16.9	VMRDM16.10	1	1	C		15		42.00	12.47	12.07	2.11	5.90	2.25	0.154	0.000	0.154	14	200	200	DWC	38	37.6	2.21	OK	0.66	OK	11.37		10.97	1.10	1.10
7	VMRDM16.10	VMRDM16.11	1	1	C		22		64.00	12.07	11.36	3.09	8.99	2.25	0.234	0.000	0.234	18	200	200	DWC	31	31	2.44	OK	0.73	OK	10.97		10.26	1.10	1.10
8	VMRDM16.11	VMRDM16.12	1	1	C		14		78.00	11.36	10.91	1.97	10.96	2.25	0.285	0.000	0.285	20	200	200	DWC	31	31	2.44	OK	0.73	OK	10.26		9.81	1.10	1.10
9	VMRDM16.12	VMRDM16.13	1	1	C		8		86.00	10.91	10.66	1.12	12.08	2.25	0.315	0.000	0.315	21	200	200	DWC	31	31	2.44	OK	0.73	OK	9.81		9.55	1.10	1.11
10	VMRDM16.13	VMRDM16.14	1	1	C		30		116.00	10.66	9.69	4.22	16.30	2.25	0.424	0.000	0.424	24	200	200	DWC	31	31	2.44	OK	0.73	OK	9.55		8.58	1.11	1.11
11	VMRDM16.14	VMRDM16.15	1	1	C		30		146.00	9.69	8.73	4.22	20.52	2.25	0.534	0.000	0.534	27	200	200	DWC	31	31	2.44	OK	0.73	OK	8.58		7.61	1.11	1.12
12	VMRDM16.15	VMRDM16.16	1	1	C		30		176.00	8.73	8.18	4.22	24.73	2.25	0.644	0.000	0.644	29	200	200	DWC	55	55	1.83	OK	0.55	OK	7.61		7.06	1.12	1.12
13	VMRDM16.16	VMRDM16.17	1	1	C		30		206.00	8.18	8.45	4.22	28.95	2.25	0.754	0.000	0.754	31	200	200	DWC	-109	520	0.60	OK	0.30	OK	7.06		7.00	1.12	1.45
14	VMRDM16.17	VMRDM16.18	1	1	C		30		236.00	8.45	8.73	4.22	33.16	2.25	0.864	0.000	0.864	34	200	200	DWC	-109	520	0.60	OK	0.32	OK	7.00		6.94	1.45	1.79
15	VMRDM16.18	VMRDM16.18A	1	1	C		30		266.00	8.73	9.01	4.22	37.38	2.25	0.973	0.000	0.973	36	200	200	DWC	-109	520	0.60	OK	0.32	OK	6.94		6.88	1.79	2.13
16	VMRDM16.18A	VMRDM16.19A	1	1	C		5		271.00	9.10	9.47	0.70	38.08	2.25	0.992	0.000	0.992	36	200	200	DWC	-14	520	0.60	OK	0.32	OK	6.88		6.87	2.22	2.60
17	VMRDM16.19	VMRDM16.19A	0	1	H		90		90.00	11.32	9.47	12.65	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	49	49	1.95	OK	0.58	OK	10.22		8.36	1.10	1.11
18	VMRDM16.19A	KBRDM6	2	1	J		16		377.00	9.47	9.00	2.25	52.98	2.25	1.380	0.000	1.380	42	200	200	DWC	34	520	0.60	OK	0.35	OK	6.87	6.87	6.84	2.60	2.16
19	KBRDM6	KBRDM5	1	1	C		16		393.00	9.00	8.99	2.25	55.23	2.25	1.438	0.000	1.438	43	200	200	DWC	1600	520	0.60	OK	0.36	OK	6.84		6.81	2.16	2.18
20	KBRDM5	KBRDM4	1	1	C		17		410.00	8.99	8.98	2.39	57.61	2.25	1.500	0.000	1.500	44	200	200	DWC	1889	520	0.60	OK	0.36	OK	6.81		6.78	2.18	2.20
21	KBRDM4	KBRDM3	1	1	C		30		440.00	8.98	8.96	4.22	61.83	2.25	1.610	0.000	1.610	46	200	200	DWC	1667	520	0.60	OK	0.37	OK	6.78		6.72	2.20	2.24
22	KBRDM3	KBRDM2	1	1	C		30		470.00	8.96	8.94	4.22	66.05	2.25	1.720	0.000	1.720	47	200	200	DWC	1765	520	0.60	OK	0.37	OK	6.72		6.66	2.24	2.28
23	KBRDM2	KBRDM1	1	1	C		30		500.00	8.94	8.92	4.22	70.26	2.25	1.830	0.000	1.830	49	200	200	DWC	1765	520	0.60	OK	0.39	OK	6.66		6.60	2.28	2.32
24	KBRDM1	VMKBRDM12.20A	1	1	C		30		530.00	8.92	8.91	4.22	74.48	2.25	1.940	0.000	1.940	50	200	200	DWC	1765	520	0.60	OK	0.39	OK	6.60		6.54	2.32	2.37
25	VMKBRDM12.20A	VMRDM12.20	2	1	J		12		640.16	8.91	7.97	1.69	89.96	2.25	2.343	0.000	2.343	55	200	200	DWC	13	520	0.60	OK	0.42	OK	6.54	6.54	6.52	2.37	1.45
26	VMRDM12.20	VMRDM12.19	1	0	C	L	30		670.16	7.97	5.62	4.22	94.17	2.25	2.452	0.000	2.452	56	200	200	DWC	13	15	3.52	OK	1.41	OK	6.52		4.51	1.45	1.11
27	VMRDM12.1	VMRDM12.2	0	1	H		30		30.00	7.343	7.081	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	115	115	1.27	OK	0.38	OK	6.24		5.98	1.10	1.10
28	VMRDM12.2	VMRDM12.3	1	1	C		4.28		34.28	7.081	6.949	0.60	4.82	2.25	0.125	0.000	0.125	13	200	200	DWC	32	32	2.42	OK	0.73	OK	5.98		5.84	1.10	1.11
29	VMRDM12.3	VMRDM12.4	1	1	C		18		52.28	6.949	6.911	2.53	7.35	2.25	0.191	0.000	0.191	16	200	200	DWC	474	180	1.01	OK	0.30	OK	5.84		5.74	1.11	1.17
30	VMRDM12.4	VMRDM12.5	1	1	C		7		59.28	6.911	6.897	0.98	8.33	2.25	0.217	0.000	0.217	17	200	200	DWC	500	180	1.01	OK	0.30	OK	5.74		5.70	1.17	1.20
31	VMRDM12.5	VMRDM12.6	1	1	C		30		89.28	6.897	6.835	4.22	12.55	2.25	0.327	0.000	0.327	21	200	200	DWC	484	180	1.01	OK	0.30	OK	5.70		5.53	1.20	1.31
32	VMRDM12.6	VMRDM12.7	1	1	C		30		119.28	6.835	6.773	4.22	16.76	2.25	0.437	0.000	0.437	24	200	200	DWC	484	320	0.76	OK	0.30	OK	5.53		5.44	1.31	1.33
33	VMRDM12.7	VMRDM12.8	1	1	C		7		126.28	6.773	6.759	0.98	17.75	2.25	0.462	0.000	0.462	25	200	200	DWC	500	320	0.76	OK	0.30	OK	5.44		5.42	1.33	1.34
34	VMRDM12.8.5A	VMRDM12.8	0	1	H		30		30.00	8.27	6.76	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	20	20	3.07	OK	0.92	OK	7.17		5.63	1.10	1.13
35	VMRDM12.8.4	VMRDM12.8.3	0	1	H		30		30.00	5.60	5.89	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-104	180	1.01	OK	0.30	OK	4.50		4.33	1.10	1.56
36	VMRDM12.8.3	VMRDM12.8.2	1	1	C		30		60.00	5.89	6.18	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	-104	180	1.01	OK	0.30	OK	4.33		4.16	1.56	2.02
37	VMRDM12.8.2	VMRDM12.8.1	1	1	C		30		90.00	6.18	6.47	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	-104	180	1.01	OK	0.30	OK	4.16		3.99	2.02	2.48
38	VMRDM12.8.1	VMRDM12.8	1	1	C		30		120.00	6.47	6.76	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	-104	320	0.76	OK	0.30	OK	3.99		3.90	2.48	2.86
39	VMRDM12.8	VMRDM12.8A	3	1	J		6		282.28	6.759	6.819	0.84	39.67	2.25	1.033	0.000	1.033	37	200	200	DWC	-100	520	0.60	OK	0.33	OK	3.90	3.90	3.89	2.86	2.93
40	VMRDM12.8A	VMRDM12.9	1	1	C		30		312.28	6.819	6.819	4.22	43.88	2.25	1.143	0.000	1.143	39	200	200	DWC	0	520	0.60	OK	0.33	OK	3.89		3.83	2.93	2.99
41	VMRDM12.9	VMRDM12.10	1	1	C		30		342.28	6.819	6.819	4.22	48.10	2.25	1.253	0.000	1.253	40	200	200	DWC	0	520	0.60	OK	0.35	OK	3.83		3.77	2.99	3.05
42	VMRDM12.10	VMRDM12.11	1	1	C		30		372.28	6.819	6.819	4.22	52.31	2.25	1.362	0.000	1.362	42	200	200	DWC	0	520	0.60	OK	0.35	OK	3.77		3.71	3.05	3.11
43	VMRDM12.11	VMRDM12.12	1	1	C		30		402.28	6.819	6.819	4.22	56.53	2.25	1.472	0.000	1.472	44	200	200	DWC	0	520	0.60	OK	0.36	OK	3.71		3.65	3.11	3.17
44	VMRDM12.12	VMRDM12.13	1	1	C		7		409.28	6.819	6.819	0.98	57.51	2.25	1.498	0.000	1.498	44	200	200	DWC	0	520	0.60	OK	0.36	OK	3.65		3.64	3.17	3.18
45	VMRDM12.13	VMRDM12.14	1	1	C		30		439.28	6.819	6.819	4.22	61.73	2.25	1.608	0.000	1.608	46	200	200	DWC	0	520	0.60	OK	0.37	OK	3.64		3.58	3.18	3.24
46	VMRDM12.14	VMRDM12.15	1	1	C		7		446.28	6.819	6.352	0.98	62.71	2.25	1.633	0.000	1.633	46	200	200	DWC	15	520	0.60	OK	0.37	OK	3.58		3.57	3.24	2.78
47	VMRDM12.28	VMRDM12.27	0	1	H		9		9.00	3.97	4.06	1.26	1.26	2.25	0.033	0.000	0.033	7	200	200	DWC	-106	180	1.01	OK	0.30	OK	2.87		2.82	1.10	1.24
48	VMRDM12.27	VMRDM12.26.1	1	1	C		30		39.00	4.06	4.35	4.22	5.48	2.25	0.143	0.000	0.143	14	200	200	DWC	-100	180	1.01	OK	0.30	OK	2.82		2.65	1.24	1.70
49	VMRDM12.26.1	VMRDM12.25.1	1	1	C		7		46.00	4.35	4.42	0.98	6.46	2.25	0.168	0.000	0.168	15	200	200	DWC	-100	180	1.01	OK	0.30	OK	2.65		2.61	1.70	1.81
50	VMRDM12.25.1	VMRDM12.24.1	1	1	C		30		76.00	4.42	4.58	4.22	10.68	2.25	0.278	0.000	0.278	19	200	200	DWC	-189	180	1.01	OK	0.30	OK	2.61		2.44	1.81	2.14
51	VMRDM12.24.1	VMRDM12.23.1	1	1	C		18		94.00	4.58	4.88	2.53	13.21	2.25	0.344	0.000	0.344	21	200	200	DWC	-60	180	1.01	OK	0.30	OK	2.44		2.34	2.14	2.54
52	VMRDM12.23.1	VMRDM12.22.1	1	1	C		30		124.00	4.88	5.31	4.22	17.42	2.25	0.454	0.000	0.454	25	200	200	DWC	-70	320	0.76	OK	0.30	OK	2.34		2.25	2.54	3.06
53	VMRDM12.22.1	VMRDM12.21.1	1	1	C		21		145.00	5.31	5.61	2.95	20.38	2.25	0.531	0.000	0.531	26	200	200	DWC	-70	320	0.76	OK	0.30	OK	2.25		2.18	3.06	3.43
54	VMRDM12.21.1	VMRDM12.20.1	1	1	C		12		157.00	5.61	5.78	1.69	22.06	2.25	0.575	0.000	0.575	28	200	200	DWC	-71	420	0.66	OK	0.30	OK	2.18		2.15	3.43	3.63
55	VMRDM12.20.1	VMRDM12.19.1	1	1	C		30		187.00	5.78	6.21	4.22	26.28	2.25	0.684	0.000	0.684	30	200	200	DWC	-70	420	0.66	OK	0.30	OK	2.15		2.08	3.63	4.13
56	VMRDM12.19.1	VMRDM12.18.1	1	1	C		7		194.00	6.21	6.31	0.98	27.26	2.25	0.710	0.000	0.710	31	200	200	DWC	-74	520	0.60	OK	0.30	OK	2.08		2.07	4.13	4.24
57	VMRDM12.18.4	VMRDM12.18.3	0	1	H		20		20.00	5.43	5.69	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-76	180	1.01	OK	0.30	OK	4.33		4.22	1.10	1.47
58	VMRDM12.18.3	VMRDM12.18.2A	1	1	C		8		28.00	5.69	5.80	1.12	3.93	2.25	0.102	0.000	0.102	12	200	200	DWC	-75	180	1.01	OK	0.30	OK	4.22		4.18	1.47	1.62
59	VMRDM12.18.2A	VMRDM12.18.2	1	1	C		21		49.00	5.80	6.08	2.95	6.89	2.25	0.179	0.000	0.179	16	200	200	DWC	-75	180	1.01	OK	0.30	OK	4.18		4.06	1.62	2.02
60	VMRDM12.18.2	VMRDM12.18.1	1	1	C		17		66.00	6.08	6.31	2.39	9.27	2.25	0.242	0.000	0.242	18	200	200	DWC	-75	180	1.01	OK	0.30	OK	4.06		3.97	2.02	2.34
61	VMRDM12.18.1	VMRDM12.16	2	1	J		44		304.00	6.31	6.33	6.18	42.72	2.25	1.112	0.000	1.112	38	200	200	DWC	-1692	520	0.60	OK	0.33	OK	2.07	2.07	1.99	4.24	4.34
62	VMRDM12.16	VMRDM12.15	1	1	C		30		334.00	6.33	6.35	4.22	46.93	2.25	1.222	0.000	1.222	40	200	200	DWC	-1500	520	0.60	OK	0.35	OK	1.99		1.93	4.34	4.42
63	VMRDM12.15	VMRDM12.15.1	2	1	J		25		805.28	6.35	5.924	3.51	113.16	2.25	2.947	0.000	2.947	62	200	200	DWC	58	520	0.60	OK	0.44	OK	1.93	1.93	1.88	4.42	4.04
64	VMRDM12.15.1	VMRDM12.17	1	1	C		30		835.28	5.924	5.496	4.22	117.38	2.25	3.057	0.000	3.057	63	200	200	DWC	70	520	0.60	OK	0.44	OK	1.88		1.82	4.04	3.68
65	VMRDM12.17	VMRDM12.18	1	1	C		30		865.28	5.496	5.557	4.22	121.59	2.25	3.166	0.000	3.166	64	200	200	DWC	-492	520	0.60	OK	0.45	OK	1.82		1.76	3.68	3.80
66	VMRDM12.18	VMRDM12.19	1	0	C	L	30		895.28	5.557	5.618	4.22	125.81	2.25	3.276	0.000	3.276	65	200	200	DWC	-492	520	0.60	OK	0.45	OK	1.76		1.70	3.80	3.92
							1565.44		1565.44			219.98					5.729	86													

SEWER NETWORK DESIGN _MUTTAR_ Block 4-LS4

Sl. No.	Man Holes				Man hole Type	MANHOLE TYPE	Length in m	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To							Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
1	4	5	6	7	8	9	10.00	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	VMRDM40	VMRDM39	0	1	H		17.69	17.69	7.03	7.14	2.49	2.49	2.25	0.065	0.000	0.065	10	200	200	DWC	-159	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	5.93		5.83	1.10	1.31
2	VMRDM39	VMRDM38	1	1	C		30	47.69	7.44	7.39	4.22	6.70	2.25	0.175	0.000	0.175	15	200	200	DWC	588	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.83		5.66	1.61	1.73
3	VMRDM38	VMRDM37	1	1	C		30	77.69	7.39	7.26	4.22	10.92	2.25	0.284	0.000	0.284	20	200	200	DWC	229	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	5.66		5.49	1.73	1.77
4	VMRDM37	VMRDM36	1	1	C		25	102.69	7.26	7.25	3.51	14.43	2.25	0.376	0.000	0.376	22	200	200	DWC	1923	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	5.49		5.41	1.77	1.84
5	VMRDM36	VMRDM35	1	1	C		30	132.69	7.25	7.22	4.22	18.65	2.25	0.486	0.000	0.486	25	200	200	DWC	1154	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	5.41		5.32	1.84	1.90
6	VMRDM35	VMRDM34	1	1	C		30	162.69	7.22	7.20	4.22	22.86	2.25	0.595	0.000	0.595	28	200	200	DWC	1200	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	5.32		5.25	1.90	1.95
7	VMRDM34	VMRDM33	1	1	C		28	190.69	7.20	7.16	3.93	26.80	2.25	0.698	0.000	0.698	30	200	200	DWC	875	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	5.25		5.20	1.95	1.96
8	VMRDM33	VMRDM32	1	1	C		30	220.69	7.16	7.11	4.22	31.01	2.25	0.808	0.000	0.808	33	200	200	DWC	588	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	5.20		5.14	1.96	1.97
9	VMRDM32	VMRDM31	1	1	C		30	250.69	7.11	7.06	4.22	35.23	2.25	0.917	0.000	0.917	35	200	200	DWC	566	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	5.14		5.08	1.97	1.98
10	VMRDM31	VMRDM30	1	1	C		12	262.69	7.06	7.04	1.69	36.91	2.25	0.961	0.000	0.961	35	200	200	DWC	600	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	5.08		5.06	1.98	1.98
11	VMRDM30	VMRDM29	1	1	C		15	277.69	7.04	7.03	2.11	39.02	2.25	1.016	0.000	1.016	36	200	200	DWC	3000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	5.06		5.03	1.98	2.00
12	VMRDM29	VMRDM28	1	1	C		17.07	294.76	7.03	7.03	2.40	41.42	2.25	1.079	0.000	1.079	38	200	200	DWC	3414	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	5.03		5.00	2.00	2.03
13	VMRDM28	VMRDM27	1	1	C		30	324.76	7.03	7.02	4.22	45.64	2.25	1.188	0.000	1.188	39	200	200	DWC	3333	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	5.00		4.94	2.03	2.08
14	VMRDM27	VMPPRDM26	1	1	C		30	354.76	7.02	7.01	4.22	49.85	2.25	1.298	0.000	1.298	41	200	200	DWC	3750	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	4.94		4.88	2.08	2.13
15	PPRDM11.2	PPRDM11.1	0	1	H		17.63	17.63	11.797	11.895	2.48	2.48	2.25	0.065	0.000	0.065	10	200	200	DWC	-180	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	10.70		10.60	1.10	1.30
16	PPRDM11.1	PPRDM11	1	1	C		30	47.63	11.895	11.993	4.22	6.69	2.25	0.174	0.000	0.174	15	200	200	DWC	-306	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	10.60		10.43	1.30	1.56
17	PPRDM11	PPRDM12	1	1	C		18	65.63	11.993	11.070	2.53	9.22	2.25	0.240	0.000	0.240	18	200	200	DWC	20	36	0.010	2.26	71.20	0.00	0.30	0.07	OK	0.68	OK	0.50	0.00	10.43		9.93	1.56	1.14
18	PPRDM12	PPRDM13	1	1	C		25	90.63	11.070	10.148	3.51	12.74	2.25	0.332	0.000	0.332	21	200	200	DWC	27	27	0.010	2.61	82.22	0.00	0.30	0.07	OK	0.78	OK	0.93	0.00	9.93		9.00	1.14	1.15
19	PPRDM13	PPRDM14	1	1	C		15	105.63	10.148	9.687	2.11	14.84	2.25	0.387	0.000	0.387	23	200	200	DWC	33	33	0.010	2.36	74.37	0.01	0.30	0.07	OK	0.71	OK	0.45	0.00	9.00		8.55	1.15	1.14
20	PPRDM14	PPRDM15	1	1	C		18	123.63	9.687	8.765	2.53	17.37	2.25	0.452	0.000	0.452	25	200	200	DWC	20	20	0.010	3.03	95.53	0.00	0.30	0.07	OK	0.91	OK	0.90	0.00	8.55		7.65	1.14	1.12
21	PPRDM15	PPRDM16	1	1	C		9	132.63	8.765	8.304	1.26	18.64	2.25	0.485	0.000	0.485	25	200	200	DWC	20	20	0.010	3.03	95.53	0.01	0.30	0.07	OK	0.91	OK	0.45	0.00	7.65		7.20	1.12	1.10
22	PPRDM16	PPRDM17	1	1	C		30	162.63	8.304	7.985	4.22	22.85	2.25	0.595	0.000	0.595	28	200	200	DWC	94	95	0.010	1.39	43.83	0.01	0.30	0.07	OK	0.42	OK	0.32	0.00	7.20		6.88	1.10	1.11
23	PPRDM17	PPRDM18	1	1	C		30	192.63	7.985	7.635	4.22	27.07	2.25	0.705	0.000	0.705	30	200	200	DWC	86	86	0.010	1.46	46.07	0.02	0.40	0.10	OK	0.59	OK	0.35	0.00	6.88		6.53	1.11	1.11
24	PPRDM18	PPRDM19	1	1	C		13	205.63	7.635	7.404	1.83	28.90	2.25	0.752	0.000	0.752	31	200	200	DWC	56	56	0.010	1.81	57.09	0.01	0.30	0.07	OK	0.54	OK	0.23	0.00	6.53		6.30	1.11	1.10
25	PPRDM19	PPRDM20	1	1	C		24	229.63	7.404	7.116	3.37	32.27	2.25	0.840	0.000	0.840	33	200	200	DWC	83	83	0.010	1.49	46.89	0.02	0.40	0.10	OK	0.60	OK	0.29	0.00	6.30		6.01	1.10	1.11
26	PPRDM20	VMPPRDM26	1	1	C		15	244.63	7.116	7.013	2.11	34.38	2.25	0.895	0.000	0.895	34	200	200	DWC	146	146	0.010	1.12	35.36	0.03	0.46	0.13	OK	0.52	OK	0.10	0.00	6.01		5.91	1.11	1.10
27	VMPPRDM26	VMRDM25	2	1	J		30	629.39	7.01	7.30	4.22	88.44	2.25	2.303	0.000	2.303	55	200	200	DWC	-105	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	4.88	4.88	4.82	2.13	2.48
28	VMRDM25	VMRDM24	1	1	C		21	650.39	7.30	7.44	2.95	91.39	2.25	2.380	0.000	2.380	56	200	200	DWC	-147	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	4.82		4.78	2.48	2.66
29	VMRDM24	VMRDM23	1	1	C		15	665.39	7.44	7.59	2.11	93.50	2.25	2.435	0.000	2.435	56	200	200	DWC	-105	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.03	0.00	4.78		4.75	2.66	2.84
30	VMRDM23	VMRDM22	1	0	C	L	28	693.39	7.59	8.44	3.93	97.44	2.25	2.537	0.000	2.537	57	200	200	DWC	-33	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.05	0.00	4.75		4.70	2.84	3.74
							693.39	693.39			97.44																											

SEWER NETWORK DESIGN _MUTTAR_ Block 4-LS3

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D< 0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	VMRDM20.21.4.2	VMRDM20.21.4.1	0	1	H		15		15.00	9.83	10.80	2.11	2.11	2.25	0.055	0.000	0.055	9	200	200	DWC	-16	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	8.73		8.65	1.10	2.15
2	VMRDM20.21.4.1	VMRDM20.21.4	1	0	C	L	30		45.00	10.80	13.71	4.22	6.32	2.25	0.165	0.000	0.165	15	200	200	DWC	-10	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	8.65		8.48	2.15	5.23
3	VMRDM20.21.9	VMRDM20.21.8	0	1	H		24		24.00	9.57	10.20	3.37	3.37	2.25	0.088	0.000	0.088	11	200	200	DWC	-38	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	8.47		8.34	1.10	1.86
4	VMRDM20.21.8	VMRDM20.21.7	1	1	C		8		32.00	10.20	10.53	1.12	4.50	2.25	0.117	0.000	0.117	13	200	200	DWC	-25	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	8.34		8.30	1.86	2.23
5	VMRDM20.21.7	VMRDM20.21.6	1	1	C		30		62.00	10.53	11.75	4.22	8.71	2.25	0.227	0.000	0.227	18	200	200	DWC	-25	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	8.30		8.13	2.23	3.62
6	VMRDM20.21.6	VMRDM20.21.5	1	1	C		18		80.00	11.75	12.48	2.53	11.24	2.25	0.293	0.000	0.293	20	200	200	DWC	-25	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	8.13		8.03	3.62	4.45
7	VMRDM20.21.5	VMRDM20.21.4	1	0	C	L	30		110.00	12.48	13.71	4.22	15.46	2.25	0.403	0.000	0.403	23	200	200	DWC	-24	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	8.03		7.94	4.45	5.77
8	VMRDM20.21.1	VMRDM20.21.2	0	1	H		30		30.00	17.172	15.747	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	21	21	0.010	2.96	93.23	0.00	0.30	0.07	OK	0.89	OK	1.43	0.00	16.07		14.64	1.10	1.11
9	VMRDM20.21.2	VMRDM20.21.3	1	1	C		16		46.00	15.747	14.988	2.25	6.46	2.25	0.168	0.000	0.168	15	200	200	DWC	21	21	0.010	2.96	93.23	0.00	0.30	0.07	OK	0.89	OK	0.76	0.00	14.64		13.88	1.11	1.11
10	VMRDM20.21.3	VMRDM20.21.4	1	0	C	L	27		73.00	14.988	13.706	3.79	10.26	2.25	0.267	0.000	0.267	19	200	200	DWC	21	21	0.010	2.96	93.23	0.00	0.30	0.07	OK	0.89	OK	1.29	0.00	13.88		12.59	1.11	1.12
							228.00		228.00			32.04					0.834	33																					

SEWER NETWORK DESIGN _MUTTAR_ Block 4-LS2

Sl. No.	Man Holes				Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	TGRDM8.6.7	TGRDM8.6.8	0	1	H		29		29.00	15.27	15.66	4.08	4.08	2.25	0.106	0.000	0.106	12	200	200	DWC	-75	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	14.17		14.01	1.10	1.65
2	TGRDM8.6.8	TGRDM8.6.9	1	1	C		13		42.00	15.66	15.83	1.83	5.90	2.25	0.154	0.000	0.154	14	200	200	DWC	-75	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	14.01		13.94	1.65	1.89
3	TGRDM8.6.9	TGRDM8.6.10	1	1	C		27		69.00	15.83	16.19	3.79	9.70	2.25	0.253	0.000	0.253	18	200	200	DWC	-75	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	13.94		13.79	1.89	2.40
4	TGRDM8.6.10	TGVPRDM8.6.11	1	1	C		30		99.00	16.19	16.56	4.22	13.91	2.25	0.362	0.000	0.362	22	200	200	DWC	-82	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	13.79		13.62	2.40	2.94
5	TGRDM8.6.14	TGRDM8.6.13	0	1	H		30		30.00	17.56	17.22	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	89	89	0.010	1.44	45.29	0.00	0.30	0.07	OK	0.43	OK	0.34	0.00	16.46		16.12	1.10	1.10
6	TGRDM8.6.13	TGRDM8.6.12	1	1	C		30		60.00	17.22	16.89	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	90	90	0.010	1.43	45.03	0.00	0.30	0.07	OK	0.43	OK	0.33	0.00	16.12		15.79	1.10	1.10
7	TGRDM8.6.12	TGVPRDM8.6.11	1	1	C		30		90.00	16.89	16.56	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	90	89	0.010	1.44	45.29	0.01	0.30	0.07	OK	0.43	OK	0.34	0.00	15.79		15.45	1.10	1.11
8	TGVPRDM8.6.11	VPRDM91.30	2	1	J		29		218.00	16.56	15.23	4.08	30.63	2.25	0.798	0.000	0.798	32	200	200	DWC	22	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	13.62	13.62	13.56	2.94	1.67
9	VPRDM91.30.2	VPRDM91.30.1	0	1	H		30		30.00	15.65	15.44	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	144	144	0.010	1.13	35.60	0.00	0.30	0.07	OK	0.34	OK	0.21	0.00	14.55		14.34	1.10	1.10
10	VPRDM91.30.1	VPRDM91.30	1	1	C		30		60.00	15.44	15.23	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	144	144	0.010	1.13	35.60	0.01	0.30	0.07	OK	0.34	OK	0.21	0.00	14.34		14.13	1.10	1.10
11	VPRDM91.30	VPRDM91.29	2	1	J		14		292.00	15.23	14.85	1.97	41.03	2.25	1.069	0.000	1.069	37	200	200	DWC	36	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	13.56	13.56	13.53	1.67	1.32
12	VPRDM91.29	VPRDM91.28	1	1	C		20		312.00	14.85	14.46	2.81	43.84	2.25	1.142	0.000	1.142	39	200	200	DWC	52	115	0.010	1.27	39.84	0.03	0.46	0.13	OK	0.58	OK	0.17	0.00	13.53		13.36	1.32	1.10
13	VPRDM91.28.2	VPRDM91.28.1	0	1	H		19		19.00	15.65	15.06	2.67	2.67	2.25	0.070	0.000	0.070	10	200	200	DWC	32	32	0.010	2.40	75.52	0.00	0.30	0.07	OK	0.72	OK	0.59	0.00	14.55		13.96	1.10	1.10
14	VPRDM91.28.1	VPRDM91.28	1	1	C		30		49.00	15.06	14.46	4.22	6.89	2.25	0.179	0.000	0.179	16	200	200	DWC	50	50	0.010	1.92	60.42	0.00	0.30	0.07	OK	0.58	OK	0.60	0.00	13.96		13.36	1.10	1.10
15	VPRDM91.28	VPRDM91.27	2	1	J		18		379.00	14.46	14.62	2.53	53.26	2.25	1.387	0.000	1.387	43	200	200	DWC	-115	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	13.36	13.36	13.33	1.10	1.29
16	VPRDM91.27	VPRDM91.26	1	1	C		30		409.00	14.62	14.88	4.22	57.47	2.25	1.497	0.000	1.497	44	200	200	DWC	-116	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	13.33		13.27	1.29	1.61
17	VPRDM91.26	VPRDM91.25	1	1	C		7.3		416.30	14.88	14.95	1.03	58.50	2.25	1.523	0.000	1.523	45	200	200	DWC	-104	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.01	0.00	13.27		13.26	1.61	1.69
18	VPRDM91.25	VPTGRDM91.24	1	1	C		23		439.30	14.95	15.15	3.23	61.73	2.25	1.608	0.000	1.608	46	200	200	DWC	-114	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	13.26		13.22	1.69	1.93
19	TGRDM8.17	TGRDM8.18	0	1	H		40		40.00	17.86	16.72	5.62	5.62	2.25	0.146	0.000	0.146	14	200	200	DWC	35	35	0.010	2.29	72.21	0.00	0.30	0.07	OK	0.69	OK	1.14	0.00	16.76		15.62	1.10	1.10
20	TGRDM8.18	TGRDM8.19	1	1	C		30		70.00	16.72	15.58	4.22	9.84	2.25	0.256	0.000	0.256	19	200	200	DWC	26	26	0.010	2.66	83.79	0.00	0.30	0.07	OK	0.80	OK	1.15	0.00	15.62		14.47	1.10	1.11
21	TGRDM8.19	TGRDM8.20	1	1	C		30		100.00	15.58	14.43	4.22	14.05	2.25	0.366	0.000	0.366	22	200	200	DWC	26	26	0.010	2.66	83.79	0.00	0.30	0.07	OK	0.80	OK	1.15	0.00	14.47		13.32	1.11	1.11
22	TGRDM8.20	TGRDM8.21	1	1	C		30		130.00	14.43	13.29	4.22	18.27	2.25	0.476	0.000	0.476	25	200	200	DWC	26	26	0.010	2.66	83.79	0.01	0.30	0.07	OK	0.80	OK	1.15	0.00	13.32		12.17	1.11	1.12
23	TGRDM8.21	TGRDM8.22	1	1	C		20		150.00	13.29	13.69	2.81	21.08	2.25	0.549	0.000	0.549	27	200	200	DWC	-51	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	12.17		12.12	1.12	1.57
24	TGRDM8.22	TGRDM8.23	1	1	C		14		164.00	13.69	13.96	1.97	23.05	2.25	0.600	0.000	0.600	28	200	200	DWC	-51	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	12.12		12.09	1.57	1.87
25	TGRDM8.23	TGRDM8.24	1	1	C		30		194.00	13.96	14.56	4.22	27.26	2.25	0.710	0.000	0.710	31	200	200	DWC	-51	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	12.09		12.02	1.87	2.54
26	TGRDM8.24	VPTGRDM91.24	1	1	C		30		224.00	14.56	15.15	4.22	31.48	2.25	0.820	0.000	0.820	33	200	200	DWC	-51	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	12.02		11.96	2.54	3.19
27	VPTGRDM91.24	VPRDM91.23	2	1	J		23		686.30	15.15	14.38	3.23	96.44	2.25	2.511	0.000	2.511	57	200	200	DWC	30	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	11.96	11.96	11.92	3.19	2.46
28	VPRDM91.23	VPRDM91.22	1	1	C		30		716.30	14.38	13.38	4.22	100.66	2.25	2.621	0.000	2.621	58	200	200	DWC	30	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	11.92		11.86	2.46	1.52
29	VPRDM91.22	VPRDM91.21	1	1	C		30		746.30	13.38	12.37	4.22	104.87	2.25	2.731	0.000	2.731	59	200	200	DWC	30	50	0.010	1.92	60.42	0.05	0.53	0.16	OK	1.02	OK	0.60	0.00	11.86		11.26	1.52	1.11
30	VPRDM91.21	VPRDM91.20	1	1	C		30		776.30	12.37	11.37	4.22	109.09	2.25	2.841	0.000	2.841	61	200	200	DWC	30	30	0.010	2.48	78.00	0.04	0.51	0.15	OK	1.26	OK	1.00	0.00	11.26		10.26	1.11	1.11
31	VPRDM91.20	VPRDM91.19	1	0	C	L	14		790.30	11.37	10.90	1.97	111.06	2.25	2.892	0.000	2.892	61	200	200	DWC	30	30	0.010	2.48	78.00	0.04	0.51	0.15	OK	1.26	OK	0.47	0.00	10.26		9.79	1.11	1.11
32	VPRDM66.31	VPRDM66.32	0	1	H		30		30.00	21.264	19.162	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	14	14	0.010	3.63	114.18	0.00	0.30	0.07	OK	1.09	OK	2.14	0.00	20.16		18.02	1.10	1.14
33	VPRDM66.32	VPRDM66.33	1	1	C		30		60.00	19.162	17.060	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	14	14	0.010	3.63	114.18	0.00	0.30	0.07	OK	1.09	OK	2.14	0.00	18.02		15.88	1.14	1.18
34	VPRDM66.33	VPRDM66.34	1	1	C		25		85.00	17.060	15.308	3.51	11.94	2.25	0.311	0.000	0.311	20	200	200	DWC	14	15	0.010	3.53	111.05	0.00	0.30	0.07	OK	1.06	OK	1.69	0.00	15.88		14.19	1.18	1.12
35	VPRDM66.34	VPRDM66.35	1	1	C		8		93.00	15.308	14.748	1.12	13.07	2.25	0.340	0.000	0.340	21	200	200	DWC	14	14	0.010	3.63	114.18	0.00	0.30	0.07	OK	1.09	OK	0.57	0.00	14.19		13.62	1.12	1.13
36	VPRDM66.35.2	VPRDM66.35.1	0	1	H		30		30.00	12.90	13.82	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	-33	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	11.80		11.63	1.10	2.19
37	VPRDM66.35.1	VPRDM66.35	1	1	C		30		60.00	13.82	14.75	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	-32	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	11.63		11.46	2.19	3.29
38	VPRDM66.35	VPRDM66.36	2	1	J		9		162.00	14.748	14.832	1.26	22.76	2.25	0.593	0.000	0.593	28	200	200	DWC	-107	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	11.46	11.46	11.44	3.29	3.39
39	VPRDM66.36	VPRDM66.37	1	1	C		30		192.00	14.832	15.084	4.22	26.98	2.25	0.703	0.000	0.703	30	200	200	DWC	-119	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	11.44		11.38	3.39	3.70
40	VPRDM66.37	VPRDM66.38	1	1	C		30		222.00	15.084	15.421	4.22	31.20	2.25	0.812	0.000	0.812	33	200	200	DWC	-89	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	11.38		11.32	3.70	4.10
41	VPRDM66.38	VPRDM66.39	1	1	C		30		252.00	15.421	15.758	4.22	35.41	2.25	0.922	0.000	0.922	35	200	200	DWC	-89	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	11.32		11.26	4.10	4.50
42	VPRDM66.39	VPRDM91.15	1	1	C		30		282.00	15.758	16.095	4.22	39.63	2.25	1.032	0.000	1.032	37	200	200	DWC	-89	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	11.26		11.20	4.50	4.90
43	VPRDM91.12	VPRDM91.13	0	1	H		30		30.00	21.56	19.74	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	16	17	0.010	3.34	105.17	0.00	0.30	0.07	OK	1.00	OK	1.82	0.00	20.46		18.64	1.10	1.10
44	VPRDM91.13	VPRDM91.14	1	1	C		40		70.00	19.74	17.92	5.62	9.84	2.25	0.256	0.000	0.256	19	200	200	DWC	22	22	0.010	2.89	91.08	0.00	0.30	0.07	OK	0.87	OK	1.82	0.00	18.64		16.82	1.10	1.10
45	VPRDM91.14	VPRDM91.15	1	1	C		32		102.00	17.92	16.10	4.50	14.33	2.25	0.373	0.000	0.373	22	200	200	DWC	18	18	0.010	3.24	102.13	0.00	0.30	0.07	OK	0.97	OK	1.83	0.00	16.82		14.99	1.10	1.11
46	VPRDM91.15	VPRDM91.16	2	1	J		30		414.00	16.095	14.691	4.22	58.18	2.25	1.515	0.000	1.515	44	200	200	DWC	21	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	11.20	11.20	11.14	4.90	3.55
47	VPRDM91.16	VPRDM91.17	1	1	C		30		444.00	14.691	13.287	4.22	62.39	2.25	1.625	0.000	1.625	46	200	200	DWC	21	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	11.14		11.08	3.55	2.21
48	VPRDM91.17	VPRDM91.18	1	1	C		30		474.00	13.287	11.883	4.22	66.61	2.25	1.735	0.000	1.735	48	200	200	DWC	21	100	0.010	1.36	42.72	0.04	0.51	0.15	OK	0.69	OK	0.30	0.00	11.08		10.78	2.21	1.10
49	VPRDM91.18	VPRDM91.19	1	0	C	L	21		495.00	11.883	10.901	2.95	69.56	2.25	1.811	0.000	1.811	49	200	200	DWC	21	21	0.010	2.96	93.23	0.02	0.40	0.10	OK	1.18	OK	1.00	0.00	10.78		9.78	1.10	1.12
							1285.30		1285.30			180.61					4.704	78																					

SEWER NETWORK DESIGN _MUTTAR_ Block 4-LS1

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	MARDM1	MARDM2	0	1	H		30		30.00	9.360	8.903	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	66	66	0.010	1.68	52.79	0.00	0.30	0.07	OK	0.50	OK	0.46	0.00	8.26		7.80	1.10	1.10
2	MARDM2	MARDM3	1	1	C		30		60.00	8.903	8.448	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	66	66	0.010	1.68	52.79	0.00	0.30	0.07	OK	0.50	OK	0.46	0.00	7.80		7.34	1.10	1.11
3	MARDM3	MARDM4	1	1	C		30		90.00	8.448	8.360	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	341	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	7.34		7.17	1.11	1.19
4	MARDM4	MARDM5	1	1	C		30		120.00	8.360	8.273	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	345	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	7.17		7.08	1.19	1.19
5	MARDM5	MASLRDM6	1	1	C		30		150.00	8.273	8.186	4.22	21.08	2.25	0.549	0.000	0.549	27	200	200	DWC	345	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	7.08		7.01	1.19	1.18
6	SLRDM4	SLRDM3	0	1	H		11.17		11.17	8.21	8.20	1.57	1.57	2.25	0.041	0.000	0.041	8	200	200	DWC	1396	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	7.11		7.05	1.10	1.15
7	SLRDM3	SLRDM2	1	1	C		30		41.17	8.20	8.20	4.22	5.79	2.25	0.151	0.000	0.151	14	200	200	DWC	6000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	7.05		6.88	1.15	1.32
8	SLRDM2	SLRDM1	1	1	C		30		71.17	8.20	8.19	4.22	10.00	2.25	0.260	0.000	0.260	19	200	200	DWC	5000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.88		6.71	1.32	1.48
9	SLRDM1	MASLRDM6	1	1	C		30		101.17	8.19	8.19	4.22	14.22	2.25	0.370	0.000	0.370	22	200	200	DWC	6000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	6.71		6.62	1.48	1.57
10	MASLRDM6	MAGNRDM7	2	1	J		12		263.17	8.19	8.176	1.69	36.98	2.25	0.963	0.000	0.963	36	200	200	DWC	1200	470	0.010	0.63	19.71	0.05	0.53	0.16	OK	0.33	OK	0.03	0.00	6.62	6.62	6.59	1.57	1.59
11	S4RDM5	S4RDM4	0	1	H		21.37		21.37	7.81	7.81	3.00	3.00	2.25	0.078	0.000	0.078	10	200	200	DWC	5343	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	6.71		6.59	1.10	1.22
12	S4RDM4	S4RDM3	1	1	C		30		51.37	7.81	7.81	4.22	7.22	2.25	0.188	0.000	0.188	16	200	200	DWC	10000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.59		6.42	1.22	1.39
13	S4RDM3.6	S4RDM3.5	0	1	H		24.98		24.98	8.06	7.96	3.51	3.51	2.25	0.091	0.000	0.091	11	200	200	DWC	260	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	6.96		6.82	1.10	1.14
14	S4RDM3.5	S4RDM3.4	1	1	C		30		54.98	7.96	7.87	4.22	7.73	2.25	0.201	0.000	0.201	17	200	200	DWC	333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.82		6.65	1.14	1.22
15	S4RDM3.4	S4RDM3.3	1	1	C		30		84.98	7.87	7.84	4.22	11.94	2.25	0.311	0.000	0.311	20	200	200	DWC	769	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.65		6.48	1.22	1.36
16	S4RDM3.3	S4RDM3.2	1	1	C		30		114.98	7.84	7.80	4.22	16.16	2.25	0.421	0.000	0.421	24	200	200	DWC	682	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	6.48		6.39	1.36	1.41
17	S4RDM3.2	S4RDM3.1	1	1	C		17		131.98	7.80	7.80	2.39	18.55	2.25	0.483	0.000	0.483	25	200	200	DWC	-4250	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	6.39		6.34	1.41	1.46
18	S4RDM3.1	S4RDM3	1	1	C		30		161.98	7.80	7.81	4.22	22.76	2.25	0.593	0.000	0.593	28	200	200	DWC	-4286	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	6.34		6.27	1.46	1.54
19	S4RDM3	S4RDM2	2	1	J		18		231.35	7.81	7.81	2.53	32.51	2.25	0.847	0.000	0.847	33	200	200	DWC	-18000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	6.27	6.27	6.24	1.54	1.57
20	S4RDM2	S4RDM1	1	1	C		30		261.35	7.81	7.81	4.22	36.73	2.25	0.956	0.000	0.956	35	200	200	DWC	30000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	6.24		6.18	1.57	1.63
21	S4RDM1	MAS4RDM11	1	1	C		30		291.35	7.81	7.81	4.22	40.94	2.25	1.066	0.000	1.066	37	200	200	DWC	-15000	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	6.18		6.12	1.63	1.69
22	MARDM15	MARDM14	0	1	H		20		20.00	7.78	7.79	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	-3333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	6.68		6.57	1.10	1.22
23	MARDM14	MARDM13	1	1	C		30		50.00	7.79	7.80	4.22	7.03	2.25	0.183	0.000	0.183	16	200	200	DWC	-3333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.57		6.40	1.22	1.40
24	MARDM13	MARDM12	1	1	C		14		64.00	7.80	7.80	1.97	8.99	2.25	0.234	0.000	0.234	18	200	200	DWC	-2800	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	6.40		6.32	1.40	1.48
25	MARDM12	MAS4RDM11	1	1	C		30		94.00	7.80	7.81	4.22	13.21	2.25	0.344	0.000	0.344	21	200	200	DWC	-3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.32		6.15	1.48	1.66
26	MAS4RDM11.2	MAS4RDM11.1	0	1	H		21.34		21.34	7.92	7.87	3.00	3.00	2.25	0.078	0.000	0.078	10	200	200	DWC	388	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	6.82		6.70	1.10	1.17
27	MAS4RDM11.1	MAS4RDM11	1	1	C		30		51.34	7.87	7.81	4.22	7.21	2.25	0.188	0.000	0.188	16	200	200	DWC	508	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.70		6.53	1.17	1.28
28	MAS4RDM11	MAS3RDM10	3	1	J		19		455.69	7.81	7.92	2.67	64.04	2.25	1.668	0.000	1.668	47	200	200	DWC	-176	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.04	0.00	6.12	6.12	6.08	1.69	1.84
29	S3RDM8	S3RDM7	0	1	H		13.03		13.03	7.80	7.82	1.83	1.83	2.25	0.048	0.000	0.048	8	200	200	DWC	-724	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	6.70		6.63	1.10	1.19
30	S3RDM7	S3RDM6	1	1	C		16		29.03	7.82	7.84	2.25	4.08	2.25	0.106	0.000	0.106	12	200	200	DWC	-727	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	6.63		6.54	1.19	1.30
31	S3RDM6	S3RDM5	1	1	C		30		59.03	7.84	7.88	4.22	8.30	2.25	0.216	0.000	0.216	17	200	200	DWC	-750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.54		6.37	1.30	1.51
32	S3RDM5	S3RDM4	1	1	C		30		89.03	7.88	7.92	4.22	12.51	2.25	0.326	0.000	0.326	21	200	200	DWC	-750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.37		6.20	1.51	1.72
33	S3RDM4	S3RDM3	1	1	C		30		119.03	7.92	7.96	4.22	16.73	2.25	0.436	0.000	0.436	24	200	200	DWC	-732	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	6.20		6.11	1.72	1.85
34	S3RDM3	S3RDM2	1	1	C		30		149.03	7.96	7.93	4.22	20.94	2.25	0.545	0.000	0.545	27	200	200	DWC	1034	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	6.11		6.04	1.85	1.89
35	S3RDM2	S3RDM1	1	1	C		30		179.03	7.93	7.93	4.22	25.16	2.25	0.655	0.000	0.655	29	200	200	DWC	4286	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	6.04		5.97	1.89	1.96
36	S3RDM1	MAS3RDM10	1	1	C		30		209.03	7.93	7.92	4.22	29.37	2.25	0.765	0.000	0.765	32	200	200	DWC	2727	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	5.97		5.91	1.96	2.01
37	MAS3RDM10	MARDM9	2	1	J		22		686.72	7.92	8.02	3.09	96.50	2.25	2.513	0.000	2.513	57	200	200	DWC	-227	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	5.91	5.91	5.87	2.01	2.15
38	MARDM9	MAS2RDM8	1	1	C		30		716.72	8.02	8.14	4.22	100.72	2.25	2.623	0.000	2.623	58	200	200	DWC	-234	180	0.010	1.01	31.84	0.08	0.61	0.20	OK	0.62	OK	0.17	0.00	5.87		5.70	2.15	2.44
39	S2RDM8	S2RDM7	0	1	H		12.49		12.49	8.15	8.14	1.76	1.76	2.25	0.046	0.000	0.046	8	200	200	DWC	1784	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	7.05		6.98	1.10	1.16
40	S2RDM7	S2RDM6	1	1	C		20		32.49	8.14	8.13	2.81	4.57	2.25	0.119	0.000	0.119	13	200	200	DWC	2222	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	6.98		6.87	1.16	1.26
41	S2RDM6	S2RDM5	1	1	C		30		62.49	8.13	8.12	4.22	8.78	2.25	0.229	0.000	0.229	18	200	200	DWC	2143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	6.87		6.70	1.26	1.42
42	S2RDM5	S2RDM4	1	1	C		26		88.49	8.12	8.11	3.65	12.43	2.25	0.324	0.000	0.324	21	200	200	DWC	2167	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	6.70		6.56	1.42	1.55
43	S2RDM4	S2RDM3	1	1	C		30		118.49	8.11	8.09	4.22	16.65	2.25	0.434	0.000	0.434	24	200	200	DWC	2143	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	6.56		6.47	1.55	1.62
44	S2RDM3	S2RDM2	1	1	C		30		148.49	8.09	8.10	4.22	20.87	2.25	0.543	0.000	0.543	27	200	200	DWC	-4286	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	6.47		6.38	1.62	1.72
45	S2RDM2	S2RDM1	1	1	C		30		178.49	8.10	8.11	4.22	25.08	2.25	0.653	0.000	0.653	29	200	200	DWC	-4286	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	6.38		6.31	1.72	1.80
46	S2RDM1	MAS2RDM8	1	1	C		30		208.49	8.11	8.14	4.22	29.30	2.25	0.763	0.000	0.763	32	200	200	DWC	-833	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	6.31		6.25	1.80	1.89
47	MAS2RDM8	MAGNRDM7	2	1	J		12		937.21	8.11	8.18	1.69	131.70	2.25	3.430	0.000	3.430	67	200	200	DWC	-194	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.02	0.00	5.70	5.70	5.68	2.41	2.50
48	MAGNRDM7	GNRDM18	2	1	J		30		1230.38	8.168	8.168	4.22	172.90	2.25	4.503	0.000	4.503	76	200	200	DWC	0	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	5.68	5.68	5.62	2.49	2.55
49	GNRDM18	GNRDM17	1	1	C		30		1260.38	8.160	8.160	4.22	177.11	2.25	4.612	0.000	4.612	77	200	200	DWC	0	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.06	0.00	5.62		5.56	2.54	2.60
50	GNRDM17	GNRDM16	1	1	C		30		1290.38	8.152	8.152	4.22	181.33	2.25	4.722	0.000	4.722	78	200	200	DWC	0	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.06	0.00	5.56		5.50	2.59	2.65
51	GNRDM16	GNRDM15	1	1	C		20		1310.38	8.144	8.144	2.81	184.14	2.25	4.795	0.000	4.795	79	200	200	DWC	0	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.04	0.00	5.50		5.46	2.64	2.68
52	GNRDM15.6	GNRDM15.5	0	1	H		30		30.00	9.75	9.49	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	112	113	0.010	1.28	40.19	0.00	0.30	0.07	OK	0.38	OK	0.27	0.00	8.65		8.38	1.10	1.11
53	GNRDM15.5	GNRDM15.4	1	1	C		30		60.00	9.49	9.22	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	112	112	0.010	1.28	40.37	0.01	0.30	0.07	OK	0.38	OK	0.27	0.00	8.38		8.11	1.11	1.11
54	GNRDM15.4	GNRDM15.3	1	1	C		30		90.00	9.22	8.95	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	112	112	0.010	1.28	40.37	0.01	0.30	0.07	OK	0.38	OK	0.27	0.00	8.11		7.84	1.11	1.11
55	GNRDM15.3	GNRDM15.2	1	1	C		30		120.00	8.95	8.68	4.22	16.86	2.25	0.439	0.000	0.439	24	200	200	DWC	112	112	0.010	1.28	40.37	0.01	0.30	0.07	OK	0.38	OK	0.27	0.00	7.84		7.57	1.11	1.11
56	GNRDM15.2	GNRDM15.1	1	1	C		30		150.00	8.68	8.41	4.22	21.08	2.25	0.549	0.000	0.549	27	200	200	DWC	112	112	0.010	1.28	40.37	0.01	0.30	0.07	OK	0.38	OK	0.27	0.00	7.57		7.30	1.11	1.11
57	GNRDM15.1	GNRDM15	1	1	C		30		180.00	8.41	8.14	4.22	25.29	2.25	0.659	0.000	0.659	29	200	200	DWC	112	112	0.010	1.28	40.37	0.02	0.40	0.10	OK	0.51	OK	0.27	0.00	7.30		7.03	1.11	1.11
58	GNRDM15	GNRDM14	2	1	J		30		1520.38	8.144	8.147	4.22	213.65	2.25	5.564	0.000	5.564	85	200	200	DWC	-10000	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.06	0.00	5.46	5.46	5.40	2.68	2.75
59	GNRDM14	GNRDM13	1	1	C		30		1550.38	8.147	8.150	4.22	217.86	2.25	5.674	0.000	5.674	86	200	200	DWC	-10000	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.06	0.00	5.40		5.34	2.75	2.81
60	GNRDM13	GNRDM12	1	1	C		30		1580.38	8.150	8.153	4.22	222.08	2.25	5.783	0.000	5.783	86	200	200	DWC	-10000	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.06	0.00	5.34		5.28	2.81	2.87
61	GNRDM12	GNRDM11	1	1	C		8		1588.38	8.153	8.154	1.12	223.20	2.25	5.813	0.000	5.813	87	200	200	DWC	-8000	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.02	0.00	5.28		5.26	2.87	2.89
62	GNRDM11	GNRDM10	1	1	C		11		1599.38	8.154	8.155	1.55	224.75	2.25	5.853	0.000	5.853	87	200	200	DWC	-11000	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.02	0.00	5.26		5.24	2.89	2.92
63	GNRDM10	GNRDM9	1	1	C		29		1628.38	8.155	8.158	4.08	228.83	2.25	5.959	0.000	5.959	88	200	200	DWC	-9667	520	0.010	0.60	18.73	0.32	0.89	0.40	OK	0.53	OK	0.06	0.00	5.24		5.18	2.92	2.98
64	GNRDM1	GNRDM2	0	1	H		30		30.00	15.05	14.05	4.22	4.22	2.25	0.110	0.000	0.110	12	200	200	DWC	30	30	0.010	2.48	78.00	0.00	0.30	0.07	OK	0.74	OK	1.00	0.00	13.95		12.95	1.10	1.10
65	GNRDM2	GNRDM3	1	1	C		30		60.00	14.05	13.02	4.22	8.43	2.25	0.220	0.000	0.220	17	200	200	DWC	29	29	0.010	2.52	79.33	0.00	0.30	0.07	OK	0.76	OK	1.03	0.00	12.95		11.92	1.10	1.10
66	GNRDM3	GNRDM4	1	1	C		30		90.00	13.02	12.01	4.22	12.65	2.25	0.329	0.000	0.329	21	200	200	DWC	30	30	0.010	2.50	78.66	0.00	0.30	0.07	OK	0.75	OK	1.02	0.00	11.92		10.90	1.10	1.11
67	GNRDM4	GNRDM5	1	1	C		10		100.00	12.01	11.67	1.41	14.05	2.25	0.366	0.000	0.366	22	200	200	DWC	30	30	0.010	2.50	78.66	0.00	0.30	0.07	OK	0.75	OK	0.34	0.00	10.90		10.56	1.11	1.11
68	GNRDM5	GNRDM6	1	1	C		14		114.00	11.67	11.20	1.97	16.02	2.25	0.417	0.000	0.417	24	200	200	DWC	30	30	0.010	2.50	78.66	0.01	0.30	0.07	OK	0.75	OK	0.47	0.00	10.56		10.09	1.11	1.11
69	GNRDM6	GNRDM7	1	1	C		30		144.00	11.20	10.19	4.22	20.24	2.25	0.527	0.000	0.527	26	200	200	DWC	30	30	0.010	2.50	78.66	0.01	0.30	0.07	OK	0.75	OK	1.02	0.00	10.09		9.07	1.11	1.12
70	GNRDM7	GNRDM8	1	1	C		30		174.00	10.19	9.17	4.22	24.45	2.25	0.637	0.000	0.637	29	200	200	DWC	30	30	0.010	2.50	78.66	0.01	0.30	0.07	OK	0.75	OK	1.02	0.00	9.07		8.05	1.12	1.12
71	GNRDM8	GNRDM9	1	1	C		30		204.00	9.17	8.16	4.22	28.67	2.25	0.747	0.000	0.747	31	200	200	DWC	30	30	0.010	2.48	78.00	0.01	0.30	0.07	OK	0.74	OK	1.00	0.00	8.05		7.05	1.12	1.11

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.8)	Actual Velocity (v1) m/s	Check Velocity (> 0.6m/s)			From		To	Starting Manhole	Ending manhole
72	GNRDM9	GNRDM9.1	2	1	J		30		1862.38	8.158	8.246	4.22	261.71	2.25	6.815	0.000	6.815	94	200	200	DWC	-341	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	5.18	5.18	5.12	2.98	3.13
73	GNRDM9.1	GNRDM9.2	1	1	C		15		1877.38	8.246	8.334	2.11	263.82	2.25	6.870	0.000	6.870	94	200	200	DWC	-170	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.03	0.00	5.12		5.09	3.13	3.24
74	GNRDM9.2.2	GNRDM9.2.1	0	1	H		13.13		13.13	8.36	8.34	1.85	1.85	2.25	0.048	0.000	0.048	8	200	200	DWC	525	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	7.26		7.19	1.10	1.15
75	GNRDM9.2.1	GNRDM9.2	1	1	C		30		43.13	8.34	8.33	4.22	6.06	2.25	0.158	0.000	0.158	15	200	200	DWC	30000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	7.19		7.02	1.15	1.31
76	GNRDM9.2	GNRDM9.3	2	1	J		30		1950.51	8.33	8.371	4.22	274.09	2.25	7.138	0.000	7.138	96	200	200	DWC	-811	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	5.09	5.09	5.03	3.24	3.34
77	GNRDM9.3	GNRDM9.4	1	1	C		26		1976.51	8.371	8.414	3.65	277.75	2.25	7.233	0.000	7.233	96	200	200	DWC	-605	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.05	0.00	5.03		4.98	3.34	3.43
78	ASRDM1	ASRDM2	0	1	H		20		20.00	15.27	14.89	2.81	2.81	2.25	0.073	0.000	0.073	10	200	200	DWC	52	52	0.010	1.88	59.25	0.00	0.30	0.07	OK	0.56	OK	0.38	0.00	14.17		13.79	1.10	1.10
79	ASRDM2	ASRDM3	1	1	C		27		47.00	14.89	14.37	3.79	6.60	2.25	0.172	0.000	0.172	15	200	200	DWC	52	52	0.010	1.88	59.25	0.00	0.30	0.07	OK	0.56	OK	0.52	0.00	13.79		13.27	1.10	1.10
80	ASRDM3	ASRDM4	1	1	C		30		77.00	14.37	13.80	4.22	10.82	2.25	0.282	0.000	0.282	19	200	200	DWC	52	52	0.010	1.88	59.25	0.00	0.30	0.07	OK	0.56	OK	0.58	0.00	13.27		12.69	1.10	1.11
81	ASRDM4	ASRDM5	1	1	C		30		107.00	13.80	13.23	4.22	15.04	2.25	0.392	0.000	0.392	23	200	200	DWC	52	53	0.010	1.86	58.68	0.01	0.30	0.07	OK	0.56	OK	0.57	0.00	12.69		12.12	1.11	1.11
82	ASRDM5	ASRDM6	1	1	C		30		137.00	13.23	12.66	4.22	19.25	2.25	0.501	0.000	0.501	26	200	200	DWC	52	53	0.010	1.86	58.68	0.01	0.30	0.07	OK	0.56	OK	0.57	0.00	12.12		11.55	1.11	1.11
83	ASRDM6	ASRDM7	1	1	C		16		153.00	12.66	12.35	2.25	21.50	2.25	0.560	0.000	0.560	27	200	200	DWC	52	53	0.010	1.86	58.68	0.01	0.30	0.07	OK	0.56	OK	0.30	0.00	11.55		11.25	1.11	1.10
84	ASRDM7	ASRDM8	1	1	C		30		183.00	12.35	11.78	4.22	25.72	2.25	0.670	0.000	0.670	30	200	200	DWC	52	53	0.010	1.86	58.68	0.01	0.30	0.07	OK	0.56	OK	0.57	0.00	11.25		10.68	1.10	1.10
85	ASRDM8	ASRDM9	1	1	C		30		213.00	11.78	11.21	4.22	29.93	2.25	0.779	0.000	0.779	32	200	200	DWC	52	52	0.010	1.88	59.25	0.01	0.30	0.07	OK	0.56	OK	0.58	0.00	10.68		10.10	1.10	1.11
86	ASRDM9	ASRDM10	1	1	C		20		233.00	11.21	10.83	2.81	32.74	2.25	0.853	0.000	0.853	33	200	200	DWC	52	52	0.010	1.88	59.25	0.01	0.30	0.07	OK	0.56	OK	0.38	0.00	10.10		9.72	1.11	1.11
87	ASRDM10.5	ASRDM10.4	0	1	H		28.3		28.30	12.83	12.41	3.98	3.98	2.25	0.104	0.000	0.104	12	200	200	DWC	67	67	0.010	1.66	52.19	0.00	0.30	0.07	OK	0.50	OK	0.42	0.00	11.73		11.31	1.10	1.10
88	ASRDM10.4	ASRDM10.3	1	1	C		29		57.30	12.41	11.99	4.08	8.05	2.25	0.210	0.000	0.210	17	200	200	DWC	69	69	0.010	1.63	51.43	0.00	0.30	0.07	OK	0.49	OK	0.42	0.00	11.31		10.89	1.10	1.10
89	ASRDM10.3	ASRDM10.2	1	1	C		27		84.30	11.99	11.60	3.79	11.85	2.25	0.308	0.000	0.308	20	200	200	DWC	69	69	0.010	1.63	51.43	0.01	0.30	0.07	OK	0.49	OK	0.39	0.00	10.89		10.50	1.10	1.10
90	ASRDM10.2	ASRDM10.1	1	1	C		23		107.30	11.60	11.26	3.23	15.08	2.25	0.393	0.000	0.393	23	200	200	DWC	68	68	0.010	1.65	51.81	0.01	0.30	0.07	OK	0.49	OK	0.34	0.00	10.50		10.16	1.10	1.10
91	ASRDM10.1	ASRDM10	1	1	C		30		137.30	11.26	10.83	4.22	19.29	2.25	0.502	0.000	0.502	26	200	200	DWC	69	68	0.010	1.65	51.81	0.01	0.30	0.07	OK	0.49	OK	0.44	0.00	10.16		9.72	1.10	1.11
92	ASRDM10	ASRDM10A	2	1	J		10.6		380.90	10.83	10.70	1.49	53.53	2.25	1.394	0.000	1.394	43	200	200	DWC	83	83	0.010	1.49	46.89	0.03	0.46	0.13	OK	0.69	OK	0.13	0.00	9.72	9.72	9.59	1.11	1.11
93	ASRDM14	ASRDM13	0	1	H		25.6		25.60	9.52	9.86	3.60	3.60	2.25	0.094	0.000	0.094	11	200	200	DWC	-76	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	8.42		8.28	1.10	1.58
94	ASRDM13	ASRDM12	1	1	C		15		40.60	9.86	10.05	2.11	5.71	2.25	0.149	0.000	0.149	14	200	200	DWC	-77	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	8.28		8.20	1.58	1.85
95	ASRDM12	ASRDM11	1	1	C		29		69.60	10.05	10.43	4.08	9.78	2.25	0.255	0.000	0.255	19	200	200	DWC	-76	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	8.20		8.04	1.85	2.39
96	ASRDM11	ASRDM10A	1	1	C		19		88.60	10.43	10.70	2.67	12.45	2.25	0.324	0.000	0.324	21	200	200	DWC	-73	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	8.04		7.93	2.39	2.77
97	ASRDM10A	GNRDM9.4	2	1	J		22		491.50	10.70	8.41	3.09	69.07	2.25	1.799	0.000	1.799	48	200	200	DWC	10	35	0.010	2.29	72.21	0.02	0.40	0.10	OK	0.92	OK	0.63	0.00	7.93	7.93	7.30	2.77	1.11
98	GNRDM9.4	GNRDM9.5	2	1	J		30		2498.01	8.41	8.458	4.22	351.03	2.25	9.141	0.000	9.141	108	200	200	DWC	-682	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.06	0.00	4.98	4.98	4.92	3.43	3.54
99	GNRDM9.5	GNRDM9.6	1	1	C		30		2528.01	8.458	8.501	4.22	355.24	2.25	9.251	0.000	9.251	109	200	200	DWC	-698	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.06	0.00	4.92		4.86	3.54	3.64
100	GNRDM9.6	GNRDM9.7	1	0	C	L	28.37		2556.38	8.501	8.545	3.99	359.23	2.25	9.355	0.000	9.355	110	200	200	DWC	-645	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.05	0.00	4.86		4.81	3.64	3.74
							2556.38		2556.38			359.23																											

Muttar All Blocks LMH (20nos)

Sl.No	Block	Lift		No	
1	Block 2	DERDMH36L	DERDMH37	1	
2		DPRDMH9L	DPRDMH10A	1	
3		DERDM71.2L	DERDM71.1	1	3
4	Block 3A	SNRDMH34L	SNRDMH8	1	1
5	Block 3B	EVRDM1L	NJPWDRDM30	1	
6		PMRDM12L	PMRDM13	1	
7		EKRDM5L	EKRDM6	1	3
8	Block 3C	MASNRDM4L	MASNRDM5	1	
9		PORDM11L	PO3CRRDM10	1	
10		CKRDM18L	CKRDM19	1	
11		VIAPRDM2L	ONHRDM5	1	
12		NH17SRRSM6L	AASNRDM19.2	1	5
13	Block4	MNRDM10L	MNRDM9	1	
14		VPRDM21L	VPRDM22	1	
15		VMRDM20.9L	VMRDM20.8	1	
16		GNRDM9.7	VPRDM66.30.1	1	
17		VPRDM91.19	VPRDM66.29	1	
18		VMRDM20.21.4	VMRDM20.20	1	
19		VMRDM22	VMRDM19	1	
20		VMRDM12.19	VPRDM66.7	1	8
			Total	**20**	**20**
	Block 2			3	
	Block 3A			1	
	Block 3B			3	
	Block 3C			5	
	Block 4			8	
			Total	**20**	

UGSS FOR MUTTAR SYSTEM

DESIGN/INPUT DATA FOR LIFT MH

Sr. No.	Description	Unit	Block 02			Block 3A	Block 3B			Block 3C					Block 4							
	Input values		From DERDMH36 to DERDMH37	From DPRDMH9 to DPRDMH10A	From DERDM71.2 to DERDM71.1	From SNRDMH34 to SNRDMH8	From EVRDM1 to NJPWDRDM30	From PMRDM12 to PMRDM13	From EKRDM5 to EKRDM6	From MASNRDM4 to MASNRDM5	From PORDM11 to PO3CRRDM10	From CKRDM18 to CKRDM19	From VIAPRDM2 to ONHRDM5	From NH17SRRSM6 to AASNRDM19.2	From MNRDM10L to MNRDM9	From VPRDM21 to VPRDM22	From VMRDM20.9 to VMRDM20.8	From GNRDM9.7 to VPRDM66.30.1	From VPRDM91.19 to VPRDM66.29	From VMRDM20.21.4 to VMRDM20.20	From VMRDM22 to VMRDM19	From VMRDM12.19 to VPRDM66.7
	Lift Manhole No.		**LM-1**	**LM-2**	**LM-3**	**LM-4**	**LM-5**	**LM-6**	**LM-7**	**LM-8**	**LM-9**	**LM-10**	**LM-11**	**LM-12**	**LM-13**	**LM-14**	**LM-15**	**LM-16**	**LM-17**	**LM-18**	**LM-18**	**LM-18**
1	Initial	MLD	2.16	0.90	0.18	0.77	0.25	0.29	0.15	2.57	0.76	0.13	0.28	0.32	0.07	0.80	1.31	0.67	0.13	0.02	0.18	0.24
2	Intermediate Flow (for year 2035)	MLD	2.38	1.00	0.19	0.85	0.28	0.32	0.17	2.84	0.84	0.15	0.31	0.35	0.07	0.89	1.45	0.74	0.14	0.02	0.20	0.26
3	Peak Flow (for year 2050)	MLD	2.586	1.082	0.211	0.919	0.301	0.347	0.184	3.079	0.913	0.159	0.332	0.383	0.079	0.963	1.57	0.808	0.156	0.023	0.219	0.283
4	GL at Pumping Station Location	m	3.76	3.56	4.251	2.054	2.981	2.747	3.383	4.773	4.940	5.000	4.903	3.210	5.586	6.370	13.312	8.545	10.901	13.706	8.442	5.618
5	IL of Incoming Sewer	m	-1.410	-0.710	-0.220	-1.250	-0.220	-0.920	-0.170	-0.290	-0.050	1.750	-0.290	-0.340	0.690	2.770	8.320	4.810	9.780	12.590	4.700	1.700
6	Length of Rising Main	m	30.000	30.000	30.000	15.000	30.000	20.000	20.000	26.000	30.000	34.000	33.000	72.000	20.000	30.000	21.000	150.000	350.000	150.000	60.000	190.000
7	Highest GL Enroute	m	3.778	3.619	4.656	2.054	3.081	3.143	3.460	4.894	4.975	5.040	5.316	6.032	5.432	6.670	14.206	21.359	22.200	18.919	9.755	14.062
8	Inner Dia of incoming sewer	m	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
9	Residual Head	m	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	Suction Depth (Depth of Lift MH)	m	**6.67**	**5.77**	**5.97**	**4.80**	**4.70**	**5.17**	**5.05**	**6.56**	**6.49**	**4.75**	**6.69**	**6.40**	**6.40**	**5.10**	**6.49**	**5.24**	**2.62**	**2.62**	**5.24**	**5.42**

	Output values																					
1	Average Flow	m^3/hr	89.92	37.63	7.33	31.96	10.46	12.08	6.42	107.08	31.75	5.54	11.54	13.33	2.75	33.50	54.58	28.08	5.42	0.79	7.63	9.83
2	Peak Flow	m^3/hr	99.25	41.54	8.08	35.29	11.54	13.33	7.08	118.21	35.04	6.08	12.75	14.71	3.04	36.96	60.25	31.00	6.00	0.88	8.42	10.88
3	Static head Required at Connecting MH/SPS	m	*7.69*	*6.83*	*7.38*	*5.80*	*5.80*	*6.57*	*6.13*	*7.68*	*7.53*	*5.79*	*8.10*	*10.22*	*7.25*	*6.40*	*8.38*	*19.05*	*14.92*	*8.83*	*7.55*	*14.86*
Output Results																						
	Size of Lift Well																					
1	**Dia (m)**		**3.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**4.00**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**3.00**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**
2	**Total Depth)m)**		**6.67**	**5.77**	**5.97**	**4.80**	**4.70**	**5.17**	**5.05**	**6.56**	**6.49**	**4.75**	**6.69**	**6.40**	**6.40**	**5.10**	**6.49**	**5.24**	**2.62**	**2.62**	**5.24**	**5.42**
	ECP-Pumping main & Pumpset																					
1	Pumping main	Dia-mm	200 DI K9	150 DI K9	100 DI K9	100 DI K9	100 DI K9	100 DI K9	100 DI K9	200 DI K9	150 DI K9	100 DI K9	100 DI K9	100 DI K9	100 DI K9	200 DI K9	200 DI K9	200 DI K9	100 DI K9	100 DI K9	100 DI K9	100 DI K9
2	Pumpset	HP	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	Size of Discharge chamber	L x B x D	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m

UGSS FOR MUTTAR SYSTEM

DESIGN/INPUT DATA FOR LIFT MH

LIFT WELL CALCULATIONS

Sr. No.	Description	Unit	Block 02			Block 3A	Block 3B			Block 3C					Block 4							
			From DERDMH36 to DERDMH37	From DPRDMH9 to DPRDMH10A	From DERDM71.2 to DERDM71.1	From SNRDMH34 to SNRDMH8	From EVRDM1 to NJPWDRDM30	From PMRDM12 to PMRDM13	From EKRDM5 to EKRDM6	From MASNRDM4 to MASNRDM5	From PORDM11 to PO3CRRDM10	From CKRDM18 to CKRDM19	From VIAPRDM2 to ONHRDM5	From NH17SRRSM6 to AASNRDM19.2	From MNRDM10L to MNRDM9	From VPRDM21 to VPRDM22	From VMRDM20.9 to VMRDM20.8	From GNRDM9.7 to VPRDM66.30.1	From VPRDM91.19 to VPRDM66.29	From VMRDM20.21.4 to VMRDM20.20	From VMRDM22 to VMRDM19	From VMRDM12.19 to VPRDM66.7
		Lift MH No.	**LM-1**	**LM-2**	**LM-3**	**LM-4**	**LM-5**	**LM-6**	**LM-7**	**LM-8**	**LM-9**	**LM-10**	**LM-11**	**LM-12**	**LM-13**	**LM-14**	**LM-15**	**LM-16**	**LM-17**	**LM-18**	**LM-19**	**LM-20**
1	Peak Flow	m^3/hr	99.25	41.54	8.08	35.29	11.54	13.33	7.08	118.21	35.04	6.08	12.75	14.71	3.04	36.96	60.25	31.00	6.00	0.88	8.42	10.88
Lift well Size design																						
1	Time for one pump cycle for ultimate design stage (CPHEEP manual part A; 4.6.6)	min	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2	Lift MH capacity required for ultimate design stage	m^3	4.135	1.731	0.337	1.470	0.481	0.556	0.295	4.925	1.460	0.253	0.531	0.613	0.127	1.540	2.510	1.292	0.250	0.036	0.351	0.453
3	Assumed sewage depth in Lift MH	m	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
4	Area required for Lift MH	m^2	8.271	3.462	0.674	2.941	0.962	1.111	0.590	9.851	2.920	0.507	1.063	1.226	0.253	3.080	5.021	2.583	0.500	0.073	0.701	0.906
5	Diameter required for Lift MH	m	3.245	2.099	0.926	1.935	1.107	1.189	0.867	3.542	1.928	0.803	1.163	1.249	0.568	1.980	2.528	1.814	0.798	0.305	0.945	1.074
6	Diameter provided for Lift MH	m	**3.500**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**4.000**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**3.000**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**
7	Actual provided Lift MH area	m^2	9.621	4.909	4.909	4.909	4.909	4.909	4.909	12.566	4.909	4.909	4.909	4.909	4.909	4.909	7.069	4.909	4.909	4.909	4.909	4.909
8	Actual provided Lift MH capacity	m^3	4.811	2.454	2.454	2.454	2.454	2.454	2.454	6.283	2.454	2.454	2.454	2.454	2.454	2.454	3.534	2.454	2.454	2.454	2.454	2.454
9	Ground level at Lift well site	m	3.760	3.563	4.251	2.054	2.981	2.747	3.383	4.773	4.940	5.000	4.903	3.210	5.586	6.370	13.312	8.545	10.901	13.706	8.442	5.618
10	Invert level of incoming sewer in Lift well	m	-1.41	-0.71	-0.22	-1.25	-0.22	-0.92	-0.17	-0.29	-0.05	1.75	-0.29	-0.34	0.69	2.77	8.32	4.81	9.78	12.59	4.70	1.70
11	Difference between MWL in Lift well and incoming IL	m	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
12	Maximum water level in Lift well (MWL)	m	-1.510	-0.810	-0.320	-1.350	-0.320	-1.020	-0.270	-0.390	-0.150	1.650	-0.390	-0.440	0.590	2.670	8.220	4.710	9.680	12.490	4.600	1.600
13	Lowest water level in Lift well (LWL)	m	-2.010	-1.310	-0.820	-1.850	-0.820	-1.520	-0.770	-0.890	-0.650	1.150	-0.890	-0.940	0.090	2.170	7.720	4.210	9.180	11.990	4.100	1.100
14	Required pump submergence depth	m	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
15	Lift well bed level	m	-2.910	-2.210	-1.720	-2.750	-1.720	-2.420	-1.670	-1.790	-1.550	0.250	-1.790	-1.840	-0.810	1.270	6.820	3.310	8.280	11.090	3.200	0.200
Well dimensions																						
1	Total Lift well depth	**m**	**6.670**	**5.770**	**5.970**	**4.800**	**4.700**	**5.170**	**5.050**	**6.560**	**6.490**	**4.750**	**6.690**	**5.050**	**6.400**	**5.100**	**6.490**	**5.240**	**2.620**	**2.620**	**5.240**	**5.420**
2	Lift well diameter required	**m**	3.500	2.500	2.500	2.500	2.500	2.500	2.500	4.000	2.500	2.500	2.500	2.500	2.500	2.500	3.000	2.500	2.500	2.500	2.500	2.500
3	Lift well diameter to be provided	**m**	**3.500**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**4.000**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**	**3.000**	**2.500**	**2.500**	**2.500**	**2.500**	**2.500**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From DERDMH36 to DERDMH37 of Block 02		
BASIC DATA		
GL AT Wet well site	3.76	m
Top level of receiving chamber	3.78	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	5.78	m
FOOT VALVE LEVEL	-1.41	m
Static head including Residual Head	7.19	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	3.76											12.38	8.62	
0	30	3.78	30	100	DI-K9	100	1654	3.51	5	6	0.60	6.60	5.78	2.00	
									TOTAL	**6**	**0.60**	**6.60**			
Combination II															
	0	3.76											6.69	2.93	
0	30	3.778	30	150	DI-K9	100	1654	1.56	36	0.83	0.08	0.91	5.78	2.00	
									TOTAL	**0.83**	**0.08**	**0.91**			
Combination III															
	0	3.76											6.01	2.25	
0	30	3.778	30	200	DI-K9	100	1654	0.878	144	0.21	0.02	0.23	5.78	2.00	
									TOTAL	**0.21**	**0.02**	**0.23**			
Combination IV															
	0	3.76											5.86	2.10	
0	30	3.778	30	250	DI-K9	100	1654	0.562	428	0.07	0.01	0.08	5.78	2.00	
									TOTAL	**0.07**	**0.01**	**0.08**			
Combination V															
	0	3.76											5.81	2.05	
0	30	3.778	30	300	DI-K9	100	1654	0.39	1041	0.03	0.00	0.03	5.78	2.00	
									TOTAL	**0.03**	**0.00**	**0.03**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	3.76											14.03	10.27	0
0	30	3.778	30	100	DI-K9	100	1796	3.811	4	7.5	0.75	8.25	5.78	2.00	0
									TOTAL	**7.5**	**0.75**	**8.25**			
Combination II															
	0	3.76											6.85	3.09	0
0	30	3.778	30	150	DI-K9	100	1796	1.694	31	0.97	0.10	1.07	5.78	2.00	0
									TOTAL	**0.97**	**0.10**	**1.07**			
Combination III															
	0	3.76											6.04	2.28	0
0	30	3.778	30	200	DI-K9	100	1796	0.953	124	0.24	0.02	0.26	5.78	2.00	0
									TOTAL	**0.24**	**0.02**	**0.26**			
Combination IV															
	0	3.76											5.87	2.11	0
0	30	3.778	30	250	DI-K9	100	1796	0.61	368	0.08	0.01	0.09	5.78	2.00	0
									TOTAL	**0.08**	**0.01**	**0.09**			
Combination V															
	0	3.76											5.81	2.05	0
0	30	3.778	30	300	DI-K9	100	1796	0.423	894	0.03	0.00	0.03	5.78	2.00	0
									TOTAL	**0.03**	**0.00**	**0.03**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	7.188	6	0.6	14.00	7.5	0.75	16.00
II	7.188	0.83	0.083	9.00	0.97	0.097	9.00
III	7.188	0.21	0.021	8.00	0.24	0.024	8.00
IV	7.188	0.07	0.007	8.00	0.08	0.008	8.00
V	7.188	0.03	0.003	8.00	0.03	0.003	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	1654	14.0	7.3	10.0	1796	16	9	10
II	1654	9.0	4.7	5.0	1796	9	5	10
III	1654	8.0	4.1	5.0	1796	8	5	5
IV	1654	8.0	4.1	5.0	1796	8	5	5
V	1654	8.0	4.1	5.0	1796	8	5	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	10	63000	630000	10	63000	630000	150817	780817
II	5	75000	375000	10	63000	630000	150817	525817
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00			
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	7	47378	379024	3460142	9	58749	469992	4290597	1027135	4487277
II	5	30453	243624	2224064	5	33067	264536	2414972	578125	2802189
III	4	27055	216440	1975899	5	29407	235256	2147672	514136	2490035
IV	4	27055	216440	1975899	5	29407	235256	2147672	514136	2490035
V	4	27055	216440	1975899	5	29407	235256	2147672	514136	2490035

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		**38670**
II	150 DI K9	30	1870	56100
		TOTAL		**56100**
III	200 DI K9	30	2507	75210
		TOTAL		**75210**
IV	250 DI K9	30	3367	101010
		TOTAL		**101010**
V	300 DI K9	30	4251	127530
		TOTAL		**127530**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	38670	780817	819487
II	56100	525817	581917
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	819487	4487277	5306764	100 DI K9	10	10
II	581917	2802189	3384106	**150 DI K9**	**5**	10
III	**539982**	**2490035**	**3030017**	**200 DI K9**	**5**	**5**
IV	565782	2490035	3055817	250 DI K9	5	5
V	592302	2490035	3082337	300 DI K9	5	5

Hence Combination III
consisting of 200 DI K9 30 m x 5 HP
is found to be economical

Propose 200 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From DERDMH36 to DERDMH37		
Design of Discharge Chamber		
Diameter	**200 DI K9**	mm
Peak flow from 200 DI K9m dia Force main	29.93	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.060	cu.m
Depth of Flow =	0.022	m
Assume Depth of flow as	**0.040**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.04/(1.5+2x0.04)	
	0.038	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.57	m/s
Cross-sectional Area, A =	1.5x0.04	
	0.06	sq.m
Carrying capacity, Q =	A x V	
	34.238	lps
	Hence Safe	

0.01
Hence Safe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From DPRDMH9 to DPRDMH10A of Block 02		
BASIC DATA		
GL AT Wet well site	3.56	m
Top level of receiving chamber	3.62	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	5.62	m
FOOT VALVE LEVEL	-0.71	m
Static head including Residual Head	6.33	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	3.56											6.94	3.38	
0	30	3.62	30	100	DI-K9	100	692	1.469	25	1.2	0.12	1.32	5.62	2.00	
									TOTAL	**1.2**	**0.12**	**1.32**			
Combination II															
	0	3.563											5.81	2.24	
0	30	3.619	30	150	DI-K9	100	692	0.653	178	0.17	0.02	0.19	5.62	2.00	
									TOTAL	**0.17**	**0.02**	**0.19**			
Combination III															
	0	3.563											5.66	2.10	
0	30	3.619	30	200	DI-K9	100	692	0.367	725	0.04	0.00	0.04	5.62	2.00	
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination IV															
	0	3.563											5.63	2.07	
0	30	3.619	30	250	DI-K9	100	692	0.235	2148	0.01	0.00	0.01	5.62	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	3.563											5.63	2.07	
0	30	3.619	30	300	DI-K9	100	692	0.163	5221	0.01	0.00	0.01	5.62	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	3.563											7.19	3.63	0
0	30	3.619	30	100	DI-K9	100	751	1.595	21	1.43	0.14	1.57	5.62	2.00	0
									TOTAL	**1.43**	**0.14**	**1.57**			
Combination II															
	0	3.563											5.84	2.28	0
0	30	3.619	30	150	DI-K9	100	751	0.709	153	0.2	0.02	0.22	5.62	2.00	0
									TOTAL	**0.2**	**0.02**	**0.22**			
Combination III															
	0	3.563											5.67	2.11	0
0	30	3.619	30	200	DI-K9	100	751	0.399	623	0.05	0.01	0.06	5.62	2.00	0
									TOTAL	**0.05**	**0.01**	**0.06**			
Combination IV															
	0	3.563											5.64	2.08	0
0	30	3.619	30	250	DI-K9	100	751	0.255	1846	0.02	0.00	0.02	5.62	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination V															
	0	3.563											5.63	2.07	0
0	30	3.619	30	300	DI-K9	100	751	0.177	4487	0.01	0.00	0.01	5.62	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.329	1.2	0.12	8.00	1.43	0.143	8.00
II	6.329	0.17	0.017	7.00	0.2	0.02	7.00
III	6.329	0.04	0.004	7.00	0.05	0.005	7.00
IV	6.329	0.01	0.001	7.00	0.02	0.002	7.00
V	6.329	0.01	0.001	7.00	0.01	0.001	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	692	8	2	5	751	8	2	5
II	692	7	2	5	751	7	2	5
III	692	7	2	5	751	7	2	5
IV	692	7	2	5	751	7	2	5
V	692	7	2	5	751	7	2	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	2	11305	90440	825634	2	12286	98288	897280	214802		1040436
II	2	9933	79464	725434	2	10783	86264	787511	188524		913958
III	2	9933	79464	725434	2	10783	86264	787511	188524		913958
IV	2	9933	79464	725434	2	10783	86264	787511	188524		913958
V	2	9933	79464	725434	2	10783	86264	787511	188524		913958

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	100 DI K9	30	1289	38670
		TOTAL		**38670**
II	150 DI K9	30	1870	56100
		TOTAL		**56100**
III	200 DI K9	30	2507	75210
		TOTAL		**75210**
IV	250 DI K9	30	3367	101010
		TOTAL		**101010**
V	300 DI K9	30	4251	127530
		TOTAL		**127530**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	38670	464772	503442
II	56100	464772	520872
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	503442	1040436	1543878	100 DI K9	5	5
II	**520872**	**913958**	**1434830**	**150 DI K9**	**5**	**5**
III	539982	913958	1453940	200 DI K9	5	5
IV	565782	913958	1479740	250 DI K9	5	5
V	592302	913958	1506260	300 DI K9	5	5

Hence Combination II consisting of 150 DI K9 30 m x 5 HP is found to be economical

Propose 150 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**150 DI K9**	mm	
Peak flow from 150 DI K9m dia Force main	12.52	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.025	cu.m	
Depth of Flow =	0.009	m	
Assume Depth of flow as	**0.030**	m	**0.02**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.03/(1.5+2x0.03)		
	0.029	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.48	m/s	
Cross-sectional Area, A =	1.5x0.03		
	0.045	sq.m	
Carrying capacity, Q =	A x V		
	21.378	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From DERDM71.2 to DERDM71.1 of Block 02		
BASIC DATA		
GL AT Wet well site	4.25	m
Top level of receiving chamber	4.66	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	6.66	m
FOOT VALVE LEVEL	-0.22	m
Static head including Residual Head	6.88	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	4.25											6.72	2.47	
0	30	4.66	30	100	DI-K9	100	135	0.286	514	0.06	0.01	0.07	6.66	2.00	
									TOTAL	**0.06**	**0.01**	**0.07**			
Combination II															
	0	4.251											6.67	2.42	
0	30	4.656	30	150	DI-K9	100	135	0.127	3701	0.01	0.00	0.01	6.66	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination III															
	0	4.251											6.66	2.41	
0	30	4.656	30	200	DI-K9	100	135	0.071	15023	0	0.00	0.00	6.66	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	4.251											6.66	2.41	
0	30	4.656	30	250	DI-K9	100	135	0.046	44540	0	0.00	0.00	6.66	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	4.251											6.66	2.41	
0	30	4.656	30	300	DI-K9	100	135	0.032	108241	0	0.00	0.00	6.66	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	4.251											6.73	2.48	0
0	30	4.656	30	100	DI-K9	100	147	0.311	440	0.07	0.01	0.08	6.66	2.00	0
									TOTAL	**0.07**	**0.01**	**0.08**			
Combination II															
	0	4.251											6.67	2.42	0
0	30	4.656	30	150	DI-K9	100	147	0.138	3168	0.01	0.00	0.01	6.66	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination III															
	0	4.251											6.66	2.41	0
0	30	4.656	30	200	DI-K9	100	147	0.078	12860	0	0.00	0.00	6.66	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	4.251											6.66	2.41	0
0	30	4.656	30	250	DI-K9	100	147	0.05	38125	0	0.00	0.00	6.66	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	4.251											6.66	2.41	0
0	30	4.656	30	300	DI-K9	100	147	0.035	92652	0	0.00	0.00	6.66	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.876	0.06	0.006	7.00	0.07	0.007	7.00
II	6.876	0.01	0.001	7.00	0.01	0.001	7.00
III	6.876	0	0	7.00	0	0	7.00
IV	6.876	0	0	7.00	0	0	7.00
V	6.876	0	0	7.00	0	0	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	135	7	0	5	147	7	0	5
II	135	7	0	5	147	7	0	5
III	135	7	0	5	147	7	0	5
IV	135	7	0	5	147	7	0	5
V	135	7	0	5	147	7	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**						**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	1960	15680	143144	0	2091	16728	152711	36558		179702
II	0	1960	15680	143144	0	2091	16728	152711	36558		179702
III	0	1960	15680	143144	0	2091	16728	152711	36558		179702
IV	0	1960	15680	143144	0	2091	16728	152711	36558		179702
V	0	1960	15680	143144	0	2091	16728	152711	36558		179702

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		**38670**
II	150 DI K9	30	1870	56100
		TOTAL		**56100**
III	200 DI K9	30	2507	75210
		TOTAL		**75210**
IV	250 DI K9	30	3367	101010
		TOTAL		**101010**
V	300 DI K9	30	4251	127530
		TOTAL		**127530**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	38670	464772	503442
II	56100	464772	520872
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**503442**	**179702**	**683144**	**100 DI K9**	**5**	**5**
II	520872	179702	700574	**150 DI K9**	**5**	5
III	539982	179702	719684	200 DI K9	5	5
IV	565782	179702	745484	250 DI K9	5	5
V	592302	179702	772004	300 DI K9	5	5

Hence Combination I
consisting of 100 DI K9 30 m x 5 HP
is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	2.44	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.005	cu.m	
Depth of Flow =	0.002	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From SNRDMH34 to SNRDMH8 of Block 3A		
BASIC DATA		
GL AT Wet well site	2.05	m
Top level of receiving chamber	2.05	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	4.05	m
FOOT VALVE LEVEL	-1.25	m
Static head including Residual Head	5.30	m
Number of reaches	1	
Length	15	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	2.05											4.54	2.48	
0	15	2.05	15	100	DI-K9	100	588	1.248	34	0.44	0.04	0.48	4.05	2.00	
									TOTAL	**0.44**	**0.04**	**0.48**			
Combination II															
	0	2.054											4.12	2.07	
0	15	2.054	15	150	DI-K9	100	588	0.555	241	0.06	0.01	0.07	4.05	2.00	
									TOTAL	**0.06**	**0.01**	**0.07**			
Combination III															
	0	2.054											4.08	2.02	
0	15	2.054	15	200	DI-K9	100	588	0.312	980	0.02	0.00	0.02	4.05	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination IV															
	0	2.054											4.07	2.01	
0	15	2.054	15	250	DI-K9	100	588	0.2	2906	0.01	0.00	0.01	4.05	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	2.054											4.05	2.00	
0	15	2.054	15	300	DI-K9	100	588	0.139	7062	0	0.00	0.00	4.05	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.054											4.63	2.57	0
0	15	2.054	15	100	DI-K9	100	638	1.354	29	0.52	0.05	0.57	4.05	2.00	0
									TOTAL	**0.52**	**0.05**	**0.57**			
Combination II															
	0	2.054											4.13	2.08	0
0	15	2.054	15	150	DI-K9	100	638	0.602	208	0.07	0.01	0.08	4.05	2.00	0
									TOTAL	**0.07**	**0.01**	**0.08**			
Combination III															
	0	2.054											4.08	2.02	0
0	15	2.054	15	200	DI-K9	100	638	0.339	843	0.02	0.00	0.02	4.05	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination IV															
	0	2.054											4.07	2.01	0
0	15	2.054	15	250	DI-K9	100	638	0.217	2498	0.01	0.00	0.01	4.05	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	2.054											4.05	2.00	0
0	15	2.054	15	300	DI-K9	100	638	0.15	6072	0	0.00	0.00	4.05	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	5.304	0.44	0.044	6.00	0.52	0.052	6.00
II	5.304	0.06	0.006	6.00	0.07	0.007	6.00
III	5.304	0.02	0.002	6.00	0.02	0.002	6.00
IV	5.304	0.01	0.001	6.00	0.01	0.001	6.00
V	5.304	0	0	6.00	0	0	6.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	588	6	1	5	638	6	1	5
II	588	6	1	5	638	6	1	5
III	588	6	1	5	638	6	1	5
IV	588	6	1	5	638	6	1	5
V	588	6	1	5	638	6	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**						**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	1	7188	57504	524959	1	7842	62736	572722	137105		662064
II	1	7188	57504	524959	1	7842	62736	572722	137105		662064
III	1	7188	57504	524959	1	7842	62736	572722	137105		662064
IV	1	7188	57504	524959	1	7842	62736	572722	137105		662064
V	1	7188	57504	524959	1	7842	62736	572722	137105		662064

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	15	1289	19335
		TOTAL		**19335**
II	150 DI K9	15	1870	28050
		TOTAL		**28050**
III	200 DI K9	15	2507	37605
		TOTAL		**37605**
IV	250 DI K9	15	3367	50505
		TOTAL		**50505**
V	300 DI K9	15	4251	63765
		TOTAL		**63765**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	19335	464772	484107
II	28050	464772	492822
III	37605	464772	502377
IV	50505	464772	515277
V	63765	464772	528537

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**484107**	**662064**	**1146171**	**100 DI K9**	**5**	**5**
II	492822	662064	1154886	**150 DI K9**	**5**	5
III	502377	662064	1164441	200 DI K9	5	5
IV	515277	662064	1177341	250 DI K9	5	5
V	528537	662064	1190601	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 15 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From SNRDMH34 to SNRDMH8		
Design of Discharge Chamber		
Diameter	**100 DI K9**	mm
Peak flow from 100 DI K9m dia Force main	10.64	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.021	cu.m
Depth of Flow =	0.008	m
Assume Depth of flow as	**0.020**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Hence Safe	

0.01

Hence Safe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From EVRDM1 to NJPWDRDM30 of Block 3B		
BASIC DATA		
GL AT Wet well site	2.98	m
Top level of receiving chamber	3.08	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	5.08	m
FOOT VALVE LEVEL	-0.22	m
Static head including Residual Head	5.30	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	2.98											5.20	2.22	
0	30	3.08	30	100	DI-K9	100	192	0.408	265	0.11	0.01	0.12	5.08	2.00	
									TOTAL	**0.11**	**0.01**	**0.12**			
Combination II															
	0	2.981											5.10	2.12	
0	30	3.081	30	150	DI-K9	100	192	0.181	1912	0.02	0.00	0.02	5.08	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	2.981											5.08	2.10	
0	30	3.081	30	200	DI-K9	100	192	0.102	7763	0	0.00	0.00	5.08	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	2.981											5.08	2.10	
0	30	3.081	30	250	DI-K9	100	192	0.065	23015	0	0.00	0.00	5.08	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	2.981											5.08	2.10	
0	30	3.081	30	300	DI-K9	100	192	0.045	55932	0	0.00	0.00	5.08	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.981											5.22	2.24	0
0	30	3.081	30	100	DI-K9	100	209	0.444	228	0.13	0.01	0.14	5.08	2.00	0
									TOTAL	**0.13**	**0.01**	**0.14**			
Combination II															
	0	2.981											5.10	2.12	0
0	30	3.081	30	150	DI-K9	100	209	0.197	1640	0.02	0.00	0.02	5.08	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	2.981											5.08	2.10	0
0	30	3.081	30	200	DI-K9	100	209	0.111	6660	0	0.00	0.00	5.08	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	2.981											5.08	2.10	0
0	30	3.081	30	250	DI-K9	100	209	0.071	19745	0	0.00	0.00	5.08	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	2.981											5.08	2.10	0
0	30	3.081	30	300	DI-K9	100	209	0.049	47984	0	0.00	0.00	5.08	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	5.301	0.11	0.011	6.00	0.13	0.013	6.00
II	5.301	0.02	0.002	6.00	0.02	0.002	6.00
III	5.301	0	0	6.00	0	0	6.00
IV	5.301	0	0	6.00	0	0	6.00
V	5.301	0	0	6.00	0	0	6.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	192	6	0	5	209	6	0	5
II	192	6	0	5	209	6	0	5
III	192	6	0	5	209	6	0	5
IV	192	6	0	5	209	6	0	5
V	192	6	0	5	209	6	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**						**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	2353	18824	171846	0	2549	20392	186160	44565		216411
II	0	2353	18824	171846	0	2549	20392	186160	44565		216411
III	0	2353	18824	171846	0	2549	20392	186160	44565		216411
IV	0	2353	18824	171846	0	2549	20392	186160	44565		216411
V	0	2353	18824	171846	0	2549	20392	186160	44565		216411

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		**38670**
II	150 DI K9	30	1870	56100
		TOTAL		**56100**
III	200 DI K9	30	2507	75210
		TOTAL		**75210**
IV	250 DI K9	30	3367	101010
		TOTAL		**101010**
V	300 DI K9	30	4251	127530
		TOTAL		**127530**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	38670	464772	503442
II	56100	464772	520872
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**503442**	**216411**	**719853**	**100 DI K9**	**5**	**5**
II	520872	216411	737283	**150 DI K9**	**5**	5
III	539982	216411	756393	200 DI K9	5	5
IV	565782	216411	782193	250 DI K9	5	5
V	592302	216411	808713	300 DI K9	5	5

Hence Combination I
consisting of 100 DI K9 30 m x 5 HP
is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	3.48	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.007	cu.m	
Depth of Flow =	0.003	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From PMRDM12 to PMRDM13 of Block 3B		
BASIC DATA		
GL AT Wet well site	2.75	m
Top level of receiving chamber	3.14	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	5.14	m
FOOT VALVE LEVEL	-0.92	m
Static head including Residual Head	6.06	m
Number of reaches	1	
Length	20	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	2.75											5.25	2.51	
0	20	3.14	20	100	DI-K9	100	222	0.472	203	0.1	0.01	0.11	5.14	2.00	
									TOTAL	**0.1**	**0.01**	**0.11**			
Combination II															
	0	2.747											5.15	2.41	
0	20	3.143	20	150	DI-K9	100	222	0.21	1465	0.01	0.00	0.01	5.14	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination III															
	0	2.747											5.14	2.40	
0	20	3.143	20	200	DI-K9	100	222	0.118	5946	0	0.00	0.00	5.14	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	2.747											5.14	2.40	
0	20	3.143	20	250	DI-K9	100	222	0.075	17628	0	0.00	0.00	5.14	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	2.747											5.14	2.40	
0	20	3.143	20	300	DI-K9	100	222	0.052	42840	0	0.00	0.00	5.14	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.747											5.26	2.52	0
0	20	3.143	20	100	DI-K9	100	241	0.511	175	0.11	0.01	0.12	5.14	2.00	0
									TOTAL	**0.11**	**0.01**	**0.12**			
Combination II															
	0	2.747											5.17	2.42	0
0	20	3.143	20	150	DI-K9	100	241	0.227	1260	0.02	0.00	0.02	5.14	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	2.747											5.14	2.40	0
0	20	3.143	20	200	DI-K9	100	241	0.128	5116	0	0.00	0.00	5.14	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	2.747											5.14	2.40	0
0	20	3.143	20	250	DI-K9	100	241	0.082	15166	0	0.00	0.00	5.14	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	2.747											5.14	2.40	0
0	20	3.143	20	300	DI-K9	100	241	0.057	36857	0	0.00	0.00	5.14	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.063	0.1	0.01	7.00	0.11	0.011	7.00
II	6.063	0.01	0.001	7.00	0.02	0.002	7.00
III	6.063	0	0	7.00	0	0	7.00
IV	6.063	0	0	7.00	0	0	7.00
V	6.063	0	0	7.00	0	0	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	222	7	0	5	241	7	1	5
II	222	7	0	5	241	7	1	5
III	222	7	0	5	241	7	1	5
IV	222	7	0	5	241	7	1	5
V	222	7	0	5	241	7	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	3202	25616	233851	1	3464	27712	252985	60563		294413
II	0	3202	25616	233851	1	3464	27712	252985	60563		294413
III	0	3202	25616	233851	1	3464	27712	252985	60563		294413
IV	0	3202	25616	233851	1	3464	27712	252985	60563		294413
V	0	3202	25616	233851	1	3464	27712	252985	60563		294413

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	20	1289	25780
		TOTAL		**25780**
II	150 DI K9	20	1870	37400
		TOTAL		**37400**
III	200 DI K9	20	2507	50140
		TOTAL		**50140**
IV	250 DI K9	20	3367	67340
		TOTAL		**67340**
V	300 DI K9	20	4251	85020
		TOTAL		**85020**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	25780	464772	490552
II	37400	464772	502172
III	50140	464772	514912
IV	67340	464772	532112
V	85020	464772	549792

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**490552**	**294413**	**784965**	**100 DI K9**	**5**	**5**
II	502172	294413	796585	**150 DI K9**	**5**	5
III	514912	294413	809325	200 DI K9	5	5
IV	532112	294413	826525	250 DI K9	5	5
V	549792	294413	844205	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 20 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	4.02	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.008	cu.m	
Depth of Flow =	0.003	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From EKRDM5 to EKRDM6 of Block 3B		
BASIC DATA		
GL AT Wet well site	3.38	m
Top level of receiving chamber	3.46	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	5.46	m
FOOT VALVE LEVEL	-0.17	m
Static head including Residual Head	5.63	m
Number of reaches	1	
Length	20	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	3.38											5.49	2.11	
0	20	3.46	20	100	DI-K9	100	118	0.251	655	0.03	0.00	0.03	5.46	2.00	
									TOTAL	**0.03**	**0.00**	**0.03**			
Combination II															
	0	3.383											5.46	2.08	
0	20	3.46	20	150	DI-K9	100	118	0.111	4721	0	0.00	0.00	5.46	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination III															
	0	3.383											5.46	2.08	
0	20	3.46	20	200	DI-K9	100	118	0.063	19166	0	0.00	0.00	5.46	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	3.383											5.46	2.08	
0	20	3.46	20	250	DI-K9	100	118	0.04	56823	0	0.00	0.00	5.46	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	3.383											5.46	2.08	
0	20	3.46	20	300	DI-K9	100	118	0.028	138092	0	0.00	0.00	5.46	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	3.383											5.50	2.12	0
0	20	3.46	20	100	DI-K9	100	128	0.271	566	0.04	0.00	0.04	5.46	2.00	0
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination II															
	0	3.383											5.46	2.08	0
0	20	3.46	20	150	DI-K9	100	128	0.121	4079	0	0.00	0.00	5.46	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination III															
	0	3.383											5.46	2.08	0
0	20	3.46	20	200	DI-K9	100	128	0.068	16560	0	0.00	0.00	5.46	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	3.383											5.46	2.08	0
0	20	3.46	20	250	DI-K9	100	128	0.043	49096	0	0.00	0.00	5.46	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	3.383											5.46	2.08	0
0	20	3.46	20	300	DI-K9	100	128	0.03	119312	0	0.00	0.00	5.46	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	5.63	0.03	0.003	6.00	0.04	0.004	6.00
II	5.63	0	0	6.00	0	0	6.00
III	5.63	0	0	6.00	0	0	6.00
IV	5.63	0	0	6.00	0	0	6.00
V	5.63	0	0	6.00	0	0	6.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	118	6	0	5	128	6	0	5
II	118	6	0	5	128	6	0	5
III	118	6	0	5	128	6	0	5
IV	118	6	0	5	128	6	0	5
V	118	6	0	5	128	6	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	0	1438	11504	105021	0	1568	12544	114515	27414	132435
II	0	1438	11504	105021	0	1568	12544	114515	27414	132435
III	0	1438	11504	105021	0	1568	12544	114515	27414	132435
IV	0	1438	11504	105021	0	1568	12544	114515	27414	132435
V	0	1438	11504	105021	0	1568	12544	114515	27414	132435

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	20	1289	25780
		TOTAL		**25780**
II	150 DI K9	20	1870	37400
		TOTAL		**37400**
III	200 DI K9	20	2507	50140
		TOTAL		**50140**
IV	250 DI K9	20	3367	67340
		TOTAL		**67340**
V	300 DI K9	20	4251	85020
		TOTAL		**85020**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	25780	464772	490552
II	37400	464772	502172
III	50140	464772	514912
IV	67340	464772	532112
V	85020	464772	549792

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**490552**	**132435**	**622987**	**100 DI K9**	**5**	**5**
II	502172	132435	634607	**150 DI K9**	**5**	5
III	514912	132435	647347	200 DI K9	5	5
IV	532112	132435	664547	250 DI K9	5	5
V	549792	132435	682227	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 20 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	2.13	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.004	cu.m	
Depth of Flow =	0.002	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From MASNRDM4 to MASNRDM5 of Block 3C		
BASIC DATA		
GL AT Wet well site	4.77	m
Top level of receiving chamber	4.89	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	6.89	m
FOOT VALVE LEVEL	-0.29	m
Static head including Residual Head	7.18	m
Number of reaches	1	
Length	26	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	4.77											14.04	9.27	
0	26	4.89	26	100	DI-K9	100	1970	4.181	4	6.5	0.65	7.15	6.89	2.00	
									TOTAL	**6.5**	**0.65**	**7.15**			
Combination II															
	0	4.773											7.99	3.22	
0	26	4.894	26	150	DI-K9	100	1970	1.858	26	1	0.10	1.10	6.89	2.00	
									TOTAL	**1**	**0.10**	**1.10**			
Combination III															
	0	4.773											7.17	2.40	
0	26	4.894	26	200	DI-K9	100	1970	1.045	105	0.25	0.03	0.28	6.89	2.00	
									TOTAL	**0.25**	**0.03**	**0.28**			
Combination IV															
	0	4.773											6.98	2.21	
0	26	4.894	26	250	DI-K9	100	1970	0.669	310	0.08	0.01	0.09	6.89	2.00	
									TOTAL	**0.08**	**0.01**	**0.09**			
Combination V															
	0	4.773											6.93	2.15	
0	26	4.894	26	300	DI-K9	100	1970	0.465	753	0.03	0.00	0.03	6.89	2.00	
									TOTAL	**0.03**	**0.00**	**0.03**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	4.773											16.43	11.66	0
0	26	4.894	26	100	DI-K9	100	2138	4.537	3	8.67	0.87	9.54	6.89	2.00	0
									TOTAL	**8.67**	**0.87**	**9.54**			
Combination II															
	0	4.773											8.19	3.42	0
0	26	4.894	26	150	DI-K9	100	2138	2.017	22	1.18	0.12	1.30	6.89	2.00	0
									TOTAL	**1.18**	**0.12**	**1.30**			
Combination III															
	0	4.773											7.21	2.44	0
0	26	4.894	26	200	DI-K9	100	2138	1.134	90	0.29	0.03	0.32	6.89	2.00	0
									TOTAL	**0.29**	**0.03**	**0.32**			
Combination IV															
	0	4.773											7.00	2.23	0
0	26	4.894	26	250	DI-K9	100	2138	0.726	266	0.1	0.01	0.11	6.89	2.00	0
									TOTAL	**0.1**	**0.01**	**0.11**			
Combination V															
	0	4.773											6.94	2.17	0
0	26	4.894	26	300	DI-K9	100	2138	0.504	647	0.04	0.00	0.04	6.89	2.00	0
									TOTAL	**0.04**	**0.00**	**0.04**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	7.184	6.5	0.65	15.00	8.67	0.867	17.00
II	7.184	1	0.1	9.00	1.18	0.118	9.00
III	7.184	0.25	0.025	8.00	0.29	0.029	8.00
IV	7.184	0.08	0.008	8.00	0.1	0.01	8.00
V	7.184	0.03	0.003	8.00	0.04	0.004	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	1970	15	9	10	2138	17	11	15
II	1970	9	6	10	2138	9	6	10
III	1970	8	5	5	2138	8	5	10
IV	1970	8	5	5	2138	8	5	10
V	1970	8	5	5	2138	8	5	10

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	10	63000	630000	15	58000	870000	208271	838271
II	10	63000	630000	10	63000	630000	150817	780817
III	5	75000	375000	10	63000	630000	150817	525817
IV	5	75000	375000	10	63000	630000	150817	525817
V	5	75000	375000	10	63000	630000	150817	525817

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	9	60448	483584	4414680	11	74368	594944	5431295	1300209		5714888
II	6	36269	290152	2648822	6	39340	314720	2873106	687799		3336621
III	5	32217	257736	2352894	5	34962	279696	2553369	611256		2964150
IV	5	32217	257736	2352894	5	34962	279696	2553369	611256		2964150
V	5	32217	257736	2352894	5	34962	279696	2553369	611256		2964150

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	26	1289	33514
		TOTAL		**33514**
II	150 DI K9	26	1870	48620
		TOTAL		**48620**
III	200 DI K9	26	2507	65182
		TOTAL		**65182**
IV	250 DI K9	26	3367	87542
		TOTAL		**87542**
V	300 DI K9	26	4251	110526
		TOTAL		**110526**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	33514	838271	871785
II	48620	780817	829437
III	65182	525817	590999
IV	87542	525817	613359
V	110526	525817	636343

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	871785	5714888	6586673	100 DI K9	10	15
II	829437	3336621	4166058	**150 DI K9**	**10**	10
III	**590999**	**2964150**	**3555149**	**200 DI K9**	**5**	**10**
IV	613359	2964150	3577509	250 DI K9	5	10
V	636343	2964150	3600493	300 DI K9	5	10

Hence Combination III consisting of 200 DI K9 26 m x 5 HP is found to be economical

Propose 200 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**200 DI K9**	mm	
Peak flow from 200 DI K9m dia Force main	35.64	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.071	cu.m	
Depth of Flow =	0.026	m	
Assume Depth of flow as	**0.050**	m	**0.02**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.05/(1.5+2x0.05)		
	0.047	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.66	m/s	
Cross-sectional Area, A =	1.5x0.05		
	0.075	sq.m	
Carrying capacity, Q =	A x V		
	49.247	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From PORDM11 to PO3CRRDM10 of Block 3C		
BASIC DATA		
GL AT Wet well site	4.94	m
Top level of receiving chamber	4.98	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	6.98	m
FOOT VALVE LEVEL	-0.05	m
Static head including Residual Head	7.03	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	4.94											7.94	3.00	
0	30	4.98	30	100	DI-K9	100	584	1.239	34	0.88	0.09	0.97	6.98	2.00	
									TOTAL	**0.88**	**0.09**	**0.97**			
Combination II															
	0	4.94											7.11	2.17	
0	30	4.975	30	150	DI-K9	100	584	0.551	245	0.12	0.01	0.13	6.98	2.00	
									TOTAL	**0.12**	**0.01**	**0.13**			
Combination III															
	0	4.94											7.01	2.07	
0	30	4.975	30	200	DI-K9	100	584	0.31	993	0.03	0.00	0.03	6.98	2.00	
									TOTAL	**0.03**	**0.00**	**0.03**			
Combination IV															
	0	4.94											6.99	2.05	
0	30	4.975	30	250	DI-K9	100	584	0.198	2945	0.01	0.00	0.01	6.98	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	4.94											6.98	2.04	
0	30	4.975	30	300	DI-K9	100	584	0.138	7156	0	0.00	0.00	6.98	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	4.94											8.11	3.17	0
0	30	4.975	30	100	DI-K9	100	634	1.345	29	1.03	0.10	1.13	6.98	2.00	0
									TOTAL	**1.03**	**0.10**	**1.13**			
Combination II															
	0	4.94											7.13	2.19	0
0	30	4.975	30	150	DI-K9	100	634	0.598	210	0.14	0.01	0.15	6.98	2.00	0
									TOTAL	**0.14**	**0.01**	**0.15**			
Combination III															
	0	4.94											7.02	2.08	0
0	30	4.975	30	200	DI-K9	100	634	0.336	853	0.04	0.00	0.04	6.98	2.00	0
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination IV															
	0	4.94											6.99	2.05	0
0	30	4.975	30	250	DI-K9	100	634	0.215	2529	0.01	0.00	0.01	6.98	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	4.94											6.98	2.04	0
0	30	4.975	30	300	DI-K9	100	634	0.149	6146	0	0.00	0.00	6.98	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	7.025	0.88	0.088	8.00	1.03	0.103	9.00
II	7.025	0.12	0.012	8.00	0.14	0.014	8.00
III	7.025	0.03	0.003	8.00	0.04	0.004	8.00
IV	7.025	0.01	0.001	8.00	0.01	0.001	8.00
V	7.025	0	0	8.00	0	0	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	584	8	1	5	634	9	2	5
II	584	8	1	5	634	8	2	5
III	584	8	1	5	634	8	2	5
IV	584	8	1	5	634	8	2	5
V	584	8	1	5	634	8	2	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	1	9541	76328	696805	2	11698	93584	854336	204521		901326
II	1	9541	76328	696805	2	10391	83128	758883	181670		878475
III	1	9541	76328	696805	2	10391	83128	758883	181670		878475
IV	1	9541	76328	696805	2	10391	83128	758883	181670		878475
V	1	9541	76328	696805	2	10391	83128	758883	181670		878475

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	100 DI K9	30	1289	38670
		TOTAL		**38670**
II	150 DI K9	30	1870	56100
		TOTAL		**56100**
III	200 DI K9	30	2507	75210
		TOTAL		**75210**
IV	250 DI K9	30	3367	101010
		TOTAL		**101010**
V	300 DI K9	30	4251	127530
		TOTAL		**127530**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	38670	464772	503442
II	56100	464772	520872
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	503442	901326	1404768	100 DI K9	5	5
II	**520872**	**878475**	**1399347**	**150 DI K9**	**5**	**5**
III	539982	878475	1418457	200 DI K9	5	5
IV	565782	878475	1444257	250 DI K9	5	5
V	592302	878475	1470777	300 DI K9	5	5

Hence Combination II
consisting of 150 DI K9 30 m x 5 HP
is found to be economical

Propose 150 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**150 DI K9**	mm	
Peak flow from 150 DI K9m dia Force main	10.57	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.021	cu.m	
Depth of Flow =	0.008	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From CKRDM18 to CKRDM19 of Block 3C		
BASIC DATA		
GL AT Wet well site	5.00	m
Top level of receiving chamber	5.04	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	7.04	m
FOOT VALVE LEVEL	1.75	m
Static head including Residual Head	5.29	m
Number of reaches	1	
Length	34	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	5.00											7.08	2.08	
0	34	5.04	34	100	DI-K9	100	101	0.215	869	0.04	0.00	0.04	7.04	2.00	
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination II															
	0	5											7.05	2.05	
0	34	5.04	34	150	DI-K9	100	101	0.096	6261	0.01	0.00	0.01	7.04	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination III															
	0	5											7.04	2.04	
0	34	5.04	34	200	DI-K9	100	101	0.054	25419	0	0.00	0.00	7.04	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	5											7.04	2.04	
0	34	5.04	34	250	DI-K9	100	101	0.034	75360	0	0.00	0.00	7.04	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	5											7.04	2.04	
0	34	5.04	34	300	DI-K9	100	101	0.024	183139	0	0.00	0.00	7.04	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	5											7.10	2.10	0
0	34	5.04	34	100	DI-K9	100	110	0.234	742	0.05	0.01	0.06	7.04	2.00	0
									TOTAL	**0.05**	**0.01**	**0.06**			
Combination II															
	0	5											7.05	2.05	0
0	34	5.04	34	150	DI-K9	100	110	0.104	5349	0.01	0.00	0.01	7.04	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination III															
	0	5											7.04	2.04	0
0	34	5.04	34	200	DI-K9	100	110	0.059	21715	0	0.00	0.00	7.04	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	5											7.04	2.04	0
0	34	5.04	34	250	DI-K9	100	110	0.037	64380	0	0.00	0.00	7.04	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	5											7.04	2.04	0
0	34	5.04	34	300	DI-K9	100	110	0.026	156456	0	0.00	0.00	7.04	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	5.29	0.04	0.004	6.00	0.05	0.005	6.00
II	5.29	0.01	0.001	6.00	0.01	0.001	6.00
III	5.29	0	0	6.00	0	0	6.00
IV	5.29	0	0	6.00	0	0	6.00
V	5.29	0	0	6.00	0	0	6.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	101	6	0	5	110	6	0	5
II	101	6	0	5	110	6	0	5
III	101	6	0	5	110	6	0	5
IV	101	6	0	5	110	6	0	5
V	101	6	0	5	110	6	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	1242	9936	90707	0	1372	10976	100201	23987		114694
II	0	1242	9936	90707	0	1372	10976	100201	23987		114694
III	0	1242	9936	90707	0	1372	10976	100201	23987		114694
IV	0	1242	9936	90707	0	1372	10976	100201	23987		114694
V	0	1242	9936	90707	0	1372	10976	100201	23987		114694

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	100 DI K9	34	1289	43826
		TOTAL		**43826**
II	150 DI K9	34	1870	63580
		TOTAL		**63580**
III	200 DI K9	34	2507	85238
		TOTAL		**85238**
IV	250 DI K9	34	3367	114478
		TOTAL		**114478**
V	300 DI K9	34	4251	144534
		TOTAL		**144534**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	43826	464772	508598
II	63580	464772	528352
III	85238	464772	550010
IV	114478	464772	579250
V	144534	464772	609306

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**508598**	**114694**	**623292**	**100 DI K9**	**5**	**5**
II	528352	114694	643046	**150 DI K9**	**5**	5
III	550010	114694	664704	200 DI K9	5	5
IV	579250	114694	693944	250 DI K9	5	5
V	609306	114694	724000	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 34 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	1.84	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.004	cu.m	
Depth of Flow =	0.001	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VIAPRDM2 to ONHRDM5 of Block 3C		
BASIC DATA		
GL AT Wet well site	4.90	m
Top level of receiving chamber	5.32	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	7.32	m
FOOT VALVE LEVEL	-0.29	m
Static head including Residual Head	7.61	m
Number of reaches	1	
Length	33	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	4.90											7.48	2.58	
0	33	5.32	33	100	DI-K9	100	213	0.451	221	0.15	0.02	0.17	7.32	2.00	
									TOTAL	**0.15**	**0.02**	**0.17**			
Combination II															
	0	4.903											7.34	2.44	
0	33	5.316	33	150	DI-K9	100	213	0.2	1591	0.02	0.00	0.02	7.32	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	4.903											7.33	2.42	
0	33	5.316	33	200	DI-K9	100	213	0.113	6458	0.01	0.00	0.01	7.32	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	4.903											7.32	2.41	
0	33	5.316	33	250	DI-K9	100	213	0.072	19147	0	0.00	0.00	7.32	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	4.903											7.32	2.41	
0	33	5.316	33	300	DI-K9	100	213	0.05	46531	0	0.00	0.00	7.32	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	4.903											7.50	2.60	0
0	33	5.316	33	100	DI-K9	100	231	0.489	190	0.17	0.02	0.19	7.32	2.00	0
									TOTAL	**0.17**	**0.02**	**0.19**			
Combination II															
	0	4.903											7.34	2.44	0
0	33	5.316	33	150	DI-K9	100	231	0.217	1367	0.02	0.00	0.02	7.32	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	4.903											7.33	2.42	0
0	33	5.316	33	200	DI-K9	100	231	0.122	5551	0.01	0.00	0.01	7.32	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	4.903											7.32	2.41	0
0	33	5.316	33	250	DI-K9	100	231	0.078	16457	0	0.00	0.00	7.32	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	4.903											7.32	2.41	0
0	33	5.316	33	300	DI-K9	100	231	0.054	39995	0	0.00	0.00	7.32	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	7.606	0.15	0.015	8.00	0.17	0.017	8.00
II	7.606	0.02	0.002	8.00	0.02	0.002	8.00
III	7.606	0.01	0.001	8.00	0.01	0.001	8.00
IV	7.606	0	0	8.00	0	0	8.00
V	7.606	0	0	8.00	0	0	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	213	8	1	5	231	8	1	5
II	213	8	1	5	231	8	1	5
III	213	8	1	5	231	8	1	5
IV	213	8	1	5	231	8	1	5
V	213	8	1	5	231	8	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	1	3464	27712	252985	1	3790	30320	276794	66262	319247
II	1	3464	27712	252985	1	3790	30320	276794	66262	319247
III	1	3464	27712	252985	1	3790	30320	276794	66262	319247
IV	1	3464	27712	252985	1	3790	30320	276794	66262	319247
V	1	3464	27712	252985	1	3790	30320	276794	66262	319247

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	33	1289	42537
		TOTAL		**42537**
II	150 DI K9	33	1870	61710
		TOTAL		**61710**
III	200 DI K9	33	2507	82731
		TOTAL		**82731**
IV	250 DI K9	33	3367	111111
		TOTAL		**111111**
V	300 DI K9	33	4251	140283
		TOTAL		**140283**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	42537	464772	507309
II	61710	464772	526482
III	82731	464772	547503
IV	111111	464772	575883
V	140283	464772	605055

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**507309**	**319247**	**826556**	**100 DI K9**	**5**	**5**
II	526482	319247	845729	**150 DI K9**	**5**	5
III	547503	319247	866750	200 DI K9	5	5
IV	575883	319247	895130	250 DI K9	5	5
V	605055	319247	924302	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 33 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	3.84	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.008	cu.m	
Depth of Flow =	0.003	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From NH17SRRSM6 to AASNRDM19.2 of		
BASIC DATA		
GL AT Wet well site	3.21	m
Top level of receiving chamber	6.03	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	8.03	m
FOOT VALVE LEVEL	-0.34	m
Static head including Residual Head	8.37	m
Number of reaches	1	
Length	72	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	3.21											8.49	5.28	
0	72	6.03	72	100	DI-K9	100	245	0.52	170	0.42	0.04	0.46	8.03	2.00	
									TOTAL	**0.42**	**0.04**	**0.46**			
Combination II															
	0	3.21											8.10	4.89	
0	72	6.032	72	150	DI-K9	100	245	0.231	1221	0.06	0.01	0.07	8.03	2.00	
									TOTAL	**0.06**	**0.01**	**0.07**			
Combination III															
	0	3.21											8.04	4.83	
0	72	6.032	72	200	DI-K9	100	245	0.13	4958	0.01	0.00	0.01	8.03	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	3.21											8.03	4.82	
0	72	6.032	72	250	DI-K9	100	245	0.083	14700	0	0.00	0.00	8.03	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	3.21											8.03	4.82	
0	72	6.032	72	300	DI-K9	100	245	0.058	35724	0	0.00	0.00	8.03	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	3.21											8.57	5.36	0
0	72	6.032	72	100	DI-K9	100	266	0.564	146	0.49	0.05	0.54	8.03	2.00	0
									TOTAL	**0.49**	**0.05**	**0.54**			
Combination II															
	0	3.21											8.11	4.90	0
0	72	6.032	72	150	DI-K9	100	266	0.251	1050	0.07	0.01	0.08	8.03	2.00	0
									TOTAL	**0.07**	**0.01**	**0.08**			
Combination III															
	0	3.21											8.05	4.84	0
0	72	6.032	72	200	DI-K9	100	266	0.141	4261	0.02	0.00	0.02	8.03	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination IV															
	0	3.21											8.04	4.83	0
0	72	6.032	72	250	DI-K9	100	266	0.09	12633	0.01	0.00	0.01	8.03	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	3.21											8.03	4.82	0
0	72	6.032	72	300	DI-K9	100	266	0.063	30700	0	0.00	0.00	8.03	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.372	0.42	0.042	9.00	0.49	0.049	9.00
II	8.372	0.06	0.006	9.00	0.07	0.007	9.00
III	8.372	0.01	0.001	9.00	0.02	0.002	9.00
IV	8.372	0	0	9.00	0.01	0.001	9.00
V	8.372	0	0	9.00	0	0	9.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	245	9.0	0.7	5.0	266	9	1	5
II	245	9.0	0.7	5.0	266	9	1	5
III	245	9.0	0.7	5.0	266	9	1	5
IV	245	9.0	0.7	5.0	266	9	1	5
V	245	9.0	0.7	5.0	266	9	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	1	4509	36072	329304	1	4901	39208	357933	85686		414991
II	1	4509	36072	329304	1	4901	39208	357933	85686		414991
III	1	4509	36072	329304	1	4901	39208	357933	85686		414991
IV	1	4509	36072	329304	1	4901	39208	357933	85686		414991
V	1	4509	36072	329304	1	4901	39208	357933	85686		414991

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	72	1289	92808
		TOTAL		**92808**
II	150 DI K9	72	1870	134640
		TOTAL		**134640**
III	200 DI K9	72	2507	180504
		TOTAL		**180504**
IV	250 DI K9	72	3367	242424
		TOTAL		**242424**
V	300 DI K9	72	4251	306072
		TOTAL		**306072**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	92808	464772	557580
II	134640	464772	599412
III	180504	464772	645276
IV	242424	464772	707196
V	306072	464772	770844

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**557580**	**414991**	**972571**	**100 DI K9**	**5**	**5**
II	599412	414991	1014403	**150 DI K9**	**5**	5
III	645276	414991	1060267	200 DI K9	5	5
IV	707196	414991	1122187	250 DI K9	5	5
V	770844	414991	1185835	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 72 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From NH17SRRSM6 to AASNRDM19.2		
Design of Discharge Chamber		
Diameter	**100 DI K9**	mm
Peak flow from 100 DI K9m dia Force main	4.43	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.009	cu.m
Depth of Flow =	0.003	m
Assume Depth of flow as	**0.020**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Hence Safe	

0.01

Hence Safe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From MNRDM10L to MNRDM9 of Block 4		
BASIC DATA		
GL AT Wet well site	5.59	m
Top level of receiving chamber	5.43	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	7.43	m
FOOT VALVE LEVEL	0.69	m
Static head including Residual Head	6.74	m
Number of reaches	1	
Length	20	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	5.59											7.44	1.86	
0	20	5.43	20	100	DI-K9	100	51	0.108	3137	0.01	0.00	0.01	7.43	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination II															
	0	5.586											7.43	1.85	
0	20	5.432	20	150	DI-K9	100	51	0.048	22600	0	0.00	0.00	7.43	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination III															
	0	5.586											7.43	1.85	
0	20	5.432	20	200	DI-K9	100	51	0.027	91752	0	0.00	0.00	7.43	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	5.586											7.43	1.85	
0	20	5.432	20	250	DI-K9	100	51	0.017	272021	0	0.00	0.00	7.43	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	5.586											7.43	1.85	
0	20	5.432	20	300	DI-K9	100	51	0.012	661066	0	0.00	0.00	7.43	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	5.586											7.44	1.86	0
0	20	5.432	20	100	DI-K9	100	55	0.117	2707	0.01	0.00	0.01	7.43	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination II															
	0	5.586											7.43	1.85	0
0	20	5.432	20	150	DI-K9	100	55	0.052	19503	0	0.00	0.00	7.43	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination III															
	0	5.586											7.43	1.85	0
0	20	5.432	20	200	DI-K9	100	55	0.029	79178	0	0.00	0.00	7.43	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	5.586											7.43	1.85	0
0	20	5.432	20	250	DI-K9	100	55	0.019	234744	0	0.00	0.00	7.43	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	5.586											7.43	1.85	0
0	20	5.432	20	300	DI-K9	100	55	0.013	570475	0	0.00	0.00	7.43	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.742	0.01	0.001	7.00	0.01	0.001	7.00
II	6.742	0	0	7.00	0	0	7.00
III	6.742	0	0	7.00	0	0	7.00
IV	6.742	0	0	7.00	0	0	7.00
V	6.742	0	0	7.00	0	0	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	51	7	0	5	55	7	0	5
II	51	7	0	5	55	7	0	5
III	51	7	0	5	55	7	0	5
IV	51	7	0	5	55	7	0	5
V	51	7	0	5	55	7	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	719	5752	52510	0	784	6272	57258	13707		66218
II	0	719	5752	52510	0	784	6272	57258	13707		66218
III	0	719	5752	52510	0	784	6272	57258	13707		66218
IV	0	719	5752	52510	0	784	6272	57258	13707		66218
V	0	719	5752	52510	0	784	6272	57258	13707		66218

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	20	1289	25780
		TOTAL		**25780**
II	150 DI K9	20	1870	37400
		TOTAL		**37400**
III	200 DI K9	20	2507	50140
		TOTAL		**50140**
IV	250 DI K9	20	3367	67340
		TOTAL		**67340**
V	300 DI K9	20	4251	85020
		TOTAL		**85020**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	25780	464772	490552
II	37400	464772	502172
III	50140	464772	514912
IV	67340	464772	532112
V	85020	464772	549792

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**490552**	**66218**	**556770**	**100 DI K9**	**5**	**5**
II	502172	66218	568390	**150 DI K9**	**5**	5
III	514912	66218	581130	200 DI K9	5	5
IV	532112	66218	598330	250 DI K9	5	5
V	549792	66218	616010	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 20 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From DERDMH36 to DERDMH37			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	0.91	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.002	cu.m	
Depth of Flow =	0.001	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VPRDM21 to VPRDM22 of Block 4		
BASIC DATA		
GL AT Wet well site	6.37	m
Top level of receiving chamber	6.67	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	8.67	m
FOOT VALVE LEVEL	2.77	m
Static head including Residual Head	5.90	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	6.37											9.74	3.37	
0	30	6.67	30	100	DI-K9	100	616	1.307	31	0.97	0.10	1.07	8.67	2.00	
									TOTAL	**0.97**	**0.10**	**1.07**			
Combination II															
	0	6.37											8.82	2.45	
0	30	6.67	30	150	DI-K9	100	616	0.581	222	0.14	0.01	0.15	8.67	2.00	
									TOTAL	**0.14**	**0.01**	**0.15**			
Combination III															
	0	6.37											8.70	2.33	
0	30	6.67	30	200	DI-K9	100	616	0.327	900	0.03	0.00	0.03	8.67	2.00	
									TOTAL	**0.03**	**0.00**	**0.03**			
Combination IV															
	0	6.37											8.68	2.31	
0	30	6.67	30	250	DI-K9	100	616	0.209	2668	0.01	0.00	0.01	8.67	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	6.37											8.67	2.30	
0	30	6.67	30	300	DI-K9	100	616	0.145	6483	0	0.00	0.00	8.67	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	6.37											9.94	3.57	0
0	30	6.67	30	100	DI-K9	100	669	1.419	26	1.15	0.12	1.27	8.67	2.00	0
									TOTAL	**1.15**	**0.12**	**1.27**			
Combination II															
	0	6.37											8.85	2.48	0
0	30	6.67	30	150	DI-K9	100	669	0.631	190	0.16	0.02	0.18	8.67	2.00	0
									TOTAL	**0.16**	**0.02**	**0.18**			
Combination III															
	0	6.37											8.71	2.34	0
0	30	6.67	30	200	DI-K9	100	669	0.355	773	0.04	0.00	0.04	8.67	2.00	0
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination IV															
	0	6.37											8.68	2.31	0
0	30	6.67	30	250	DI-K9	100	669	0.227	2291	0.01	0.00	0.01	8.67	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	6.37											8.68	2.31	0
0	30	6.67	30	300	DI-K9	100	669	0.158	5567	0.01	0.00	0.01	8.67	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	5.9	0.97	0.097	7.00	1.15	0.115	8.00
II	5.9	0.14	0.014	7.00	0.16	0.016	7.00
III	5.9	0.03	0.003	6.00	0.04	0.004	6.00
IV	5.9	0.01	0.001	6.00	0.01	0.001	6.00
V	5.9	0	0	6.00	0.01	0.001	6.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	616	7	1	5	669	8	2	5
II	616	7	1	5	669	7	1	5
III	616	6	1	5	669	6	1	5
IV	616	6	1	5	669	6	1	5
V	616	6	1	5	669	6	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	1	8822	70576	644294	2	10913	87304	797006	190797		835091
II	1	8822	70576	644294	1	9606	76848	701552	167946		812240
III	1	7581	60648	553661	1	8234	65872	601351	143959		697619
IV	1	7581	60648	553661	1	8234	65872	601351	143959		697619
V	1	7581	60648	553661	1	8234	65872	601351	143959		697619

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	100 DI K9	30	1289	38670
		TOTAL		**38670**
II	150 DI K9	30	1870	56100
		TOTAL		**56100**
III	200 DI K9	30	2507	75210
		TOTAL		**75210**
IV	250 DI K9	30	3367	101010
		TOTAL		**101010**
V	300 DI K9	30	4251	127530
		TOTAL		**127530**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	38670	464772	503442
II	56100	464772	520872
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	503442	835091	1338533	100 DI K9	5	5
II	520872	812240	1333112	**150 DI K9**	**5**	5
III	**539982**	**697619**	**1237601**	**200 DI K9**	**5**	**5**
IV	565782	697619	1263401	250 DI K9	5	5
V	592302	697619	1289921	300 DI K9	5	5

Hence Combination III consisting of 200 DI K9 30 m x 5 HP is found to be economical

Propose 200 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From VPRDM21 to VPRDM22		
Design of Discharge Chamber		
Diameter	**200 DI K9**	mm
Peak flow from 200 DI K9m dia Force main	11.15	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.022	cu.m
Depth of Flow =	0.008	m
Assume Depth of flow as	**0.020**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Sorry, Unsafe	

0.01

Sorry, Unsafe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VMRDM20.9 to VMRDM20.8 of Block 4		
BASIC DATA		
GL AT Wet well site	13.31	m
Top level of receiving chamber	14.21	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	16.21	m
FOOT VALVE LEVEL	8.32	m
Static head including Residual Head	7.89	m
Number of reaches	1	
Length	21	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	13.31											18.13	4.82	
0	21	14.21	21	100	DI-K9	100	1004	2.131	12	1.75	0.18	1.93	16.21	2.00	
									TOTAL	**1.75**	**0.18**	**1.93**			
Combination II															
	0	13.312											16.46	3.15	
0	21	14.206	21	150	DI-K9	100	1004	0.947	90	0.23	0.02	0.25	16.21	2.00	
									TOTAL	**0.23**	**0.02**	**0.25**			
Combination III															
	0	13.312											16.27	2.96	
0	21	14.206	21	200	DI-K9	100	1004	0.533	364	0.06	0.01	0.07	16.21	2.00	
									TOTAL	**0.06**	**0.01**	**0.07**			
Combination IV															
	0	13.312											16.23	2.92	
0	21	14.206	21	250	DI-K9	100	1004	0.341	1079	0.02	0.00	0.02	16.21	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination V															
	0	13.312											16.22	2.91	
0	21	14.206	21	300	DI-K9	100	1004	0.237	2623	0.01	0.00	0.01	16.21	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	13.312											18.31	5.00	0
0	21	14.206	21	100	DI-K9	100	1090	2.314	11	1.91	0.19	2.10	16.21	2.00	0
									TOTAL	**1.91**	**0.19**	**2.10**			
Combination II															
	0	13.312											16.50	3.19	0
0	21	14.206	21	150	DI-K9	100	1090	1.028	77	0.27	0.03	0.30	16.21	2.00	0
									TOTAL	**0.27**	**0.03**	**0.30**			
Combination III															
	0	13.312											16.28	2.97	0
0	21	14.206	21	200	DI-K9	100	1090	0.578	313	0.07	0.01	0.08	16.21	2.00	0
									TOTAL	**0.07**	**0.01**	**0.08**			
Combination IV															
	0	13.312											16.23	2.92	0
0	21	14.206	21	250	DI-K9	100	1090	0.37	927	0.02	0.00	0.02	16.21	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination V															
	0	13.312											16.22	2.91	0
0	21	14.206	21	300	DI-K9	100	1090	0.257	2252	0.01	0.00	0.01	16.21	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	7.886	1.75	0.175	10.00	1.91	0.191	10.00
II	7.886	0.23	0.023	9.00	0.27	0.027	9.00
III	7.886	0.06	0.006	8.00	0.07	0.007	8.00
IV	7.886	0.02	0.002	8.00	0.02	0.002	8.00
V	7.886	0.01	0.001	8.00	0.01	0.001	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	1004	10	3	5	1090	10	3	5
II	1004	9	3	5	1090	9	3	5
III	1004	8	3	5	1090	8	3	5
IV	1004	8	3	5	1090	8	3	5
V	1004	8	3	5	1090	8	3	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	3	20520	164160	1498631	3	22284	178272	1627460	389601		1888232
II	3	18494	147952	1350666	3	20062	160496	1465182	350753		1701419
III	3	16403	131224	1197955	3	17840	142720	1302903	311905		1509860
IV	3	16403	131224	1197955	3	17840	142720	1302903	311905		1509860
V	3	16403	131224	1197955	3	17840	142720	1302903	311905		1509860

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	21	1289	27069
		TOTAL		**27069**
II	150 DI K9	21	1870	39270
		TOTAL		**39270**
III	200 DI K9	21	2507	52647
		TOTAL		**52647**
IV	250 DI K9	21	3367	70707
		TOTAL		**70707**
V	300 DI K9	21	4251	89271
		TOTAL		**89271**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	27069	464772	491841
II	39270	464772	504042
III	52647	464772	517419
IV	70707	464772	535479
V	89271	464772	554043

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	491841	1888232	2380073	100 DI K9	5	5
II	504042	1701419	2205461	**150 DI K9**	**5**	5
III	**517419**	**1509860**	**2027279**	**200 DI K9**	**5**	**5**
IV	535479	1509860	2045339	250 DI K9	5	5
V	554043	1509860	2063903	300 DI K9	5	5

Hence Combination III
consisting of 200 DI K9 21 m x 5 HP
is found to be economical

Propose 200 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From VMRDM20.9 to VMRDM20.8			
Design of Discharge Chamber			
Diameter	**200 DI K9**	mm	
Peak flow from 200 DI K9m dia Force main	18.17	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.036	cu.m	
Depth of Flow =	0.013	m	
Assume Depth of flow as	**0.030**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.03/(1.5+2x0.03)		
	0.029	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.48	m/s	
Cross-sectional Area, A =	1.5x0.03		
	0.045	sq.m	
Carrying capacity, Q =	A x V		
	21.378	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From GNRDM9.7 to VPRDM66.30.1 of		
BASIC DATA		
GL AT Wet well site	8.55	m
Top level of receiving chamber	21.36	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	23.36	m
FOOT VALVE LEVEL	4.81	m
Static head including Residual Head	18.55	m
Number of reaches	1	
Length	150	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	8.55											27.20	18.65	
0	150	21.36	150	100	DI-K9	100	517	1.096	43	3.49	0.35	3.84	23.36	2.00	
									TOTAL	**3.49**	**0.35**	**3.84**			
Combination II															
	0	8.545											23.90	15.35	
0	150	21.359	150	150	DI-K9	100	517	0.487	307	0.49	0.05	0.54	23.36	2.00	
									TOTAL	**0.49**	**0.05**	**0.54**			
Combination III															
	0	8.545											23.49	14.95	
0	150	21.359	150	200	DI-K9	100	517	0.274	1246	0.12	0.01	0.13	23.36	2.00	
									TOTAL	**0.12**	**0.01**	**0.13**			
Combination IV															
	0	8.545											23.40	14.86	
0	150	21.359	150	250	DI-K9	100	517	0.175	3694	0.04	0.00	0.04	23.36	2.00	
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination V															
	0	8.545											23.38	14.84	
0	150	21.359	150	300	DI-K9	100	517	0.122	8977	0.02	0.00	0.02	23.36	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	8.545											27.81	19.27	0
0	150	21.359	150	100	DI-K9	100	561	1.191	37	4.05	0.41	4.46	23.36	2.00	0
									TOTAL	**4.05**	**0.41**	**4.46**			
Combination II															
	0	8.545											23.99	15.44	0
0	150	21.359	150	150	DI-K9	100	561	0.529	263	0.57	0.06	0.63	23.36	2.00	0
									TOTAL	**0.57**	**0.06**	**0.63**			
Combination III															
	0	8.545											23.51	14.97	0
0	150	21.359	150	200	DI-K9	100	561	0.298	1070	0.14	0.01	0.15	23.36	2.00	0
									TOTAL	**0.14**	**0.01**	**0.15**			
Combination IV															
	0	8.545											23.41	14.87	0
0	150	21.359	150	250	DI-K9	100	561	0.191	3171	0.05	0.01	0.06	23.36	2.00	0
									TOTAL	**0.05**	**0.01**	**0.06**			
Combination V															
	0	8.545											23.38	14.84	0
0	150	21.359	150	300	DI-K9	100	561	0.132	7706	0.02	0.00	0.02	23.36	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	18.549	3.49	0.349	23.00	4.05	0.405	24.00
II	18.549	0.49	0.049	20.00	0.57	0.057	20.00
III	18.549	0.12	0.012	19.00	0.14	0.014	19.00
IV	18.549	0.04	0.004	19.00	0.05	0.005	19.00
V	18.549	0.02	0.002	19.00	0.02	0.002	19.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	517	23.0	3.7	5.0	561	24	4	5
II	517	20.0	3.2	5.0	561	20	4	5
III	517	19.0	3.1	5.0	561	19	3	5
IV	517	19.0	3.1	5.0	561	19	3	5
V	517	19.0	3.1	5.0	561	19	3	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	4	24310	194480	1775425	4	27578	220624	2014095	482158	2257583
II	3	21108	168864	1541574	4	22938	183504	1675224	401035	1942609
III	3	20062	160496	1465182	3	21827	174616	1594084	381611	1846793
IV	3	20062	160496	1465182	3	21827	174616	1594084	381611	1846793
V	3	20062	160496	1465182	3	21827	174616	1594084	381611	1846793

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	150	1289	193350
		TOTAL		**193350**
II	150 DI K9	150	1870	280500
		TOTAL		**280500**
III	200 DI K9	150	2507	376050
		TOTAL		**376050**
IV	250 DI K9	150	3367	505050
		TOTAL		**505050**
V	300 DI K9	150	4251	637650
		TOTAL		**637650**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	193350	464772	658122
II	280500	464772	745272
III	376050	464772	840822
IV	505050	464772	969822
V	637650	464772	1102422

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	658122	2257583	2915705	100 DI K9	5	5
II	745272	1942609	2687881	**150 DI K9**	**5**	5
III	**840822**	**1846793**	**2687615**	**200 DI K9**	**5**	**5**
IV	969822	1846793	2816615	250 DI K9	5	5
V	1102422	1846793	2949215	300 DI K9	5	5

Hence Combination III consisting of 200 DI K9 150 m x 5 HP is found to be economical

Propose 200 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From GNRDM9.7 to VPRDM66.30.1		
Design of Discharge Chamber		
Diameter	**200 DI K9**	mm
Peak flow from 200 DI K9m dia Force main	9.35	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.019	cu.m
Depth of Flow =	0.007	m
Assume Depth of flow as	**0.020**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Hence Safe	

0.01

Hence Safe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VPRDM91.19 to VPRDM66.29 of		
BASIC DATA		
GL AT Wet well site	10.90	m
Top level of receiving chamber	22.20	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	24.20	m
FOOT VALVE LEVEL	9.78	m
Static head including Residual Head	14.42	m
Number of reaches	1	
Length	350	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	10.90											24.63	13.73	
0	350	22.20	350	100	DI-K9	100	100	0.212	892	0.39	0.04	0.43	24.20	2.00	
									TOTAL	**0.39**	**0.04**	**0.43**			
Combination II															
	0	10.901											24.26	13.35	
0	350	22.2	350	150	DI-K9	100	100	0.094	6424	0.05	0.01	0.06	24.20	2.00	
									TOTAL	**0.05**	**0.01**	**0.06**			
Combination III															
	0	10.901											24.21	13.31	
0	350	22.2	350	200	DI-K9	100	100	0.053	26082	0.01	0.00	0.01	24.20	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	10.901											24.20	13.30	
0	350	22.2	350	250	DI-K9	100	100	0.034	77325	0	0.00	0.00	24.20	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	10.901											24.20	13.30	
0	350	22.2	350	300	DI-K9	100	100	0.024	187916	0	0.00	0.00	24.20	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	10.901											24.71	13.81	0
0	350	22.2	350	100	DI-K9	100	108	0.23	769	0.46	0.05	0.51	24.20	2.00	0
									TOTAL	**0.46**	**0.05**	**0.51**			
Combination II															
	0	10.901											24.27	13.37	0
0	350	22.2	350	150	DI-K9	100	108	0.102	5543	0.06	0.01	0.07	24.20	2.00	0
									TOTAL	**0.06**	**0.01**	**0.07**			
Combination III															
	0	10.901											24.22	13.32	0
0	350	22.2	350	200	DI-K9	100	108	0.057	22501	0.02	0.00	0.02	24.20	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination IV															
	0	10.901											24.21	13.31	0
0	350	22.2	350	250	DI-K9	100	108	0.037	66711	0.01	0.00	0.01	24.20	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	10.901											24.20	13.30	0
0	350	22.2	350	300	DI-K9	100	108	0.026	162120	0	0.00	0.00	24.20	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	14.42	0.39	0.039	15.00	0.46	0.046	15.00
II	14.42	0.05	0.005	15.00	0.06	0.006	15.00
III	14.42	0.01	0.001	15.00	0.02	0.002	15.00
IV	14.42	0	0	15.00	0.01	0.001	15.00
V	14.42	0	0	15.00	0	0	15.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	100	15.0	0.5	5.0	108	15	1	5
II	100	15.0	0.5	5.0	108	15	1	5
III	100	15.0	0.5	5.0	108	15	1	5
IV	100	15.0	0.5	5.0	108	15	1	5
V	100	15.0	0.5	5.0	108	15	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	0	3071	24568	224283	1	3333	26664	243418	58272	282556
II	0	3071	24568	224283	1	3333	26664	243418	58272	282556
III	0	3071	24568	224283	1	3333	26664	243418	58272	282556
IV	0	3071	24568	224283	1	3333	26664	243418	58272	282556
V	0	3071	24568	224283	1	3333	26664	243418	58272	282556

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	350	1289	451150
		TOTAL		**451150**
II	150 DI K9	350	1870	654500
		TOTAL		**654500**
III	200 DI K9	350	2507	877450
		TOTAL		**877450**
IV	250 DI K9	350	3367	1178450
		TOTAL		**1178450**
V	300 DI K9	350	4251	1487850
		TOTAL		**1487850**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	451150	464772	915922
II	654500	464772	1119272
III	877450	464772	1342222
IV	1178450	464772	1643222
V	1487850	464772	1952622

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**915922**	**282556**	**1198478**	**100 DI K9**	**5**	**5**
II	1119272	282556	1401828	**150 DI K9**	**5**	5
III	1342222	282556	1624778	200 DI K9	5	5
IV	1643222	282556	1925778	250 DI K9	5	5
V	1952622	282556	2235178	300 DI K9	5	5

Hence Combination I
consisting of 100 DI K9 350 m x 5 HP
is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From VPRDM91.19 to VPRDM66.29			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	1.81	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.004	cu.m	
Depth of Flow =	0.001	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VMRDM20.21.4 to VMRDM20.20 of		
BASIC DATA		
GL AT Wet well site	13.71	m
Top level of receiving chamber	18.92	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	20.92	m
FOOT VALVE LEVEL	12.59	m
Static head including Residual Head	8.33	m
Number of reaches	1	
Length	150	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	13.71											20.92	7.21	
0	150	18.92	150	100	DI-K9	100	15	0.031	31456	0	0.00	0.00	20.92	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination II															
	0	13.706											20.92	7.21	
0	150	18.919	150	150	DI-K9	100	15	0.014	226637	0	0.00	0.00	20.92	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination III															
	0	13.706											20.92	7.21	
0	150	18.919	150	200	DI-K9	100	15	0.008	920086	0	0.00	0.00	20.92	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	13.706											20.92	7.21	
0	150	18.919	150	250	DI-K9	100	15	0.005	2727822	0	0.00	0.00	20.92	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	13.706											20.92	7.21	
0	150	18.919	150	300	DI-K9	100	15	0.003	6629152	0	0.00	0.00	20.92	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	13.706											20.93	7.22	0
0	150	18.919	150	100	DI-K9	100	16	0.034	26550	0.01	0.00	0.01	20.92	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination II															
	0	13.706											20.92	7.21	0
0	150	18.919	150	150	DI-K9	100	16	0.015	191288	0	0.00	0.00	20.92	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination III															
	0	13.706											20.92	7.21	0
0	150	18.919	150	200	DI-K9	100	16	0.008	776579	0	0.00	0.00	20.92	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	13.706											20.92	7.21	0
0	150	18.919	150	250	DI-K9	100	16	0.005	2302360	0	0.00	0.00	20.92	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	13.706											20.92	7.21	0
0	150	18.919	150	300	DI-K9	100	16	0.004	5595194	0	0.00	0.00	20.92	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.329	0	0	9.00	0.01	0.001	9.00
II	8.329	0	0	9.00	0	0	9.00
III	8.329	0	0	9.00	0	0	9.00
IV	8.329	0	0	9.00	0	0	9.00
V	8.329	0	0	9.00	0	0	9.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	15	9.0	0.0	5.0	16	9	0	5
II	15	9.0	0.0	5.0	16	9	0	5
III	15	9.0	0.0	5.0	16	9	0	5
IV	15	9.0	0.0	5.0	16	9	0	5
V	15	9.0	0.0	5.0	16	9	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	261	2088	19062	0	327	2616	23882	5717		24779
II	0	261	2088	19062	0	327	2616	23882	5717		24779
III	0	261	2088	19062	0	327	2616	23882	5717		24779
IV	0	261	2088	19062	0	327	2616	23882	5717		24779
V	0	261	2088	19062	0	327	2616	23882	5717		24779

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	150	1289	193350
		TOTAL		**193350**
II	150 DI K9	150	1870	280500
		TOTAL		**280500**
III	200 DI K9	150	2507	376050
		TOTAL		**376050**
IV	250 DI K9	150	3367	505050
		TOTAL		**505050**
V	300 DI K9	150	4251	637650
		TOTAL		**637650**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	193350	464772	658122
II	280500	464772	745272
III	376050	464772	840822
IV	505050	464772	969822
V	637650	464772	1102422

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**658122**	**24779**	**682901**	**100 DI K9**	**5**	**5**
II	745272	24779	770051	**150 DI K9**	**5**	5
III	840822	24779	865601	200 DI K9	5	5
IV	969822	24779	994601	250 DI K9	5	5
V	1102422	24779	1127201	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 150 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From VMRDM20.21.4 to VMRDM20.20		
Design of Discharge Chamber		
Diameter	**100 DI K9**	mm
Peak flow from 100 DI K9m dia Force main	0.27	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.001	cu.m
Depth of Flow =	0.000	m
Assume Depth of flow as	**0.020**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Hence Safe	

0.01

Hence Safe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VMRDM22 to VMRDM19 of		
BASIC DATA		
GL AT Wet well site	8.44	m
Top level of receiving chamber	9.76	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	11.76	m
FOOT VALVE LEVEL	4.70	m
Static head including Residual Head	7.06	m
Number of reaches	1	
Length	60	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	8.44											11.90	3.46	
0	60	9.76	60	100	DI-K9	100	140	0.298	476	0.13	0.01	0.14	11.76	2.00	
									TOTAL	**0.13**	**0.01**	**0.14**			
Combination II															
	0	8.442											11.78	3.34	
0	60	9.755	60	150	DI-K9	100	140	0.132	3432	0.02	0.00	0.02	11.76	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	8.442											11.76	3.31	
0	60	9.755	60	200	DI-K9	100	140	0.074	13932	0	0.00	0.00	11.76	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination IV															
	0	8.442											11.76	3.31	
0	60	9.755	60	250	DI-K9	100	140	0.048	41304	0	0.00	0.00	11.76	2.00	
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	8.442											11.76	3.31	
0	60	9.755	60	300	DI-K9	100	140	0.033	100377	0	0.00	0.00	11.76	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	8.442											11.92	3.48	0
0	60	9.755	60	100	DI-K9	100	152	0.323	410	0.15	0.02	0.17	11.76	2.00	0
									TOTAL	**0.15**	**0.02**	**0.17**			
Combination II															
	0	8.442											11.78	3.34	0
0	60	9.755	60	150	DI-K9	100	152	0.143	2955	0.02	0.00	0.02	11.76	2.00	0
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	8.442											11.77	3.32	0
0	60	9.755	60	200	DI-K9	100	152	0.081	11997	0.01	0.00	0.01	11.76	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	8.442											11.76	3.31	0
0	60	9.755	60	250	DI-K9	100	152	0.052	35567	0	0.00	0.00	11.76	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			
Combination V															
	0	8.442											11.76	3.31	0
0	60	9.755	60	300	DI-K9	100	152	0.036	86434	0	0.00	0.00	11.76	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	7.055	0.13	0.013	8.00	0.15	0.015	8.00
II	7.055	0.02	0.002	8.00	0.02	0.002	8.00
III	7.055	0	0	8.00	0.01	0.001	8.00
IV	7.055	0	0	8.00	0	0	8.00
V	7.055	0	0	8.00	0	0	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	140	8.0	0.4	5.0	152	8	0	5
II	140	8.0	0.4	5.0	152	8	0	5
III	140	8.0	0.4	5.0	152	8	0	5
IV	140	8.0	0.4	5.0	152	8	0	5
V	140	8.0	0.4	5.0	152	8	0	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	0	2287	18296	167026	0	2483	19864	181340	43411		210437
II	0	2287	18296	167026	0	2483	19864	181340	43411		210437
III	0	2287	18296	167026	0	2483	19864	181340	43411		210437
IV	0	2287	18296	167026	0	2483	19864	181340	43411		210437
V	0	2287	18296	167026	0	2483	19864	181340	43411		210437

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	60	1289	77340
		TOTAL		**77340**
II	150 DI K9	60	1870	112200
		TOTAL		**112200**
III	200 DI K9	60	2507	150420
		TOTAL		**150420**
IV	250 DI K9	60	3367	202020
		TOTAL		**202020**
V	300 DI K9	60	4251	255060
		TOTAL		**255060**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	77340	464772	542112
II	112200	464772	576972
III	150420	464772	615192
IV	202020	464772	666792
V	255060	464772	719832

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**542112**	**210437**	**752549**	**100 DI K9**	**5**	**5**
II	576972	210437	787409	**150 DI K9**	**5**	5
III	615192	210437	825629	200 DI K9	5	5
IV	666792	210437	877229	250 DI K9	5	5
V	719832	210437	930269	300 DI K9	5	5

Hence Combination I consisting of 100 DI K9 60 m x 5 HP is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM			
From VMRDM22 to VMRDM19			
Design of Discharge Chamber			
Diameter	**100 DI K9**	mm	
Peak flow from 100 DI K9m dia Force main	2.53	lps	
Size of Discharge Chamber -			
Width of chamber =	1.50	m	
Length of chamber =	1.80	m	
Assuming width of channel =	1.50	m	
Assuming effective length of travel inside the channel =	1.80	m	
Assuming a detention time of 2 sec,			
Volume required =	0.005	cu.m	
Depth of Flow =	0.002	m	
Assume Depth of flow as	**0.020**	m	**0.01**
Mean Hydraulic Radius,m = Area / Wetted Perimeter			**Hence Safe**
m = A/P =	1.5x0.02/(1.5+2x0.02)		
	0.019	m	
Assuming n = 0.014 for concrete channels and using Manning's formula			
$v = (1/n)m^{2/3}i^{1/2}$			
Providing a slope, i =	1 in	200	
Velocity, V =	0.37	m/s	
Cross-sectional Area, A =	1.5x0.02		
	0.03	sq.m	
Carrying capacity, Q =	A x V		
	10.970	lps	
	Hence Safe		

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

UGSS FOR MUTTAR SYSTEM		
DESIGN OF PUMPING MAIN FROM From VMRDM12.19 to VPRDM66.7 of		
BASIC DATA		
GL AT Wet well site	5.62	m
Top level of receiving chamber	14.06	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	16.06	m
FOOT VALVE LEVEL	1.70	m
Static head including Residual Head	14.36	m
Number of reaches	1	
Length	190	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	5.62											16.77	11.15	
0	190	14.06	190	100	DI-K9	100	181	0.385	296	0.64	0.06	0.70	16.06	2.00	
									TOTAL	**0.64**	**0.06**	**0.70**			
Combination II															
	0	5.618											16.16	10.54	
0	190	14.062	190	150	DI-K9	100	181	0.171	2135	0.09	0.01	0.10	16.06	2.00	
									TOTAL	**0.09**	**0.01**	**0.10**			
Combination III															
	0	5.618											16.08	10.47	
0	190	14.062	190	200	DI-K9	100	181	0.096	8666	0.02	0.00	0.02	16.06	2.00	
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination IV															
	0	5.618											16.07	10.46	
0	190	14.062	190	250	DI-K9	100	181	0.062	25693	0.01	0.00	0.01	16.06	2.00	
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	5.618											16.06	10.44	
0	190	14.062	190	300	DI-K9	100	181	0.043	62438	0	0.00	0.00	16.06	2.00	
									TOTAL	**0**	**0.00**	**0.00**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	5.618											16.89	11.27	0
0	190	14.062	190	100	DI-K9	100	197	0.417	255	0.75	0.08	0.83	16.06	2.00	0
									TOTAL	**0.75**	**0.08**	**0.83**			
Combination II															
	0	5.618											16.17	10.55	0
0	190	14.062	190	150	DI-K9	100	197	0.185	1839	0.1	0.01	0.11	16.06	2.00	0
									TOTAL	**0.1**	**0.01**	**0.11**			
Combination III															
	0	5.618											16.10	10.48	0
0	190	14.062	190	200	DI-K9	100	197	0.104	7466	0.03	0.00	0.03	16.06	2.00	0
									TOTAL	**0.03**	**0.00**	**0.03**			
Combination IV															
	0	5.618											16.07	10.46	0
0	190	14.062	190	250	DI-K9	100	197	0.067	22134	0.01	0.00	0.01	16.06	2.00	0
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	5.618											16.06	10.44	0
0	190	14.062	190	300	DI-K9	100	197	0.046	53790	0	0.00	0.00	16.06	2.00	0
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	14.362	0.64	0.064	16.00	0.75	0.075	16.00
II	14.362	0.09	0.009	15.00	0.1	0.01	15.00
III	14.362	0.02	0.002	15.00	0.03	0.003	15.00
IV	14.362	0.01	0.001	15.00	0.01	0.001	15.00
V	14.362	0	0	15.00	0	0	15.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	181	16.0	0.9	5.0	197	16	1	5
II	181	15.0	0.9	5.0	197	15	1	5
III	181	15.0	0.9	5.0	197	15	1	5
IV	181	15.0	0.9	5.0	197	15	1	5
V	181	15.0	0.9	5.0	197	15	1	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	5	75000	375000	5	75000	375000	89772	464772
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**8.00**				
Combinatio	**Intermediate Stage**				**Ultimate Stage**						**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	1	5947	47576	434325	1	6404	51232	467701	111964		546289
II	1	5555	44440	405697	1	6012	48096	439072	105110		510807
III	1	5555	44440	405697	1	6012	48096	439072	105110		510807
IV	1	5555	44440	405697	1	6012	48096	439072	105110		510807
V	1	5555	44440	405697	1	6012	48096	439072	105110		510807

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	190	1289	244910
		TOTAL		**244910**
II	150 DI K9	190	1870	355300
		TOTAL		**355300**
III	200 DI K9	190	2507	476330
		TOTAL		**476330**
IV	250 DI K9	190	3367	639730
		TOTAL		**639730**
V	300 DI K9	190	4251	807690
		TOTAL		**807690**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	244910	464772	709682
II	355300	464772	820072
III	476330	464772	941102
IV	639730	464772	1104502
V	807690	464772	1272462

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**709682**	**546289**	**1255971**	**100 DI K9**	**5**	**5**
II	820072	510807	1330879	**150 DI K9**	**5**	5
III	941102	510807	1451909	200 DI K9	5	5
IV	1104502	510807	1615309	250 DI K9	5	5
V	1272462	510807	1783269	300 DI K9	5	5

Hence Combination I
consisting of 100 DI K9 190 m x 5 HP
is found to be economical

Propose 100 DI K9 x 5 HP Non clog pumpset

UGSS FOR MUTTAR SYSTEM		
From VMRDM12.19 to VPRDM66.7		
Design of Discharge Chamber		
Diameter	**100 DI K9**	mm
Peak flow from 100 DI K9m dia Force main	3.28	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.007	cu.m
Depth of Flow =	0.002	m
Assume Depth of flow as	**0.020**	m
Mean Hydraulic Radius,m = Area / Wetted Perimeter		
m = A/P =	1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Hence Safe	

0.01

Hence Safe

Discharge MH GL	5.20	m
Discharge MH IL	3.29	m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	**1.80**	**1.50**	**1.50**
Provide Dischrge chamber of size			**1.8 m x 1.5 x 1.5 m**

DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS
MUTTAR STP-From WW1 to WW2

Note:

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering

the wastage due to valves and specials actually used.
In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
2	WW1	-0.01	91.954	WW1	WW2	2000	91.954+58.537 = 150.491 lps	2.82	1.3
3B	WW1	-0.56	58.537						
3A	WW2	-2.28	76.064	WW2	IC@STP	3500	150.491+76.064 = 226.555 lps	1.3	2.05
3C	STP	-0.96	68.901	WW@STP	IC@STP	20	68.901+66.985 = 135.886 lps	2.05	2.05
4	STP	-0.67	66.985						

Pumping main fro WW1 to WW2
Ultimate peak flow 150.491 lps

Flow in MLD

Stage	Year	Flow in MLD
Initial	2025	10.92
Intermediate	2040	11.96
Ultimate	2055	13.00

Length of Pumping Main		2000.00	m
Top level of Inlet chamber		2.30	m
Hours of pumping		24.00	hrs
Residual Head		2.00	m
FOOT VALVE LEVEL		-3.77	m
Static head including Residual Head		8.07	m

RESULTS

SEWAGE QUANTITY

Discharge (3 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination		
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)
							Available		Available	Available
Initial	2025	10.92	7583	126.39	ECP-3-DWF	500 DI K9	30.00	400 DI K9	40.00	45.00
Intermediate	2040	11.96	8306	138.43						
Ultimate	2055	13.00	9028	150.46						

Discharge (2 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination		
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)
							Available		Available	Available
Initial	2025	7.28	5056	84.26	ECP-2-DWF	400 DI K9	20.00	400 DI K9	20.00	25.00
Intermediate	2040	7.98	5542	92.36						
Ultimate	2055	8.66	6014	100.23						

Discharge (1 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination		
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)
							Available		Available	Available
Initial	2025	3.64	2528	42.13	ECP-1-DWF	**300 DI K9**	**10.00**	**400 DI K9**	**10.00**	**10.00**
Intermediate	2040	3.99	2771	46.18						
Ultimate	2055	4.33	3007	50.12						

PROVIDE PUMPING MAIN OF **400 DI K9** SIZE

RESULTS

Size of main **400 DI K9**

PUMPSETS

				CHECK	
During the period from 2025 to 2040 (considering 15 years as life of pumpset)					
Provide	15 HP x	2 NO.		30	40
Provide	10 HP x	1 NO.		10	
Standby	10 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 D'	10 HP x	1 NO.		10	10.00
Ave, flow (2 DWF	10 HP x	1 NO.		10	20.00
+	10 HP x	1 NO.		10	
Peak, flow (3 DW	15 HP x	2 NO.		30	40.00
+	10 HP x	1 NO.		10	
During the period from 2040 to 2055 (considering 15 years as life of pumpset)					
Provide	15 HP x	3 NO.		45	45
Standby	10 HP x	1 NO.		10	
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 D'	10 HP x	1 NO.		10	10.00
Ave, flow (2 DWF	15 HP x	1 NO.		15	25.00
+	10 HP x	1 NO.		10	
Peak, flow (3 DW	15 HP x	3 NO.		45	45.00

For Estimate of pump sets propose (Intermediate)

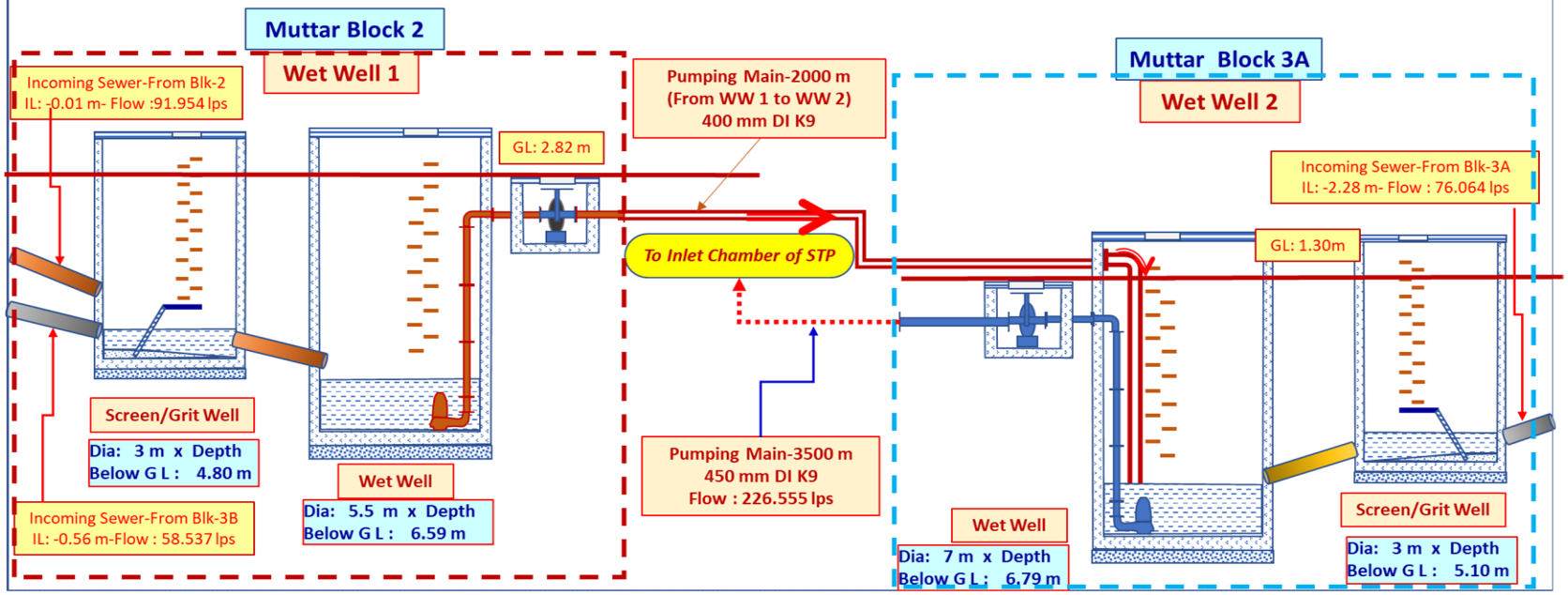
15 HP x 2 No. + 10 HP x 1 No. + 10 HP x 1 No. Standby

MUTTAR STP-From WW1 to WW2					
Design/Input Data					
Sr. No.	**Description**	**Values**	**Unit**		
Input values					
1	Average Flow	10.92	MLD	7583	lpm
2	Intermediate Flow	*11.96*	MLD	8306	lpm
3	Peak Flow	*13.00*	MLD	9028	lpm
4	GL at Pumping Station Location (STP site)	*2.82*	m	3.380	
5	IL of Incoming Sewer	*-0.56*	m		
6	Length of Rising Main	*2000.00*	m		
7	Wet well 2-Top level	*2.30*	m		
8	Dia of incoming sewer	*0.45*	m		
9	d/D of incoming sewer	*0.80*			
10	Velocity in sewer at peak design Ultimate flow	*1.09*	m/s		
11	Residual Head	*2.00*	m		
Output values					
1	Average Flow	455.00	m^3/hr		
2	Peak Flow	541.67	m^3/hr		
3	Suction Depth (Depth of SPS)	**6.59**	m		

Muttar System

Schematic Diagram of Wet wells & Pumping main from WW1 to WW2 *(Not to scale)*

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
2	WW1	-0.01	91.954	WW1	WW2	2000	91.954+58.537 = 150.491 lps	2.82	1.30
3B	WW1	-0.56	58.537						
3A	WW2	-2.28	76.064	WW2	IC@STP	3500	150.491+76.064 = 226.555 lps	1.30	2.05
3C	STP	-0.96	68.901	WW@STP	IC@STP	20	68.901+66.985 = 135.886 lps	2.05	2.05
4	STP	-0.67	66.985						



MUTTAR STP-From WW1 to WW2				
Diameter required for Screen/Grit well				
Data				
Average Flow		10.920	MLD	
Peak Design Flow		13.000	MLD	
		0.150	m^3/s	0.150
Inner Dia of incoming sewer		0.450	m	OD: 0.23
d/D		0.800		
Depth of flow in sewer at peak flow		0.360	m	0.2
Velocity in sewer at peak design Ultimate flow		1.090	m/s	
Drop of screen chamber floor to invert		0.080	m	
G.L of Screen well		2.820	m	
I.L of Screen Well		-0.560	m	
Assumed width of bars		10	mm	
Clear spacing between bars		25	mm	
Design of Bar Rack (Screen)				
Type of Screening		**Manual**		
Assume Velocity through screen		0.7	m/s	0.7
Clear area of openings through the rack		0.215	m^2	0.215
Clear width of openings through the rack		0.597	m	1.075
Number of clear spacings		24.000		
So number of bars		23.000		
Total width of the Screen		0.800	m	
Projected fixtures width each side		0.150	m	
Total width of the Screen		1.100	m	
Angle of Inclination of Bar		45 °		
→Angle of Inclination should be 75°-85° in Mechanically Cleaned and 45° in Manually Cleaned.				
Height above G.L		1.000	m	
Total depth of Bar Rack		1.250	m	
Sin 45°		0.707		
Slant height of Screen		1.800	m	
Tan 45°		1.000		
Horizontal length of Screen		1.300		
Length between pipe and screen		0.600	m	
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)		1.500	m	
Total Length of the chamber		3.000	m	
Providing Manual Screen of Size 1.1 m Width X 1.8 m Height				
Providing well internal diameter of Screen/Grit Well 3 m				

Design of Grit Well

Peak Flow	=	9028.000	lpm
Average Flow	=	7583.000	lpm
Ground Level	=	2.820	m
Invert Level of Incoming se	=	-0.560	m
Size of Approach Sewer	=	450.000	mm

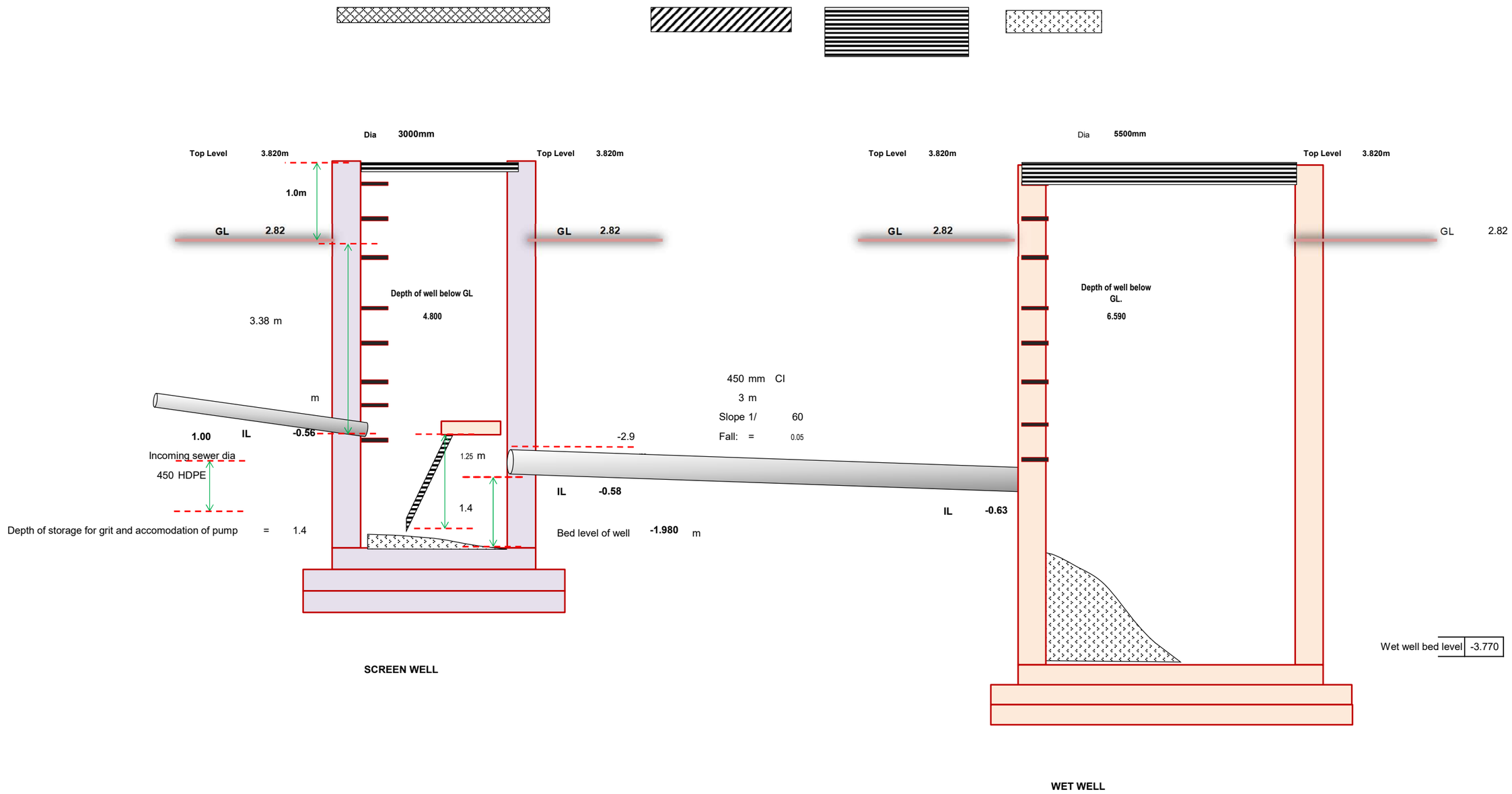
Volume of grit collection

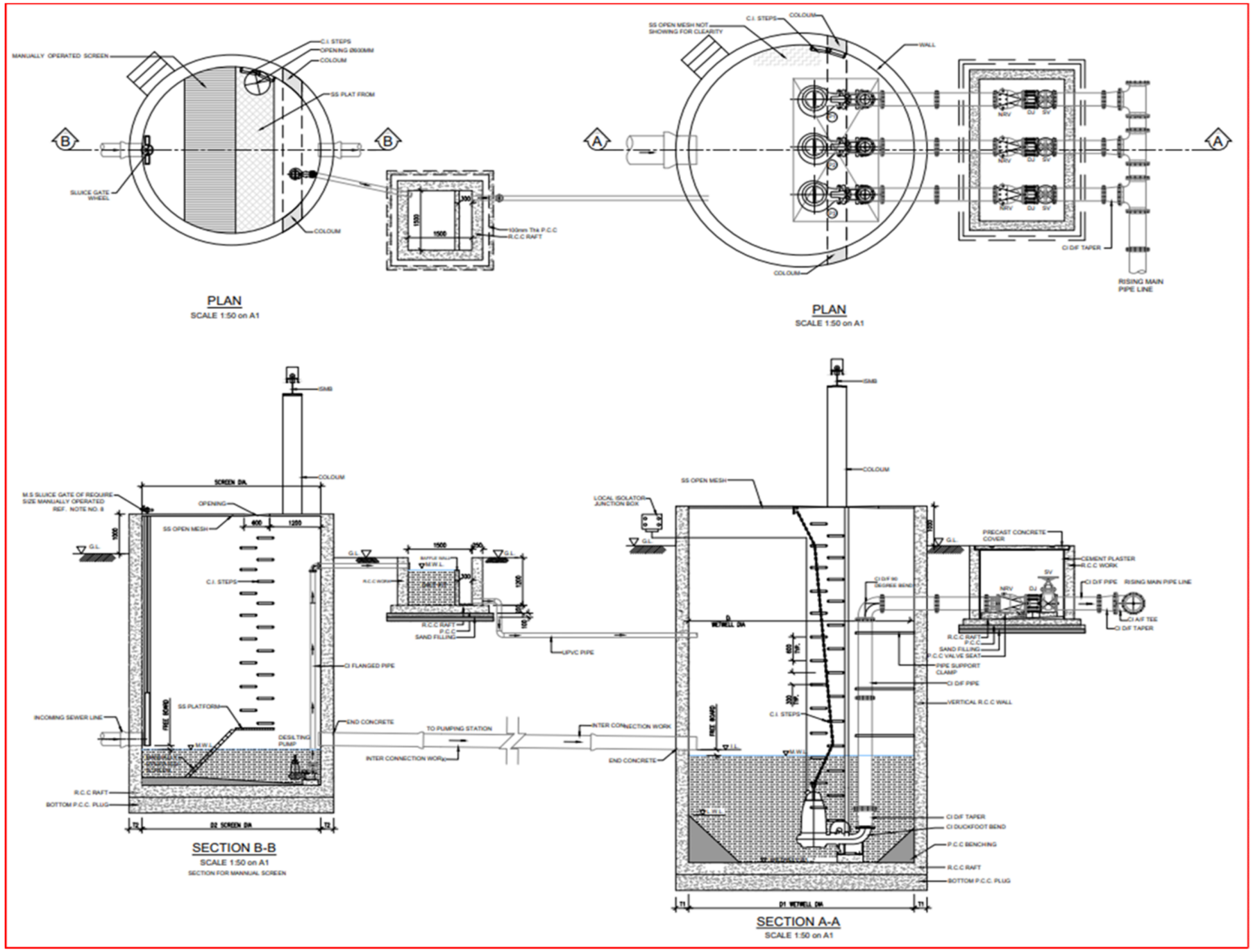
As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

hence, take maximum,	0.15	=	0.15 x 1000	m^3 / Mm^3
		=	150	m^3 / Mm^3
This quantity is for 24 hrs, hence, per hour flow		=	150 / 24	
		=	6.25	m^3 / mm^3

Diameter required for Screen/Grit well				
The quantity increases 3 to 4 times during peak				
Taking average, 3.5	=	3.5 x	6.25	
	=	21.875	m^3 / mm^3	
This quantity lasts for 2 to 3 hours in Morning and evening				
Hence, taking the maximum hours of	=	3		
Volume = 3 x 21.88	=	65.625	m^3 / mm^3	
For 5 hours of normal flow =	=	6.250	x 5	
	=	31.250	m^3 / mm^3	
Therefore for total / day	=	96.875	m^3 / mm^3	
Volume of grit collected / day	=	9028	x 60 x 24	96.88
			1000	10^6
	=	1.259	cu.m	
Volume of Storage required	=	1.259	cu.m	
Assuming dia of well as	=	3.00	m	
Area of well	=	7.069	sq.m	
Depth of Storage required	=	0.178	m	
Total depth of Bar Rack	=	1.250		
Total depth requird.		1.428		
Provide a minimum depth of	=	1.40	Min. 1.30 m(1.0 m +	
Check:				
Volume provided	=	22 x 3 x 3 x 1.4 x 2		
	=	7 x 4		
	=	6.600	cu.m	
No. of days	=	6.600	/ 1.26	
	=	5.241	**days**	
Depth of Grit well				
G.L	=	2.820	m	
I.L of incoming pipe	=	-0.560	m	
Depth of storage for grit and accomodation of pump	=	1.400	m	
Total depth	=	4.780	m	
Provide a Total depth below GL.	=	**4.800**	m	

MUTTAR STP-From WW1 to WW2				
Design/Input Data				
Wet Well Calculations				
Sr. No.	**Description**	**Unit**	**Value**	**Remark**
Basic details				
1	Peak Flow	m^3/hr	**541.667**	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m^3	33.854	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m^2	22.569	
5	Diameter required for wet well	m	5.361	
6	Diameter provided for wet well	m	**5.500**	
7	Actual provided wet well area	m^2	23.758	
8	Actual provided wet well capacity	m^3	35.637	
9	Ground level at wet well site	m	2.820	
10	Invert level of incoming sewer in wet well	m	**-0.670**	
11	Difference between MWL in wet well and incoming IL	m	0.100	
12	Maximum water level in wet well (MWL)	m	-0.770	
13	Lowest water level in wet well (LWL)	m	-2.270	
14	Required pump submergence depth	m	1.500	
15	Wet well bed level	m	-3.770	
wet well dimensions				
1	Total wet well depth	**m**	6.590	
2	Wet well diameter required	**m**	5.500	
3	Wet well diameter to be provided	**m**	**5.500**	


Dia 3000mm
Top Level 3.820m
Top Level 3.820m
1.0m
GL 2.82
GL 2.82
Depth of well below GL
4.800
3.38 m
m
1.00 IL -0.56
Incoming sewer dia
450 HDPE
Depth of storage for grit and accomodation of pump = 1.4
1.25 m
1.4
-2.9
IL -0.58
Bed level of well -1.980 m
450 mm CI
3 m
Slope 1/ 60
Fall: = 0.05
IL -0.63
SCREEN WELL
Dia 5500mm
Top Level 3.820m
Top Level 3.820m
GL 2.82
GL 2.82
Depth of well below GL.
6.590
Wet well bed level -3.770
WET WELL


MANUALLY OPERATED SCREEN
C.I. STEPS
OPENING Ø600MM
COLOUM
SS PLAT FROM
SLUICE GATE WHEEL
COLOUM
100mm Thk P.C.C
R.C.C RAFT
PLAN
SCALE 1:50 on A1
SS OPEN MESH NOT SHOWING FOR CLEARITY
C.I. STEPS
COLOUM
WALL
NRV
DJ
SV
CI DIF TAPER
RISING MAIN PIPE LINE
COLOUM
PLAN
SCALE 1:50 on A1
ISMB
COLOUM
SCREEN DIA
M.S SLUICE GATE OF REQUIRE SIZE MANUALLY OPERATED REF. NOTE NO. 8
OPENING
SS OPEN MESH
G.L.
C.I. STEPS
CI FLANGED PIPE
SS PLATFORM
FREE BOARD
INCOMING SEWER LINE
END CONCRETE
DESILTING PUMP
M.W.L.
R.C.C RAFT
BOTTOM P.C.C. PLUG
D2 SCREEN DIA
SECTION B-B
SCALE 1:50 on A1
SECTION FOR MANNUAL SCREEN
BATTLE WALL
R.C.C RAFT
P.C.C
SAND FILLING
UPVC PIPE
TO PUMPING STATION
INTER CONNECTION WORK
ISMB
COLOUM
SS OPEN MESH
LOCAL ISOLATOR JUNCTION BOX
WETWELL DIA
C.I. STEPS
FREE BOARD
END CONCRETE
D1 WETWELL DIA
PRECAST CONCRETE COVER
CEMENT PLASTER
R.C.C WORK
CI D/F PIPE
RISING MAIN PIPE LINE
CI A/F TEE
CI D/F TAPER
R.C.C RAFT
P.C.C
SAND FILLING
P.C.C VALVE SEAT
PIPE SUPPORT CLAMP
CI D/F PIPE
VERTICAL R.C.C WALL
CI D/F TAPER
CI DUCKFOOT BEND
P.C.C BENCHING
R.C.C RAFT
BOTTOM P.C.C. PLUG
SECTION A-A
SCALE 1:50 on A1

Valve Chamber		
Length	**2.30**	m
Breadth	**3.80**	m
Total Depth	**1.90**	m
penstock depth-Grit /screen	**3.50**	m
penstock depth-Suction well	**3.50**	m
Silt Pit		
Length	**1.5**	m
Width	**1.5**	m
Depth	**1.2**	m

SPS DATA		
Depth of Suction Well	**7.59**	m
Dia of Suction Well	**5.50**	m
Pump HP	**20.00**	HP
RM Delivery Pipe Dia.	**400.00**	mm
SCREEN WELL DATA		
G.L	**2.82**	m
I.L of incoming pipe	**-0.56**	m
Dia of Grit Well	**3.00**	m
Incoming Pipe Dia. Of Network	**450.00**	mm
Total width of the Screen	**1.30**	m
Slant height of Screen	**1.80**	m
Depth	**5.80**	m

Valve Chamber*			
Dia, mm	**L, m**	**B, m**	**D, m**
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SOURCE :

wt.of 25x3 mm flat=0.59 kg/m	**0.59**
wt.of 12x3 mm flat=0.28 kg/m	**0.28**
wt.of 25x6 mm flat=1.18 kg/m	**1.18**
wt.of 50x10 mm flat=3.92 kg/m	**3.92**
wt.of 50x50 x6mm angle=4.47 kg/m	**4.47**
wt.of 150x75 x10mm angle=16.9 kg/m	**16.9**
wt.of ISMB 300mm =42.2 kg/m	**42.2**
wt.of ISMB 400mm =66.3 kg/m	**66.3**
wt.of ISMB 600mm =122 kg/m	**122**

Pipe Depth at IntCon.	**3.50**	m

Grit Well						
Design of Grit Well						
Depth of Grit Well	5.80	m			Total Depth(m)	6.70
Parapet Height	1.00	m			outer dia (m)	3.9
Total Height of well + Parapet	6.80	m			centre dia(m)	3.45
Dia of Grit Well	**3**	m			raft dia(m)	3.00
Thickness of wall	0.45	m			Screen Horizontal platform width(m)	1.5
Thickness of Raft Slab	0.45	m			Screen Mesh Opening(m)	0.6
Thickness of Plugging	0.30	m				
Design of kerb						
Diameter of grit well	3.00	m			**Extra width for Excavation for working including both sides**	**1.2**
Well wall thickness	0.45	m			**Benching depth assumed**	**0.25**
Kerb wall thickness at top	0.53	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.05	m				
kerb height inner	0.45	m				
kerb height outer excluding inner	0.60	m				
kerb slope	0.71	m				
Thickness of raft	0.45	m				
Thickness of plugging	0.30	m				
Circumference of well kerb (l)	11.07	m				
Volume of Kerb	4.86	cu.m				

Suction Well						
Design Data						
Depth of Suction Well	**7.59**	m			Screen Mesh Opening for Pump	
Parapet Height	1.00	m			Length(m)	1.4
Total Height of well + Parapet	8.59	m			Breadth(m)	1.5
Dia of Suction Well	**5.50**	m			Outer Dia (m)	6.7
Thickness of wall	0.6	m			Center Dia (m)	6.10
Thickness of Raft Slab	0.6	m			Raft Dia (m)	5.50
Thickness of Plugging	0.4	m			Total Depth	8.59
Design of kerb						
Diameter of wall	5.50	m				
Well wall thickness	0.60	m				
Kerb wall thickness at top	0.68	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.33	m				
kerb height inner	0.60	m				
kerb height outer excluding inner	0.73	m				
kerb slope	0.90	m				
Thickness of raft	0.60	m				
Thickness of plugging	0.40	m				
Circumference of well kerb (l)	19.40	m				
Volume of Kerb	4.21	cu.m				

DESIGN OF PUMPING MAIN FROM WET WELL for Perandoor 1A at STP to Receving Chamber

BASIC DATA		
GL AT Wet well site	**2.820**	m
Top level of receiving chamber	**2.300**	m
Residual Head	**2.000**	m
TOTAL HGL REQUIRED AT END	**2.300**	m
FOOT VALVE LEVEL	**-3.770**	m
Static head including Residual Head	**8.070**	m
Number of reaches	**1**	
Length	**2000**	m

Combination	Pipes selected
I	300 DI K9
II	350 DI K9
III	400 DI K9
IV	450 DI K9
V	500 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.82											26.75	23.93	AT WET WELL
0	2000	2.30	2000	300	DI-K9	140	8306	1.958	98	20.41	2.04	22.45	4.30	2.00	AT STP SITE
									TOTAL	**20.41**	**2.04**	**22.45**			
Combination II															
	0	2.82											14.93	12.11	AT WET WELL
0	2000	2.3	2000	350	DI-K9	140	8306	1.439	207	9.66	0.97	10.63	4.30	2.00	AT STP SITE
									TOTAL	**9.66**	**0.97**	**10.63**			
Combination III															
	0	2.82											9.84	7.02	AT WET WELL
0	2000	2.3	2000	400	DI-K9	140	8306	1.102	397	5.04	0.50	5.54	4.30	2.00	AT STP SITE
									TOTAL	**5.04**	**0.50**	**5.54**			
Combination IV															
	0	2.82											7.42	4.60	AT WET WELL
0	2000	2.3	2000	450	DI-K9	140	8306	0.87	704	2.84	0.28	3.12	4.30	2.00	AT STP SITE
									TOTAL	**2.84**	**0.28**	**3.12**			
Combination V															
	0	2.82											6.17	3.35	AT WET WELL
0	2000	2.3	2000	500	DI-K9	140	8306	0.705	1177	1.7	0.17	1.87	4.30	2.00	AT STP SITE
									TOTAL	**1.7**	**0.17**	**1.87**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.82											30.49	27.67	AT WET WELL
0	2000	2.3	2000	300	DI-K9	140	9028	2.129	84	23.81	2.38	26.19	4.30	2.00	AT STP SITE
									TOTAL	**23.81**	**2.38**	**26.19**			
Combination II															
	0	2.82											16.73	13.91	AT WET WELL
0	2000	2.3	2000	350	DI-K9	140	9028	1.564	177	11.3	1.13	12.43	4.30	2.00	AT STP SITE
									TOTAL	**11.3**	**1.13**	**12.43**			
Combination III															
	0	2.82											10.77	7.95	AT WET WELL
0	2000	2.3	2000	400	DI-K9	140	9028	1.197	340	5.88	0.59	6.47	4.30	2.00	AT STP SITE
									TOTAL	**5.88**	**0.59**	**6.47**			
Combination IV															
	0	2.82											7.94	5.12	AT WET WELL
0	2000	2.3	2000	450	DI-K9	140	9028	0.946	604	3.31	0.33	3.64	4.30	2.00	AT STP SITE
									TOTAL	**3.31**	**0.33**	**3.64**			
Combination V															
	0	2.82											6.48	3.66	AT WET WELL
0	2000	2.3	2000	500	DI-K9	140	9028	0.766	1008	1.98	0.20	2.18	4.30	2.00	AT STP SITE
									TOTAL	**1.98**	**0.20**	**2.18**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.07	20.41	2.041	30.52	23.81	2.381	34.26
II	8.07	9.66	0.966	18.70	11.3	1.13	20.50
III	8.07	5.04	0.504	13.61	5.88	0.588	14.54
IV	8.07	2.84	0.284	11.19	3.31	0.331	11.71
V	8.07	1.7	0.17	9.94	1.98	0.198	10.25

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	8306	31	79	80	9028	34	97	100
II	8306	19	49	50	9028	21	58	60
III	8306	14	35	40	9028	15	41	45
IV	8306	11	29	30	9028	12	33	35
V	8306	10	26	30	9028	10	29	30

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	80	46000	3680000	100	46000	4600000	1101203	4781203
II	50	47000	2350000	60	46000	2760000	660722	3010722
III	40	47000	1880000	45	47000	2115000	506314	2386314
IV	30	50000	1500000	35	50000	1750000	418936	1918936
V	30	50000	1500000	30	50000	1500000	359088	1859088

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**	**10**					
Combination	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	79	518549	5185490	47338780	97	632715	6327150	57761092	13827546	61166327	
II	49	317664	3176640	28999817	58	378570	3785700	34559978	8273384	37273201	
III	35	231338	2313380	21119043	41	268456	2684560	24507577	5866919	26985962	
IV	29	190167	1901670	17360508	33	216307	2163070	19746850	4727239	22087747	
V	26	168863	1688630	15415647	29	189252	1892520	17276976	4135971	19551618	

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	300 DI K9	2000	4251	8502000
		TOTAL		**8502000**
II	350 DI K9	2000	5188	10376000
		TOTAL		**10376000**
III	400 DI K9	2000	6226	12452000
		TOTAL		**12452000**
IV	450 DI K9	2000	7485	14970000
		TOTAL		**14970000**
V	500 DI K9	2000	8654	17308000
		TOTAL		**17308000**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	8502000	4781203	13283203
II	10376000	3010722	13386722
III	12452000	2386314	14838314
IV	14970000	1918936	16888936
V	17308000	1859088	19167088

TABLE 8. Cost of installation and maintenance

Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	13283203	61166327	74449530	300 DI K9	80	100
II	13386722	37273201	50659923	**350 DI K9**	**50**	60
III	14838314	26985962	41824276	400 DI K9	40	45
IV	16888936	22087747	38976683	450 DI K9	30	35
V	**19167088**	**19551618**	**38718706**	**500 DI K9**	**30**	30

Hence Combination V consisting of 500 DI K9 2000 m x 30 HP is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	**2.820**	m
Top level of receiving chamber	**2.300**	m
Residual Head	**2.000**	m
TOTAL HGL REQUIRED AT END	**2.300**	m
FOOT VALVE LEVEL	**-3.770**	m
Static head including Residual Head	**8.070**	m
Number of reaches	**1**	
Length	**2000**	m

Combination	Pipes selected
I	300 DI K9
II	350 DI K9
III	400 DI K9
IV	450 DI K9
V	500 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.82											14.93	12.11	AT WET WELL
0	2000	2.30	2000	300	DI-K9	140	5542	1.307	207	9.66	0.97	10.63	4.30	2.00	AT STP SITE
									TOTAL	**9.66**	**0.97**	**10.63**			
Combination II															
	0	2.82											9.33	6.51	AT WET WELL
0	2000	2.3	2000	350	DI-K9	140	5542	0.96	438	4.57	0.46	5.03	4.30	2.00	AT STP SITE
									TOTAL	**4.57**	**0.46**	**5.03**			
Combination III															
	0	2.82											6.92	4.10	AT WET WELL
0	2000	2.3	2000	400	DI-K9	140	5542	0.735	840	2.38	0.24	2.62	4.30	2.00	AT STP SITE
									TOTAL	**2.38**	**0.24**	**2.62**			
Combination IV															
	0	2.82											5.77	2.95	AT WET WELL
0	2000	2.3	2000	450	DI-K9	140	5542	0.581	1490	1.34	0.13	1.47	4.30	2.00	AT STP SITE
									TOTAL	**1.34**	**0.13**	**1.47**			
Combination V															
	0	2.82											5.18	2.36	AT WET WELL
0	2000	2.3	2000	500	DI-K9	140	5542	0.47	2489	0.8	0.08	0.88	4.30	2.00	AT STP SITE
									TOTAL	**0.8**	**0.08**	**0.88**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.82											16.66	13.84	AT WET WELL
0	2000	2.3	2000	300	DI-K9	140	6014	1.418	178	11.24	1.12	12.36	4.30	2.00	AT STP SITE
									TOTAL	**11.24**	**1.12**	**12.36**			
Combination II															
	0	2.82											10.14	7.32	AT WET WELL
0	2000	2.3	2000	350	DI-K9	140	6014	1.042	377	5.31	0.53	5.84	4.30	2.00	AT STP SITE
									TOTAL	**5.31**	**0.53**	**5.84**			
Combination III															
	0	2.82											7.35	4.53	AT WET WELL
0	2000	2.3	2000	400	DI-K9	140	6014	0.798	722	2.77	0.28	3.05	4.30	2.00	AT STP SITE
									TOTAL	**2.77**	**0.28**	**3.05**			
Combination IV															
	0	2.82											6.02	3.20	AT WET WELL
0	2000	2.3	2000	450	DI-K9	140	6014	0.63	1281	1.56	0.16	1.72	4.30	2.00	AT STP SITE
									TOTAL	**1.56**	**0.16**	**1.72**			
Combination V															
	0	2.82											5.32	2.50	AT WET WELL
0	2000	2.3	2000	500	DI-K9	140	6014	0.51	2140	0.93	0.09	1.02	4.30	2.00	AT STP SITE
									TOTAL	**0.93**	**0.09**	**1.02**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.07	9.66	0.966	18.70	11.24	1.124	20.43
II	8.07	4.57	0.457	13.10	5.31	0.531	13.91
III	8.07	2.38	0.238	10.69	2.77	0.277	11.12
IV	8.07	1.34	0.134	9.54	1.56	0.156	9.79
V	8.07	0.8	0.08	8.95	0.93	0.093	9.09

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	5542	19	32	35	6014	20	38	40
II	5542	13	23	25	6014	14	26	30
III	5542	11	19	20	6014	11	21	25
IV	5542	10	17	20	6014	10	18	20
V	5542	9	16	20	6014	9	17	20

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	35	50000	1750000	40	47000	1880000	450057	2200057
II	25	50000	1250000	30	50000	1500000	359088	1609088
III	20	50000	1000000	25	50000	1250000	299240	1299240
IV	20	50000	1000000	20	50000	1000000	239392	1239392
V	20	50000	1000000	20	50000	1000000	239392	1239392

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE	10				
Combination	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	32	211929	2119290	19347179	38	251400	2514000	22950520	5494172	24841351
II	23	148474	1484740	13554318	26	171151	1711510	15624521	3740386	17294704
III	19	121158	1211580	11060617	21	136777	1367770	12486489	2989166	14049783
IV	17	108219	1082190	9879405	18	120374	1203740	10989045	2630690	12510095
V	16	101488	1014880	9264926	17	111879	1118790	10213529	2445038	11709964

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	300 DI K9	2000	4251	8502000
		TOTAL		**8502000**
II	350 DI K9	2000	5188	10376000
		TOTAL		**10376000**
III	400 DI K9	2000	6226	12452000
		TOTAL		**12452000**
IV	450 DI K9	2000	7485	14970000
		TOTAL		**14970000**
V	500 DI K9	2000	8654	17308000
		TOTAL		**17308000**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	8502000	2200057	10702057
II	10376000	1609088	11985088
III	12452000	1299240	13751240
IV	14970000	1239392	16209392
V	17308000	1239392	18547392

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	10702057	24841351	35543408	300 DI K9	35	40
II	11985088	17294704	29279792	350 DI K9	25	30
III	**13751240**	**14049783**	**27801023**	400 DI K9	20	25
IV	16209392	12510095	28719487	450 DI K9	20	20
V	18547392	11709964	30257356	500 DI K9	20	20

Hence Combination III consisting of 400 DI K9 2000 m x 20 HP is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	2.82	m
Top level of receiving chamber	2.30	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	2.30	m
FOOT VALVE LEVEL	-3.77	m
Static head including Residual Head	8.07	m
Number of reaches	1	
Length	2000	m

Combination	Pipes selected
I	300 DI K9
II	350 DI K9
III	400 DI K9
IV	450 DI K9
V	500 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.82											7.25	4.43	AT WET WELL
0	2000	2.30	2000	300	DI-K9	140	2771	0.653	747	2.68	0.27	2.95	4.30	2.00	AT STP SITE
									TOTAL	**2.68**	**0.27**	**2.95**			
Combination II															
	0	2.82											5.69	2.87	AT WET WELL
0	2000	2.3	2000	350	DI-K9	140	2771	0.48	1582	1.26	0.13	1.39	4.30	2.00	AT STP SITE
									TOTAL	**1.26**	**0.13**	**1.39**			
Combination III															
	0	2.82											5.03	2.21	AT WET WELL
0	2000	2.3	2000	400	DI-K9	140	2771	0.367	3031	0.66	0.07	0.73	4.30	2.00	AT STP SITE
									TOTAL	**0.66**	**0.07**	**0.73**			
Combination IV															
	0	2.82											4.71	1.89	AT WET WELL
0	2000	2.3	2000	450	DI-K9	140	2771	0.29	5379	0.37	0.04	0.41	4.30	2.00	AT STP SITE
									TOTAL	**0.37**	**0.04**	**0.41**			
Combination V															
	0	2.82											4.54	1.72	AT WET WELL
0	2000	2.3	2000	500	DI-K9	140	2771	0.235	8986	0.22	0.02	0.24	4.30	2.00	AT STP SITE
									TOTAL	**0.22**	**0.02**	**0.24**			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.82											7.73	4.91	AT WET WELL
0	2000	2.3	2000	300	DI-K9	140	3007	0.709	642	3.12	0.31	3.43	4.30	2.00	AT STP SITE
									TOTAL	**3.12**	**0.31**	**3.43**			
Combination II															
	0	2.82											5.92	3.10	AT WET WELL
0	2000	2.3	2000	350	DI-K9	140	3007	0.521	1359	1.47	0.15	1.62	4.30	2.00	AT STP SITE
									TOTAL	**1.47**	**0.15**	**1.62**			
Combination III															
	0	2.82											5.15	2.33	AT WET WELL
0	2000	2.3	2000	400	DI-K9	140	3007	0.399	2605	0.77	0.08	0.85	4.30	2.00	AT STP SITE
									TOTAL	**0.77**	**0.08**	**0.85**			
Combination IV															
	0	2.82											4.77	1.95	AT WET WELL
0	2000	2.3	2000	450	DI-K9	140	3007	0.315	4623	0.43	0.04	0.47	4.30	2.00	AT STP SITE
									TOTAL	**0.43**	**0.04**	**0.47**			
Combination V															
	0	2.82											4.59	1.77	AT WET WELL
0	2000	2.3	2000	500	DI-K9	140	3007	0.255	7723	0.26	0.03	0.29	4.30	2.00	AT STP SITE
									TOTAL	**0.26**	**0.03**	**0.29**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.07	2.68	0.268	11.02	3.12	0.312	11.50
II	8.07	1.26	0.126	9.46	1.47	0.147	9.69
III	8.07	0.66	0.066	8.80	0.77	0.077	8.92
IV	8.07	0.37	0.037	8.48	0.43	0.043	8.54
V	8.07	0.22	0.022	8.31	0.26	0.026	8.36

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	2771	11	10	10	3007	12	11	15
II	2771	9	8	10	3007	10	9	10
III	2771	9	8	10	3007	9	8	10
IV	2771	8	7	10	3007	9	8	10
V	2771	8	7	10	3007	8	8	10

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	10	63000	630000	15	58000	870000	208271	838271
II	10	63000	630000	10	63000	630000	150817	780817
III	10	63000	630000	10	63000	630000	150817	780817
IV	10	63000	630000	10	63000	630000	150817	780817
V	10	63000	630000	10	63000	630000	150817	780817

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10						
Combination	**Intermediate Stage**				**Ultimate Stage**								**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**				
I	10	62474	624740	5703305	11	70774	707740	6461019	1546717				7250021
II	8	53587	535870	4892003	9	59599	595990	5440844	1302495				6194498
III	8	49862	498620	4551944	8	54828	548280	5005295	1198228				5750172
IV	7	48032	480320	4384882	8	52541	525410	4796513	1148247				5533129
V	7	47117	471170	4301351	8	51430	514300	4695089	1123967				5425318

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	300 DI K9	2000	4251	8502000
		TOTAL		**8502000**
II	350 DI K9	2000	5188	10376000
		TOTAL		**10376000**
III	400 DI K9	2000	6226	12452000
		TOTAL		**12452000**
IV	450 DI K9	2000	7485	14970000
		TOTAL		**14970000**
V	500 DI K9	2000	8654	17308000
		TOTAL		**17308000**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	8502000	838271	9340271
II	10376000	780817	11156817
III	12452000	780817	13232817
IV	14970000	780817	15750817
V	17308000	780817	18088817

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	**9340271**	**7250021**	**16590292**	300 DI K9	10	15
II	11156817	6194498	17351315	**350 DI K9**	**10**	10
III	13232817	5750172	18982989	400 DI K9	10	10
IV	15750817	5533129	21283946	450 DI K9	10	10
V	18088817	5425318	23514135	500 DI K9	10	10

Hence Combination I
consisting of 300 DI K9 2000 m x 10 HP
is found to be economical

DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS
MUTTAR STP-From WW2 to Inlet Chamber

Note:

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering the wastage due to valves and specials actually used.
In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
2	WW1	-0.01	91.954	WW1	WW2	2000	91.954+58.537 = 150.491 lps	2.82	1.3
3B	WW1	-0.56	58.537						
3A	WW2	-2.28	76.064	WW2	IC@STP	3500	150.491+76.064 = 226.555 lps	1.3	2.05
3C	STP	-0.96	68.901	WW@STP	IC@STP	20	68.901+66.985 = 135.886 lps	2.05	2.05
4	STP	-0.67	66.985						

Pumping main fro WW1 to WW2
Ultimate peak flow 226.555 lps

Flow in MLD

Stage	Year	Flow in MLD
Initial	**2025**	**16.41**
Intermediate	**2040**	**17.92**
Ultimate	**2055**	**19.57**

Length of Pumping Main	3500.00	m
Top level of Inlet chamber	9.60	m
Hours of pumping	24.00	hrs
Residual Head	2.00	m
FOOT VALVE LEVEL	-5.49	m
Static head including Residual Head	17.09	m

RESULTS
SEWAGE QUANTITY
Discharge (3 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		**Pipe size and type**	Pumpset Capacity (HP) **(Intermediate)**	**Pipe size and type**	Pumpset Capacity (HP) **(Base year to Intermediate)**	Pumpset Capacity (HP) **(Inter. To Ultimate)**	**Inter.**	**Ultimate**
							Available		Available	Available	mps	mps
Initial	2025	16.41	11396	189.93	ECP-3-DWF	**500 DI K9**	**95.00**	**450 DI K9**	**115.00**	**135.00**	**1.30**	**1.42**
Intermediate	2040	17.92	12444	207.41								
Ultimate	2055	19.57	13590	226.50								
Discharge (2 DWF)												
Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		**Pipe size and type**	Pumpset Capacity (HP) **(Intermediate)**	**Pipe size and type**	Pumpset Capacity (HP) **(Base year to Intermediate)**	Pumpset Capacity (HP) **(Inter. To Ultimate)**	**Inter.**	**Ultimate**
							Available		Available	Available	mps	mps
Initial	2025	10.94	7597	126.62	ECP-2-DWF	**500 DI K9**	**55.00**	**450 DI K9**	**60.00**	**70.00**	**0.87**	**0.95**
Intermediate	2040	11.94	8292	138.19								
Ultimate	2055	13.04	9056	150.93								
Discharge (1 DWF)												
Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		**Pipe size and type**	Pumpset Capacity (HP) **(Intermediate)**	**Pipe size and type**	Pumpset Capacity (HP) **(Base year to**	Pumpset Capacity (HP) **(Inter. To**	**Inter.**	**Ultimate**
							Available		Available	Available	mps	mps
Initial	2025	5.47	3799	63.31	ECP-1-DWF	**350 DI K9**	**30.00**	**450 DI K9**	**25.00**	**30.00**	**0.43**	**0.47**
Intermediate	2040	5.97	4146	69.10								
Ultimate	2055	6.52	4528	75.46								

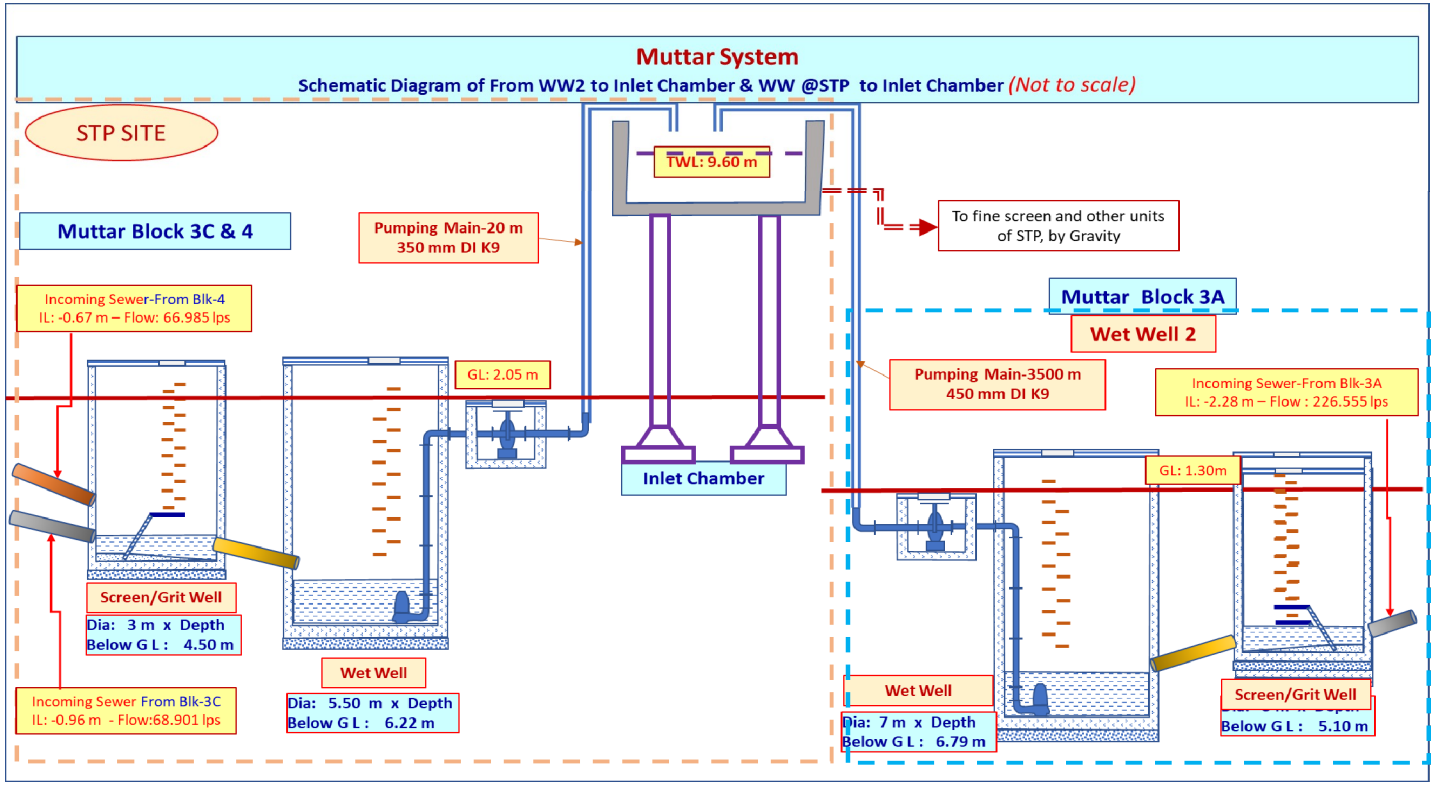
PROVIDE PUMPING MAIN OF **450 DI K9** SIZE

RESULTS

		Size of main	**450 DI K9**		
PUMPSETS					
During the period from 2025 to 2040 (considering 15 years as life of pumpset)				CHECK	
Provide	30 HP x	3 NO.		90	115
Provide	25 HP x	1 NO.		25	
Standby	30 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period	25 HP x	1 NO.		25	25.00
Ave, flow (2	30 HP x	2 NO.		60	60.00
Peak, flow (3	30 HP x	3 NO.		90	115.00
+	25 HP x	1 NO.		25	
During the period from 2040 to 2055 (considering 15 years as life of pumpset)					
Provide	35 HP x	3 NO.		105	135
Provide	30 HP x	1 NO.		30	
Standby	30 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period	30 HP x	1 NO.		30	30.00
Ave, flow (2	35 HP x	2 NO.		70	70.00
Peak, flow (3	35 HP x	3 NO.		105	135.00
+	30 HP x	1 NO.		30	

For Estimate of pump sets propose (Intermediate)
30 HP x 3 No. + 25 HP x 1 No. + 30 HP x 1 No. Standby

MUTTAR STP-From WW2 to Inlet Chamber					
Design/Input Data					
Sr. No.	**Description**	**Values**	**Unit**		
Input values					
1	Average Flow	16.41	MLD	11396	lpm
2	Intermediate Flow	*17.92*	MLD	12444	lpm
3	Peak Flow	*19.57*	MLD	13590	lpm
4	GL at Pumping Station Location	*1.30*	m	3.580	
5	IL of Incoming Sewer	*-2.28*	m		
6	Length of Rising Main	*3500.00*	m		
7	Inlet chamber TWL	*9.60*	m		
8	Dia of incoming sewer	*0.45*	m		
9	d/D of incoming sewer	*0.80*			
10	Velocity in sewer at peak design Ultimate flow	*1.09*	m/s		
11	Residual Head	*2.00*	m		
Output values					
1	Average Flow	683.75	m^3/hr		
2	Peak Flow	815.42	m^3/hr		
3	Suction Depth (Depth of SPS)	**6.79**	m		


Muttar System
Schematic Diagram of From WW2 to Inlet Chamber & WW @STP to Inlet Chamber (Not to scale)
STP SITE
Muttar Block 3C & 4
Pumping Main-20 m
350 mm DI K9
TWL: 9.60 m
To fine screen and other units of STP, by Gravity
Incoming Sewer-From Blk-4
IL: -0.67 m – Flow: 66.985 lps
GL: 2.05 m
Inlet Chamber
Screen/Grit Well
Dia: 3 m x Depth
Below G L : 4.50 m
Wet Well
Dia: 5.50 m x Depth
Below G L : 6.22 m
Incoming Sewer From Blk-3C
IL: -0.96 m - Flow:68.901 lps
Muttar Block 3A
Wet Well 2
Pumping Main-3500 m
450 mm DI K9
Incoming Sewer-From Blk-3A
IL: -2.28 m – Flow : 226.555 lps
GL: 1.30m
Wet Well
Dia: 7 m x Depth
Below G L : 6.79 m
Screen/Grit Well
Below G L : 5.10 m

MUTTAR STP-From WW2 to Inlet Chamber				
Diameter required for Screen/Grit well				
Data				
Average Flow		16.410	MLD	
Peak Design Flow		19.570	MLD	
		0.227	m^3/s	0.227
Inner Dia of incoming sewer		0.450	m	OD: 0.23
d/D		0.800		
Depth of flow in sewer at peak flow		0.360	m	0.2
Velocity in sewer at peak design Ultimate flow		1.090	m/s	
Drop of screen chamber floor to invert		0.080	m	
G.L of Screen well		1.300	m	
I.L of Screen Well		-2.280	m	
Assumed width of bars		10	mm	
Clear spacing between bars		25	mm	
Design of Bar Rack (Screen)				
Type of Screening		**Manual**		
Assume Velocity through screen		0.7	m/s	0.7
Clear area of openings through the rack		0.324	m^2	0.324
Clear width of openings through the rack		0.899	m	1.618
Number of clear spacings		36.000		
So number of bars		35.000		
Total width of the Screen		1.300	m	
Projected fixtures width each side		0.150	m	
Total width of the Screen		1.600	m	
Angle of Inclination of Bar		45 °		
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually				
Height above G.L		1.000	m	
Total depth of Bar Rack		1.250	m	
Sin 45°		0.707		
Slant height of Screen		1.800	m	
Tan 45°		1.000		
Horizontal length of Screen		1.300		
Length between pipe and screen		0.600	m	
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)		1.500	m	
Total Length of the chamber		3.000	m	
Providing Manual Screen of Size 1.6 m Width X 1.8 m Height				
Providing well internal diameter of Screen/Grit Well 3 m				

Design of Grit Well

Peak Flow	=	13590.000	lpm
Average Flow	=	11396.000	lpm
Ground Level	=	1.300	m
Invert Level of Incoming	=	-2.280	m
Size of Approach Sewer	=	450.000	mm

Volume of grit collection

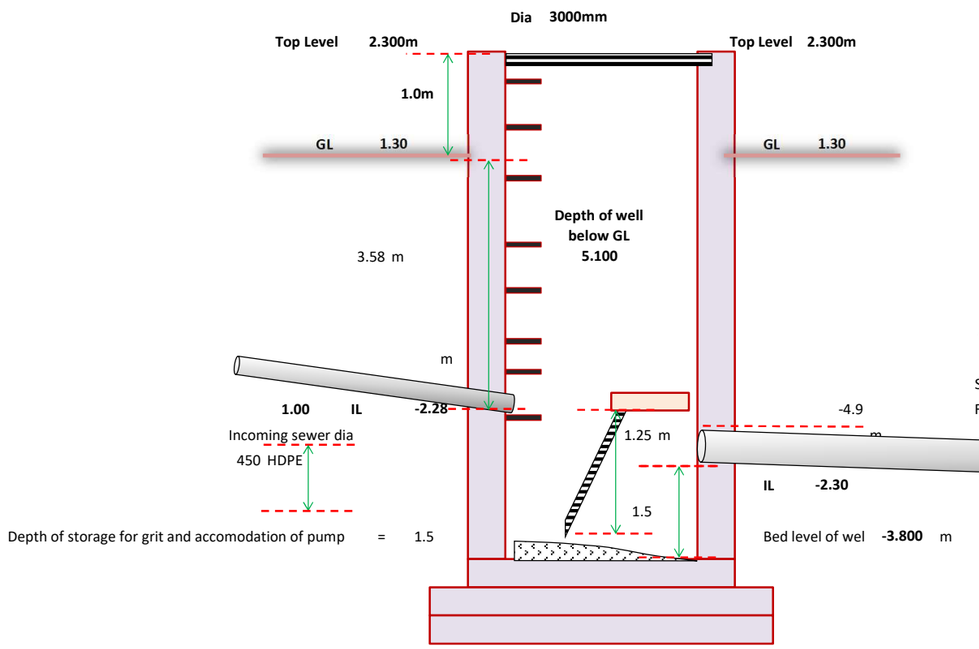
As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

hence, take maximum, 0.15 = 0.15 x 1000 m^3 / Mm^3

= 150 m^3 / Mm^3

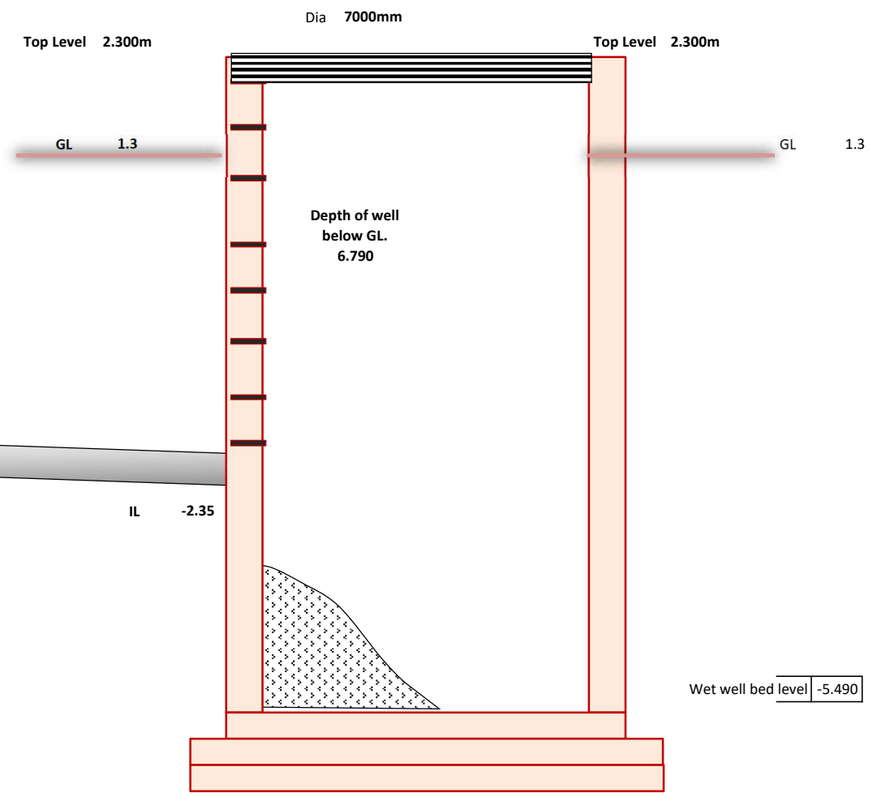
Diameter required for Screen/Grit well				
This quantity is for 24 hrs, hence, per hour flow	=	150 / 24		
	=	6.25	m^3 / mm^3	
The quantity increases 3 to 4 times during peak				
Taking average, 3.5	=	3.5 x	6.25	
	=	21.875	m^3 / mm^3	
This quantity lasts for 2 to 3 hours in Morning and evening				
Hence, taking the maximum hours of	=	3		
Volume = 3 x 21.88	=	65.625	m^3 / mm^3	
For 5 hours of normal flow =	=	6.250	x 5	
	=	31.250	m^3 / mm^3	
Therefore for total / day	=	96.875	m^3 / mm^3	
Volume of grit collected / day	=	13590	x 60 x 24	96.88
			1000	10^6
	=	1.896	cu.m	
Volume of Storage required	=	1.896	cu.m	
Assuming dia of well as	=	3.00	m	
Area of well	=	7.069	sq.m	
Depth of Storage required	=	0.268	m	
Total depth of Bar Rack	=	1.250		
Total depth requird.		1.518		
Provide a minimum depth of	=	1.50	Min. 1.30 m(1.0 m	
Check:				
Volume provided	=	22 x 3 x 3 x 1.5 x 2		
	=	7 x 4		
	=	7.070	cu.m	
No. of days	=	7.070	/ 1.9	
	=	3.729	**days**	
Depth of Grit well				
G.L	=	1.300	m	
I.L of incoming pipe	=	-2.280	m	
Depth of storage for grit and accomodation of pump	=	1.500	m	
Total depth	=	5.080	m	
Provide a Total depth below GL.	=	**5.100**	m	

MUTTAR STP-From WW2 to Inlet Chamber				
Design/Input Data				
Wet Well Calculations				
Sr. No.	**Description**	**Unit**	**Value**	**Remark**
Basic details				
1	Peak Flow	m^3/hr	**815.417**	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A: 4.6.6
2	wet well capacity required for ultimate design stage	m^3	50.964	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m^2	33.976	
5	Diameter required for wet well	m	6.577	
6	Diameter provided for wet well	m	**7.000**	
7	Actual provided wet well area	m^2	38.485	
8	Actual provided wet well capacity	m^3	57.727	
9	Ground level at wet well site	m	1.300	
10	Invert level of incoming sewer in wet well	m	**-2.390**	
11	Difference between MWL in wet well and incoming	m	0.100	
12	Maximum water level in wet well (MWL)	m	-2.490	
13	Lowest water level in wet well (LWL)	m	-3.990	
14	Required pump submergence depth	m	1.500	
15	Wet well bed level	m	-5.490	
wet well dimensions				
1	Total wet well depth	**m**	6.790	
2	Wet well diameter required	**m**	7.000	
3	Wet well diameter to be provided	**m**	**7.000**	

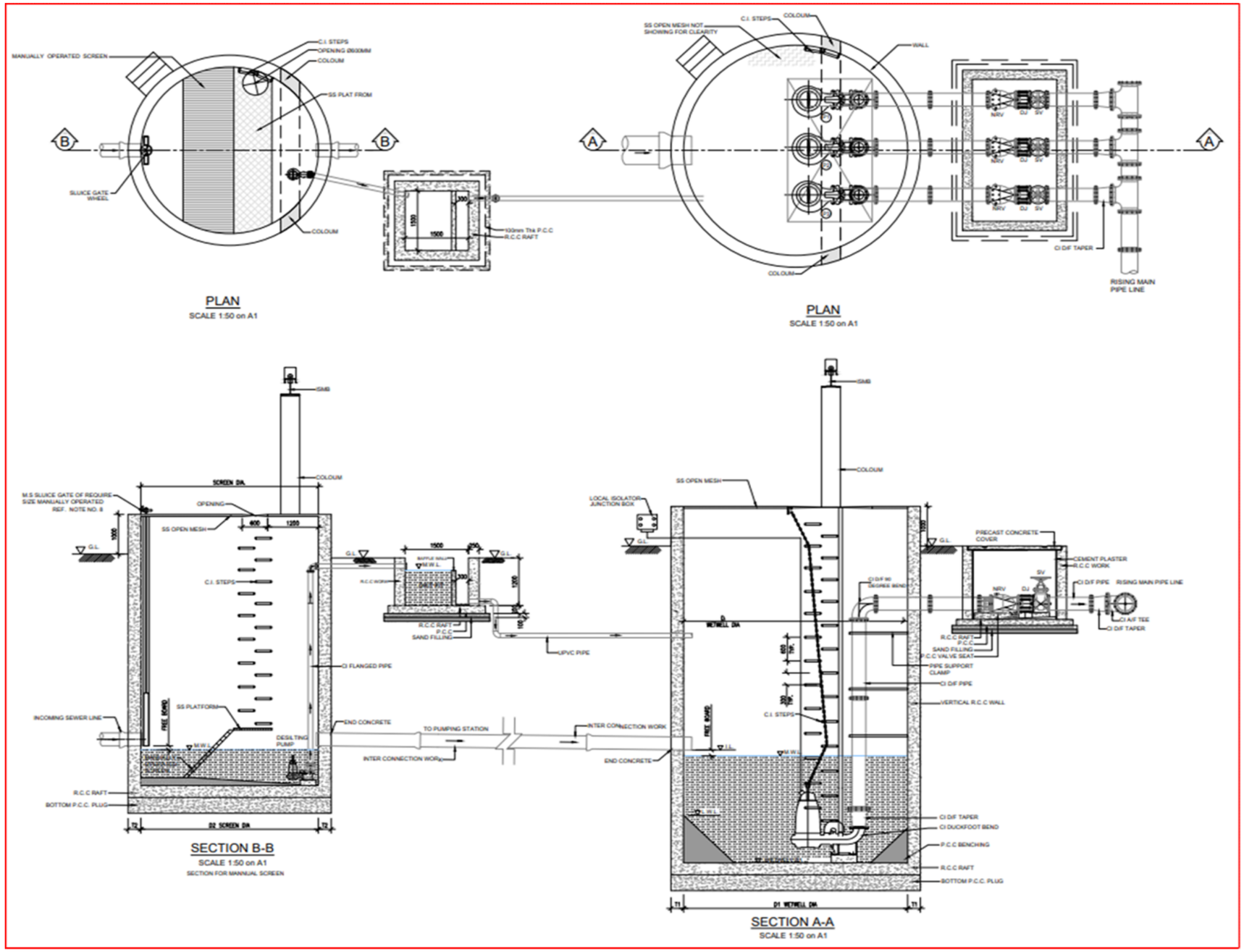


SCREEN WELL

450 mm CI
3 m
Slope 1/ 60
Fall: = 0.05



WET WELL


MANUALLY OPERATED SCREEN
C.I. STEPS
OPENING Ø630MM
COLOUM
SS PLAT FROM
SLUICE GATE WHEEL
COLOUM
100mm Thk P.C.C
R.C.C RAFT
PLAN
SCALE 1:50 on A1
SS OPEN MESH NOT SHOWING FOR CLEARITY
C.I. STEPS
COLOUM
WALL
NRV
SV
CI DIF TAPER
RISING MAIN PIPE LINE
PLAN
SCALE 1:50 on A1
ISMB
COLOUM
SCREEN DIA
M.S SLUICE GATE OF REQUIRE SIZE MANUALLY OPERATED REF. NOTE NO. 8
OPENING
SS OPEN MESH
C.I. STEPS
CI FLANGED PIPE
SS PLATFORM
FREE BOARD
INCOMING SEWER LINE
END CONCRETE
DESILTING PUMP
R.C.C RAFT
BOTTOM P.C.C. PLUG
D2 SCREEN DIA
SECTION B-B
SCALE 1:50 on A1
SECTION FOR MANNUAL SCREEN
TO PUMPING STATION
INTER CONNECTION WORK
UPVC PIPE
R.C.C RAFT
P.C.C
SAND FILLING
LOCAL ISOLATOR JUNCTION BOX
SS OPEN MESH
COLOUM
WETWELL DIA
C.I. STEPS
END CONCRETE
INTER CONNECTION WORK
PRECAST CONCRETE COVER
CEMENT PLASTER
R.C.C WORK
CI D/F PIPE
RISING MAIN PIPE LINE
CI A/F TEE
CI D/F TAPER
R.C.C RAFT
P.C.C
SAND FILLING
P.C.C VALVE SEAT
PIPE SUPPORT CLAMP
CI D/F PIPE
VERTICAL R.C.C WALL
CI D/F TAPER
CI DUCKFOOT BEND
P.C.C BENCHING
R.C.C RAFT
BOTTOM P.C.C. PLUG
D1 WETWELL DIA
SECTION A-A
SCALE 1:50 on A1

Valve Chamber		
Length	**2.40**	m
Breadth	**3.90**	m
Total Depth	**2.20**	m
penstock depth-Grit /screen	**4.00**	m
penstock depth-Suction well	**4.00**	m
Silt Pit		
Length	**1.5**	m
Width	**1.5**	m
Depth	**1.2**	m

SPS DATA		
Depth of Suction Well	**7.79**	m
Dia of Suction Well	**7.00**	m
Pump HP	**55.00**	HP
RM Delivery Pipe Dia.	**500.00**	mm
SCREEN WELL DATA		
G.L	**1.30**	m
I.L of incoming pipe	**-2.28**	m
Dia of Grit Well	**3.00**	m
Incoming Pipe Dia. Of Network	**450.00**	mm
Total width of the Screen	**1.30**	m
Slant height of Screen	**1.80**	m
Depth	**6.10**	m

Valve Chamber*			
Dia, mm	**L, m**	**B, m**	**D, m**
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SOURCE :

wt.of 25x3 mm flat=0.59 kg/m	**0.59**
wt.of 12x3 mm flat=0.28 kg/m	**0.28**
wt.of 25x6 mm flat=1.18 kg/m	**1.18**
wt.of 50x10 mm flat=3.92 kg/m	**3.92**
wt.of 50x50 x6mm angle=4.47 kg/m	**4.47**
wt.of 150x75 x10mm angle=16.9 kg/m	**16.9**
wt.of ISMB 300mm =42.2 kg/m	**42.2**
wt.of ISMB 400mm =66.3 kg/m	**66.3**
wt.of ISMB 600mm =122 kg/m	**122**

Pipe Depth at IntCon.	**4.00**	m

Grit Well						
Design of Grit Well						
Depth of Grit Well	6.10	m			Total Depth(m)	7.00
Parapet Height	1.00	m			outer dia (m)	3.9
Total Height of well + Parapet	7.10	m			centre dia(m)	3.45
Dia of Grit Well	**3**	m			raft dia(m)	3.00
Thickness of wall	0.45	m			Screen Horizontal platform width(m)	1.5
Thickness of Raft Slab	0.45	m			Screen Mesh Opening(m)	0.6
Thickness of Plugging	0.30	m				
Design of kerb						
Diameter of grit well	3.00	m			**Extra width for Excavation for working including both sides**	**1.2**
Well wall thickness	0.45	m			**Benching depth assumed**	**0.25**
Kerb wall thickness at top	0.53	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.05	m				
kerb height inner	0.45	m				
kerb height outer excluding inner	0.60	m				
kerb slope	0.71	m				
Thickness of raft	0.45	m				
Thickness of plugging	0.30	m				
Circumference of well kerb (l)	11.07	m				
Volume of Kerb	4.86	cu.m				

Suction Well						
Design Data						
Depth of Suction Well	**7.79**	m			Screen Mesh Opening for Pump	
Parapet Height	1.00	m			Length(m)	1.8
Total Height of well + Parapet	8.79	m			Breadth(m)	2
Dia of Suction Well	**7.00**	m			Outer Dia (m)	9
Thickness of wall	1	m			Center Dia (m)	8.00
Thickness of Raft Slab	1	m			Raft Dia (m)	7.00
Thickness of Plugging	0.5	m			Total Depth	9.29
Design of kerb						
Diameter of wall	7.00	m				
Well wall thickness	1.00	m				
Kerb wall thickness at top	1.08	m				
Kerb wall thickness at bottom	0.25	m				
kerb height outer	2.10	m				
kerb height inner	1.00	m				
kerb height outer excluding inner	1.10	m				
kerb slope	1.38	m				
Thickness of raft	1.00	m				
Thickness of plugging	0.50	m				
Circumference of well kerb (l)	25.37	m				
Volume of Kerb	12.86	cu.m				

DESIGN OF PUMPING MAIN FROM WET WELL for Perandoor 1A at STP to Receving Chamber

BASIC DATA		
GL AT Wet well site	**1.300**	m
Top level of receiving chamber	**9.600**	m
Residual Head	**2.000**	m
TOTAL HGL REQUIRED AT END	**9.600**	m
FOOT VALVE LEVEL	**-5.490**	m
Static head including Residual Head	**17.090**	m
Number of reaches	**1**	
Length	**3500**	m

Combination	Pipes selected
I	300 DI K9
II	350 DI K9
III	400 DI K9
IV	450 DI K9
V	500 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.30											95.30	94.00	AT WET WELL
0	3500	9.60	3500	300	DI-K9	140	12444	2.934	46	76.09	7.61	83.70	11.60	2.00	AT STP SITE
									TOTAL	**76.09**	**7.61**	**83.70**			
Combination II															
	0	1.3											50.88	49.58	AT WET WELL
0	3500	9.6	3500	350	DI-K9	140	12444	2.156	98	35.71	3.57	39.28	11.60	2.00	AT STP SITE
									TOTAL	**35.71**	**3.57**	**39.28**			
Combination III															
	0	1.3											32.08	30.78	AT WET WELL
0	3500	9.6	3500	400	DI-K9	140	12444	1.65	188	18.62	1.86	20.48	11.60	2.00	AT STP SITE
									TOTAL	**18.62**	**1.86**	**20.48**			
Combination IV															
	0	1.3											23.16	21.86	AT WET WELL

0	3500	9.6	3500	450	DI-K9	140	12444	1.304	333	10.51	1.05	11.56	11.60	2.00	AT STP SITE
									TOTAL	**10.51**	**1.05**	**11.56**			
Combination V															
	0	1.3											18.51	17.21	AT WET WELL
0	3500	9.6	3500	500	DI-K9	140	12444	1.056	557	6.28	0.63	6.91	11.60	2.00	AT STP SITE
									TOTAL	**6.28**	**0.63**	**6.91**			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		**GL**	**Distance (m)**	**Pipe**			**Disc. In lpm**	**Velcity-mps**	**Grade**	**Friction Loss**	**OL**	**TL**	**HGL**	**RH**	**REMARKS**
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	1.3											110.31	#####	AT WET WELL
0	3500	9.6	3500	300	DI-K9	140	13590	3.204	39	89.74	8.97	98.71	11.60	2.00	AT STP SITE
									TOTAL	**89.74**	**8.97**	**98.71**			
Combination II															
	0	1.3											57.99	56.69	AT WET WELL
0	3500	9.6	3500	350	DI-K9	140	13590	2.354	83	42.17	4.22	46.39	11.60	2.00	AT STP SITE
									TOTAL	**42.17**	**4.22**	**46.39**			
Combination III															
	0	1.3											35.81	34.51	AT WET WELL
0	3500	9.6	3500	400	DI-K9	140	13590	1.802	159	22.01	2.20	24.21	11.60	2.00	AT STP SITE
									TOTAL	**22.01**	**2.20**	**24.21**			
Combination IV															
	0	1.3											25.21	23.91	AT WET WELL
0	3500	9.6	3500	450	DI-K9	140	13590	1.424	283	12.37	1.24	13.61	11.60	2.00	AT STP SITE
									TOTAL	**12.37**	**1.24**	**13.61**			
Combination V															
	0	1.3											19.74	18.44	AT WET WELL
0	3500	9.6	3500	500	DI-K9	140	13590	1.154	473	7.4	0.74	8.14	11.60	2.00	AT STP SITE
									TOTAL	**7.4**	**0.74**	**8.14**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	17.09	76.09	7.609	100.79	89.74	8.974	115.80
II	17.09	35.71	3.571	56.37	42.17	4.217	63.48
III	17.09	18.62	1.862	37.57	22.01	2.201	41.30
IV	17.09	10.51	1.051	28.65	12.37	1.237	30.70
V	17.09	6.28	0.628	24.00	7.4	0.74	25.23

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	12444	101	393	395	13590	116	493	495
II	12444	56	220	220	13590	63	270	275
III	12444	38	146	150	13590	41	176	180
IV	12444	29	112	115	13590	31	131	135
V	12444	24	93	95	13590	25	107	110

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	395	50000	19750000	495	50000	24750000	5924953	25674953
II	220	50000	11000000	275	50000	13750000	3291641	14291641
III	150	50000	7500000	180	50000	9000000	2154528	9654528
IV	115	50000	5750000	135	50000	6750000	1615896	7365896
V	95	46000	4370000	110	50000	5500000	1316656	5686656

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**10**						
Combinatio	**Intermediate Stage**				**Ultimate Stage**								**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**				
I	393	2565821	25658210	234235987	493	3219513	32195130	293912087	70360217				304596204
II	220	1435077	14350770	131009403	270	1764766	17647660	161106993	38567733				169577136
III	146	956457	9564570	87315775	176	1148192	11481920	104819427	25092937				112408712
IV	112	729367	7293670	66584535	131	853400	8534000	77907614	18650463				85234999
V	93	610953	6109530	55774420	107	701397	7013970	64031130	15328544				71102964

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	300 DI K9	3500	4251	14878500
		TOTAL		**14878500**
II	350 DI K9	3500	5188	18158000
		TOTAL		**18158000**
III	400 DI K9	3500	6226	21791000
		TOTAL		**21791000**
IV	450 DI K9	3500	7485	26197500
		TOTAL		**26197500**
V	500 DI K9	3500	8654	30289000
		TOTAL		**30289000**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	14878500	25674953	40553453
II	18158000	14291641	32449641
III	21791000	9654528	31445528
IV	26197500	7365896	33563396
V	30289000	5686656	35975656

TABLE 8. Cost of installation and maintenance

Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size**	**Inter. Pump**	**Ult. Pump set Cap.**
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	40553453	304596204	345149657	300 DI K9	395	495
II	32449641	169577136	202026777	350 DI K9	220	275
III	31445528	112408712	143854240	400 DI K9	150	180
IV	33563396	85234999	118798395	450 DI K9	115	135
V	**35975656**	**71102964**	**107078620**	**500 DI K9**	**95**	110

Hence Combination V
consisting of 500 DI K9 3500 m x 95 HP
is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	**1.300**	m
Top level of receiving chamber	**9.600**	m
Residual Head	**2.000**	m
TOTAL HGL REQUIRED AT END	**9.600**	m
FOOT VALVE LEVEL	**-5.490**	m
Static head including Residual Head	**17.090**	m
Number of reaches	**1**	
Length	**3500**	m

Combination	Pipes selected
I	300 DI K9
II	350 DI K9
III	400 DI K9
IV	450 DI K9
V	500 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	1.30											50.88	49.58	AT WET WELL
0	3500	9.60	3500	300	DI-K9	140	8292	1.955	98	35.71	3.57	39.28	11.60	2.00	AT STP SITE
									TOTAL	**35.71**	**3.57**	**39.28**			
Combination II															
	0	1.3											30.11	28.81	AT WET WELL
0	3500	9.6	3500	350	DI-K9	140	8292	1.436	208	16.83	1.68	18.51	11.60	2.00	AT STP SITE
									TOTAL	**16.83**	**1.68**	**18.51**			
Combination III															
	0	1.3											21.27	19.97	AT WET WELL
0	3500	9.6	3500	400	DI-K9	140	8292	1.1	398	8.79	0.88	9.67	11.60	2.00	AT STP SITE
									TOTAL	**8.79**	**0.88**	**9.67**			

Combination IV															
	0	1.3											17.05	15.75	AT WET WELL
0	3500	9.6	3500	450	DI-K9	140	8292	0.869	707	4.95	0.50	5.45	11.60	2.00	AT STP SITE
									TOTAL	**4.95**	**0.50**	**5.45**			
Combination V															
	0	1.3											14.87	13.57	AT WET WELL
0	3500	9.6	3500	500	DI-K9	140	8292	0.704	1180	2.97	0.30	3.27	11.60	2.00	AT STP SITE
									TOTAL	**2.97**	**0.30**	**3.27**			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		**GL**	**Distance (m)**	**Pipe**			**Disc. In lpm**	**Velcity-mps**	**Grade**	**Friction Loss**	**OL**	**TL**	**HGL**	**RH**	**REMARKS**
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	1.3											57.99	56.69	AT WET WELL
0	3500	9.6	3500	300	DI-K9	140	9056	2.135	83	42.17	4.22	46.39	11.60	2.00	AT STP SITE
									TOTAL	**42.17**	**4.22**	**46.39**			
Combination II															
	0	1.3											33.48	32.18	AT WET WELL
0	3500	9.6	3500	350	DI-K9	140	9056	1.569	176	19.89	1.99	21.88	11.60	2.00	AT STP SITE
									TOTAL	**19.89**	**1.99**	**21.88**			
Combination III															
	0	1.3											23.00	21.70	AT WET WELL
0	3500	9.6	3500	400	DI-K9	140	9056	1.201	338	10.36	1.04	11.40	11.60	2.00	AT STP SITE
									TOTAL	**10.36**	**1.04**	**11.40**			
Combination IV															
	0	1.3											18.01	16.71	AT WET WELL
0	3500	9.6	3500	450	DI-K9	140	9056	0.949	600	5.83	0.58	6.41	11.60	2.00	AT STP SITE
									TOTAL	**5.83**	**0.58**	**6.41**			
Combination V															
	0	1.3											15.44	14.14	AT WET WELL
0	3500	9.6	3500	500	DI-K9	140	9056	0.769	1003	3.49	0.35	3.84	11.60	2.00	AT STP SITE
									TOTAL	**3.49**	**0.35**	**3.84**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	17.09	35.71	3.571	56.37	42.17	4.217	63.48
II	17.09	16.83	1.683	35.60	19.89	1.989	38.97
III	17.09	8.79	0.879	26.76	10.36	1.036	28.49
IV	17.09	4.95	0.495	22.54	5.83	0.583	23.50
V	17.09	2.97	0.297	20.36	3.49	0.349	20.93

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	8292	56	146	150	9056	63	180	180
II	8292	36	92	95	9056	39	110	115
III	8292	27	69	70	9056	28	81	85
IV	8292	23	58	60	9056	24	67	70
V	8292	20	53	55	9056	21	59	60

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	150	50000	7500000	180	50000	9000000	2154528	9654528
II	95	46000	4370000	115	50000	5750000	1376504	5746504
III	70	46000	3220000	85	46000	3910000	936023	4156023
IV	60	46000	2760000	70	46000	3220000	770842	3530842
V	55	46000	2530000	60	46000	2760000	660722	3190722

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**	**10**					
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	146	956195	9561950	87291857	180	1175901	11759010	107349005	25698498		112990355
II	92	603896	6038960	55130181	110	721917	7219170	65904418	15776994		70907175
III	69	453918	4539180	41438561	81	527698	5276980	48174000	11532473		52971034
IV	58	382230	3822300	34894103	67	435359	4353590	39744294	9514468		44408571
V	53	345307	3453070	31523370	59	387719	3877190	35395198	8473329		39996699

TABLE 6. COST OF PIPE				
Combination No.	**Pipe Size and Type**	**Length**	**Rate of pipe/m**	**Total cost**
I	300 DI K9	3500	4251	14878500
		TOTAL		**14878500**
II	350 DI K9	3500	5188	18158000
		TOTAL		**18158000**
III	400 DI K9	3500	6226	21791000
		TOTAL		**21791000**
IV	450 DI K9	3500	7485	26197500
		TOTAL		**26197500**
V	500 DI K9	3500	8654	30289000
		TOTAL		**30289000**

TABLE 7. Cost of installation			
Combination No.	**Cost of Pumping main (Amount from Table.6)**	**Cost of Pumpset (Total cost from Table.4)**	**Total cost of installation**
1	*2*	*3*	*4. (2 + 3)*
I	14878500	9654528	24533028
II	18158000	5746504	23904504
III	21791000	4156023	25947023
IV	26197500	3530842	29728342
V	30289000	3190722	33479722

TABLE 8. Cost of installation and maintenance						
Combination No.	**Cost of Installation (Cost from Table.7)**	**Cost of Electrical Energy (Cost**	**Total cost installation & maintenance**	**Pipe Size and Type**	**Inter.** Pump set Cap.	**Ult.** Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	24533028	112990355	137523383	300 DI K9	150	180
II	23904504	70907175	94811679	350 DI K9	95	115
III	25947023	52971034	78918057	400 DI K9	70	85
IV	29728342	44408571	74136913	450 DI K9	60	70
V	**33479722**	**39996699**	**73476421**	**500 DI K9**	**55**	60

Hence Combination V consisting of 500 DI K9 3500 m x 55 HP is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	1.30	m
Top level of receiving chamber	9.60	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	9.60	m
FOOT VALVE LEVEL	-5.49	m
Static head including Residual Head	17.09	m
Number of reaches	1	
Length	3500	m

Combination	Pipes selected
I	300 DI K9
II	350 DI K9
III	400 DI K9
IV	450 DI K9
V	500 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.30											22.48	21.18	AT WET WELL
0	3500	9.60	3500	300	DI-K9	140	4146	0.978	354	9.89	0.99	10.88	11.60	2.00	AT STP SITE
									TOTAL	**9.89**	**0.99**	**10.88**			
Combination II															
	0	1.3											16.74	15.44	AT WET WELL
0	3500	9.6	3500	350	DI-K9	140	4146	0.718	750	4.67	0.47	5.14	11.60	2.00	AT STP SITE
									TOTAL	**4.67**	**0.47**	**5.14**			
Combination III															
	0	1.3											14.28	12.98	AT WET WELL
0	3500	9.6	3500	400	DI-K9	140	4146	0.55	1437	2.44	0.24	2.68	11.60	2.00	AT STP SITE
									TOTAL	**2.44**	**0.24**	**2.68**			

Combination IV															
	0	1.3											13.11	11.81	AT WET WELL
0	3500	9.6	3500	450	DI-K9	140	4146	0.434	2550	1.37	0.14	1.51	11.60	2.00	AT STP SITE
									TOTAL	**1.37**	**0.14**	**1.51**			
Combination V															
	0	1.3											12.50	11.20	AT WET WELL
0	3500	9.6	3500	500	DI-K9	140	4146	0.352	4261	0.82	0.08	0.90	11.60	2.00	AT STP SITE
									TOTAL	**0.82**	**0.08**	**0.90**			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		**GL**	**Distance (m)**	**Pipe**			**Disc. In lpm**	**Velcity-mps**	**Grade**	**Friction Loss**	**OL**	**TL**	**HGL**	**RH**	**REMARKS**
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	1.3											24.39	23.09	AT WET WELL
0	3500	9.6	3500	300	DI-K9	140	4528	1.068	301	11.63	1.16	12.79	11.60	2.00	AT STP SITE
									TOTAL	**11.63**	**1.16**	**12.79**			
Combination II															
	0	1.3											17.64	16.34	AT WET WELL
0	3500	9.6	3500	350	DI-K9	140	4528	0.784	637	5.49	0.55	6.04	11.60	2.00	AT STP SITE
									TOTAL	**5.49**	**0.55**	**6.04**			
Combination III															
	0	1.3											14.76	13.46	AT WET WELL
0	3500	9.6	3500	400	DI-K9	140	4528	0.601	1221	2.87	0.29	3.16	11.60	2.00	AT STP SITE
									TOTAL	**2.87**	**0.29**	**3.16**			
Combination IV															
	0	1.3											13.38	12.08	AT WET WELL
0	3500	9.6	3500	450	DI-K9	140	4528	0.474	2166	1.62	0.16	1.78	11.60	2.00	AT STP SITE
									TOTAL	**1.62**	**0.16**	**1.78**			
Combination V															
	0	1.3											12.67	11.37	AT WET WELL
0	3500	9.6	3500	500	DI-K9	140	4528	0.384	3619	0.97	0.10	1.07	11.60	2.00	AT STP SITE
									TOTAL	**0.97**	**0.10**	**1.07**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	17.09	9.89	0.989	27.97	11.6	1.163	29.88
II	17.09	4.67	0.467	22.23	5.49	0.549	23.13
III	17.09	2.44	0.244	19.77	2.87	0.287	20.25
IV	17.09	1.37	0.137	18.60	1.62	0.162	18.87
V	17.09	0.82	0.082	17.99	0.97	0.097	18.16

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	4146	28	36	40	4528	30	42	45
II	4146	22	29	30	4528	23	33	35
III	4146	20	26	30	4528	20	29	30
IV	4146	19	24	25	4528	19	27	30
V	4146	18	23	25	4528	18	26	30

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	40	47000	1880000	45	47000	2115000	506314	2386314
II	30	50000	1500000	35	50000	1750000	418936	1918936
III	30	50000	1500000	30	50000	1500000	359088	1859088
IV	25	50000	1250000	30	50000	1500000	359088	1609088
V	25	50000	1250000	30	50000	1500000	359088	1609088

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**	**10**					
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**		
I	36	237219	2372190	21655925	42	276756	2767560	25265291	6048310		27704235
II	29	188534	1885340	17211430	33	214216	2142160	19555961	4681542		21892971
III	26	167687	1676870	15308289	29	187553	1875530	17121873	4098840		19407130
IV	24	157754	1577540	14401497	27	174810	1748100	15958554	3820351		18221848
V	23	152591	1525910	13930162	26	168145	1681450	15350100	3674692		17604855

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	300 DI K9	3500	4251	14878500
		TOTAL		**14878500**
II	350 DI K9	3500	5188	18158000
		TOTAL		**18158000**
III	400 DI K9	3500	6226	21791000
		TOTAL		**21791000**
IV	450 DI K9	3500	7485	26197500
		TOTAL		**26197500**
V	500 DI K9	3500	8654	30289000
		TOTAL		**30289000**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	14878500	2386314	17264814
II	18158000	1918936	20076936
III	21791000	1859088	23650088
IV	26197500	1609088	27806588
V	30289000	1609088	31898088

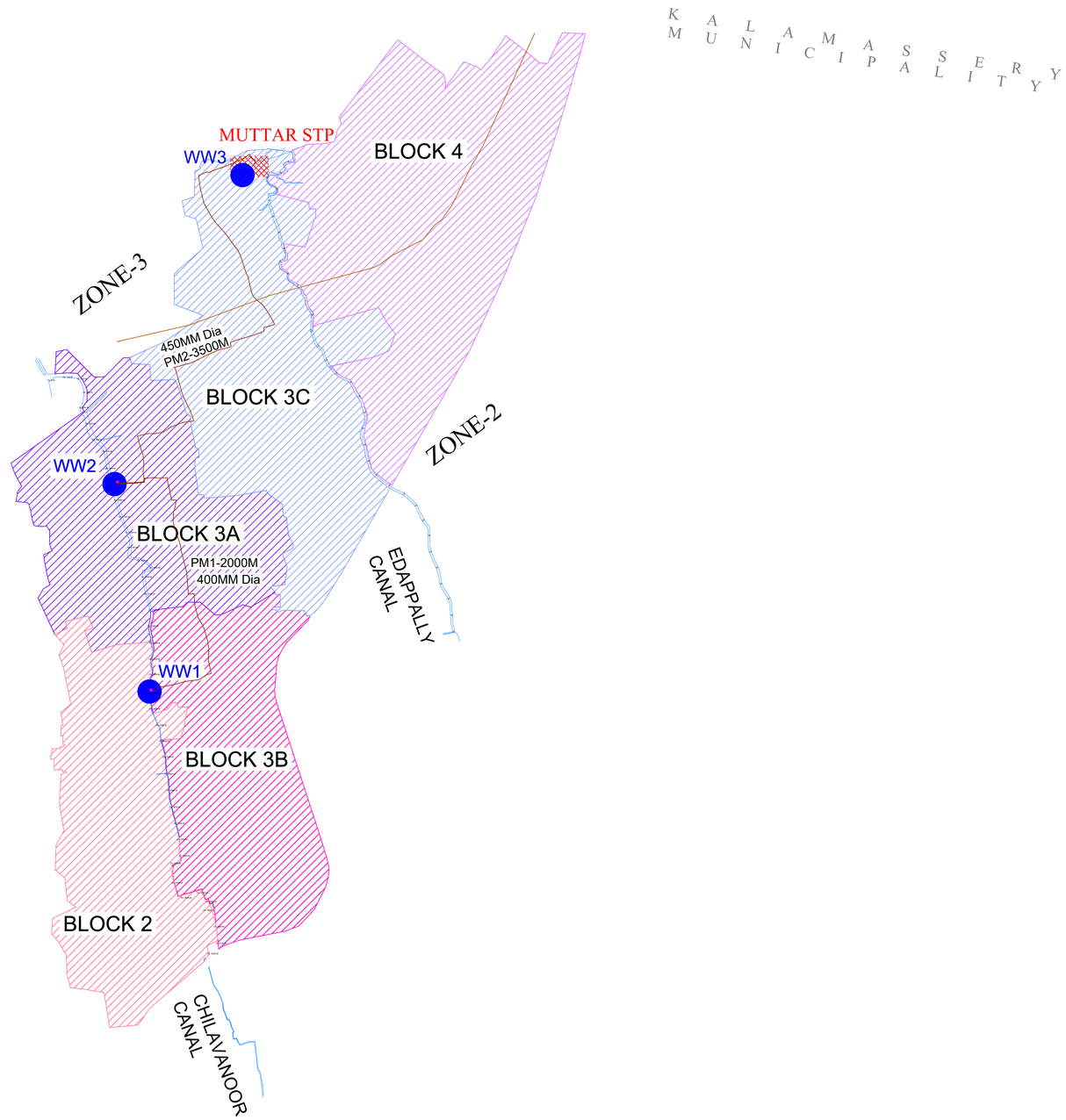
TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	17264814	27704235	44969049	300 DI K9	40	45
II	**20076936**	**21892971**	**41969907**	**350 DI K9**	**30**	**35**
III	23650088	19407130	43057218	400 DI K9	30	30
IV	27806588	18221848	46028436	450 DI K9	25	30
V	31898088	17604855	49502943	500 DI K9	25	30

Hence Combination II
consisting of 350 DI K9 3500 m x 30 HP
is found to be economical

ANNEXURE 6

DRAWINGS : SEWER NETWORK

ZONE II,III MUTTAR STP 16.50MLD BLOCKS,PUMPING MAINS, STP LOCATION, AND WET WELLS



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LEGEND

- EXISTING CANAL BOUNDARY
- PUMPING MAIN
- RAILWAY LINE
- WET WELLS
- PROPOSED STP AREA, MUTTAR

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III
KEY PLAN WITH BLOCKS, PM, WW , AND STP LOCATION

DATE: 18/10/2022

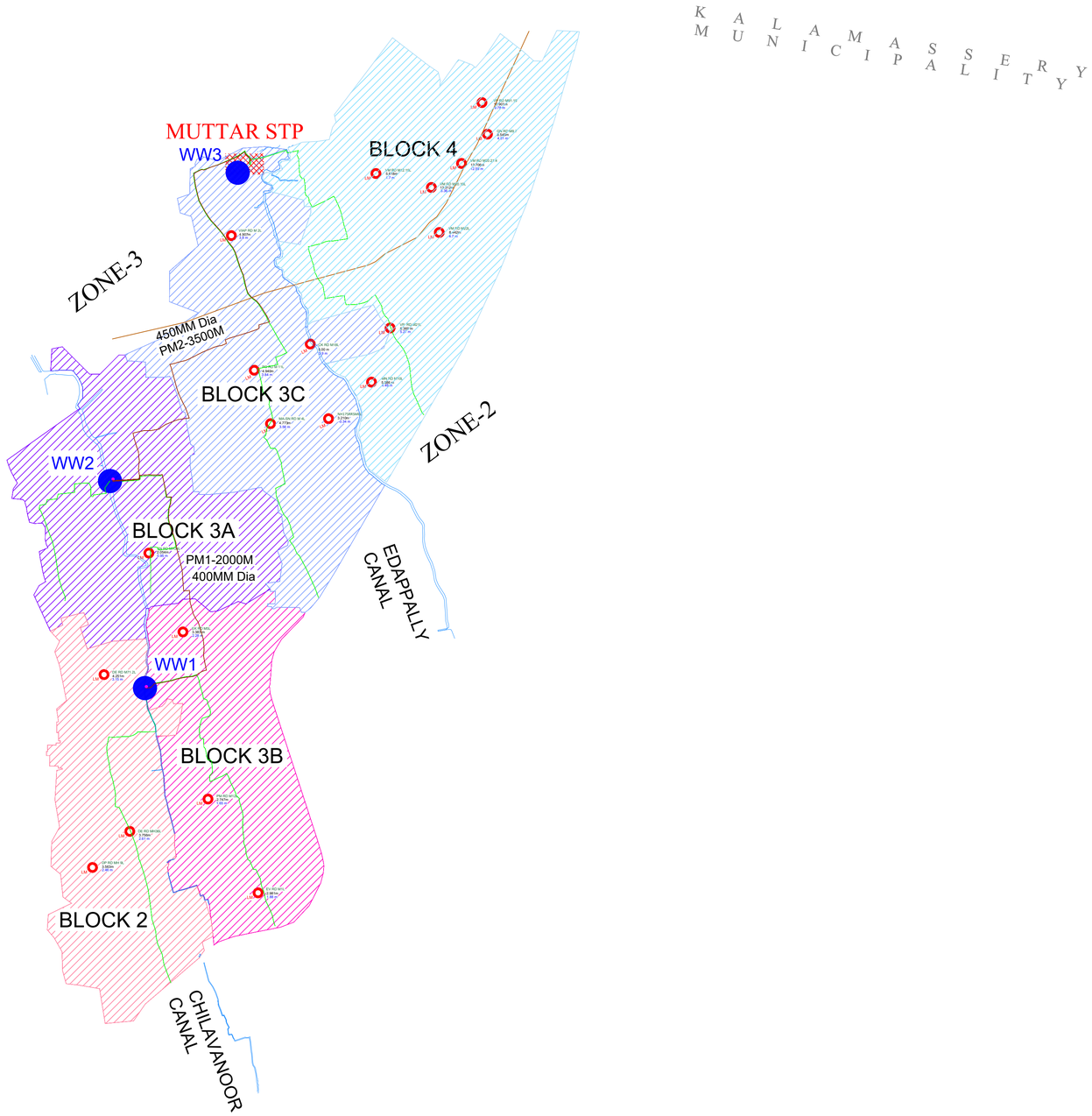
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1784

DIMENSIONS: in MTS

SHEET: 1 OF 1

ZONE II,III MUTTAR STP 16.50MLD BLOCKS, PUMPING STATIONS, PUMPING MAINS, STP, TRUNK MAINS, AND LIFTING MANHOLES



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LEGEND

- EXISTING CANAL BOUNDARY
- PUMPING MAIN
- TRUNK MAIN
- RAILWAY LINE
- TEXT — MANHOLE ID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

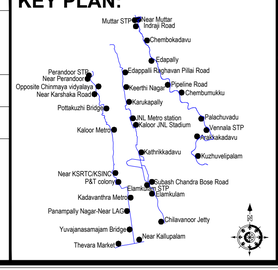
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III
KEY PLAN WITH PM, TM, WW, LIFTING MANHOLES, AND STP LOCATION

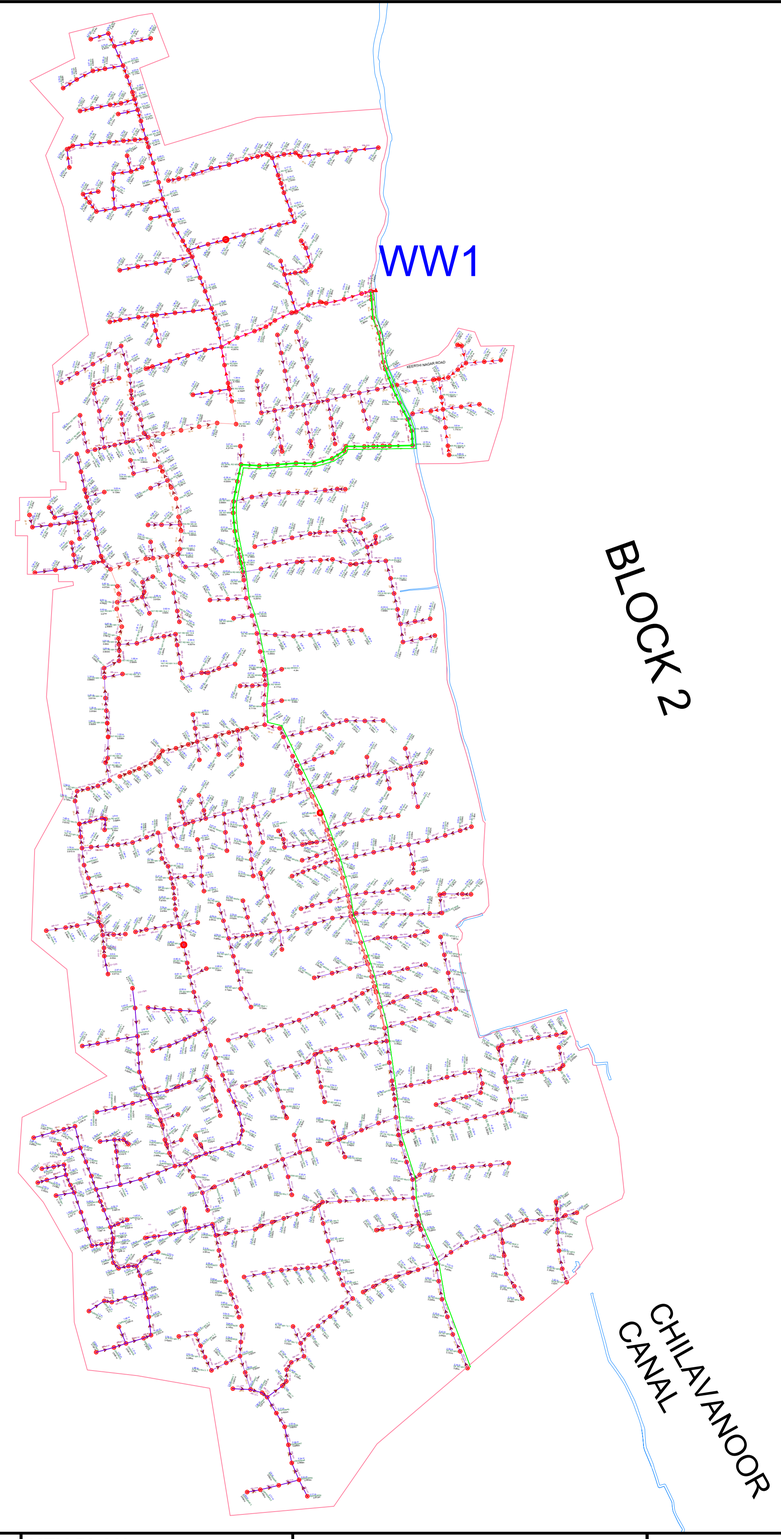
DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1785

DIMENSIONS: in MTS

SHEET: 1 OF 1



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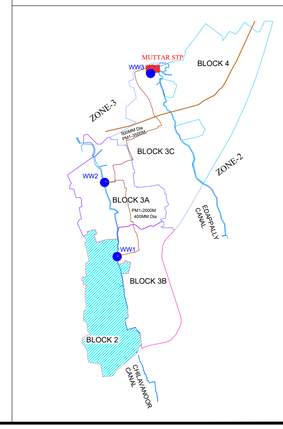
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

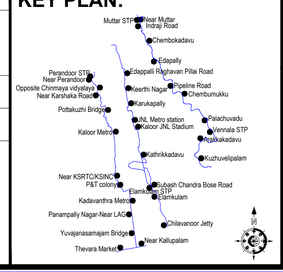
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM-BLOCK 2 SHEET-002

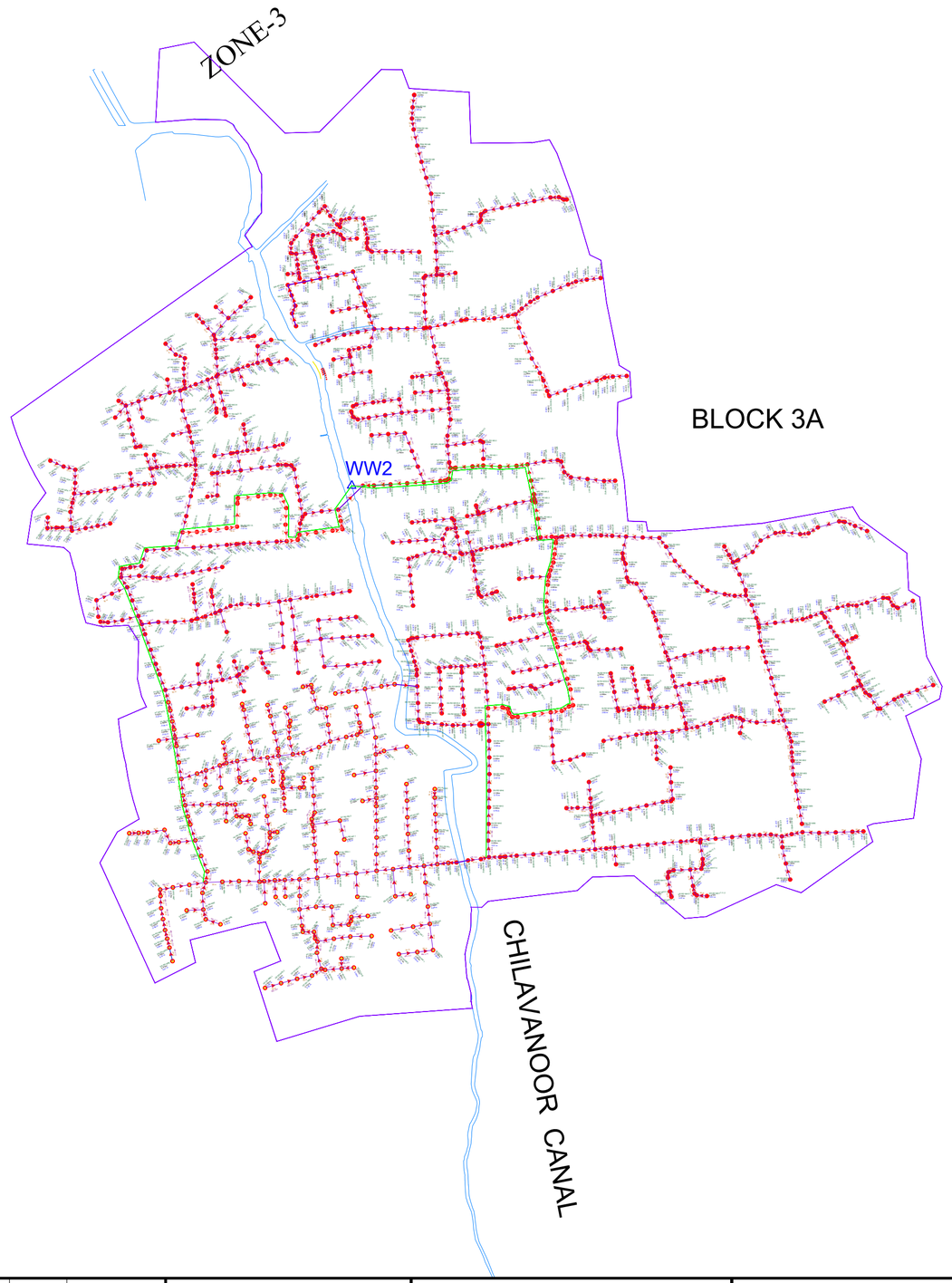
DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 1



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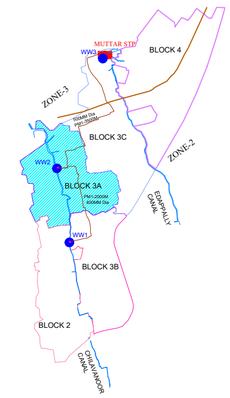
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

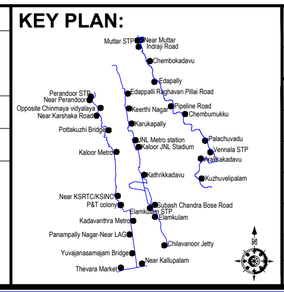
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM-BLOCK 3A SHEET-003

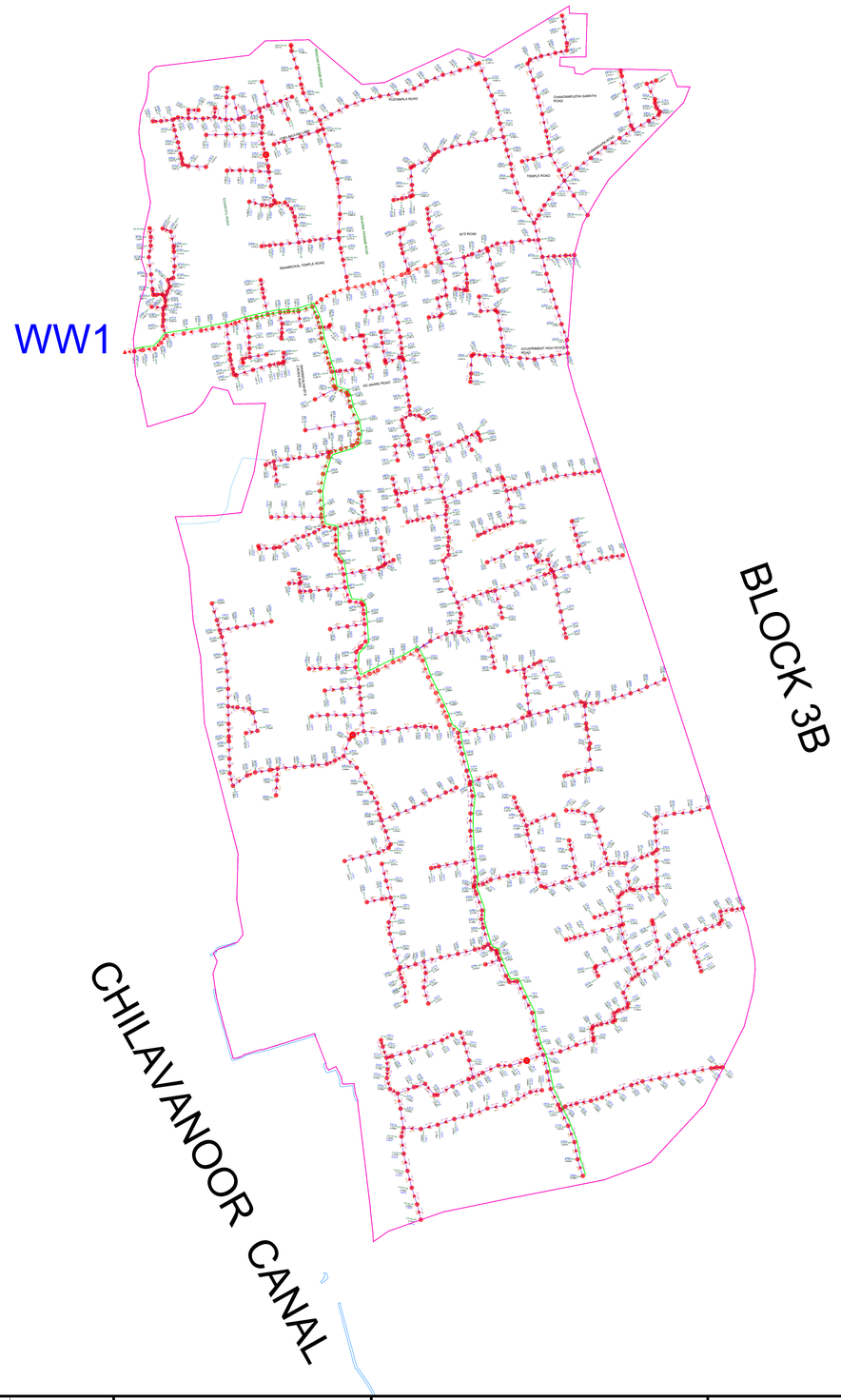
DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 1



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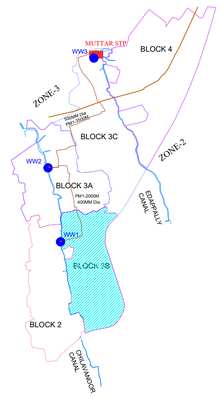
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

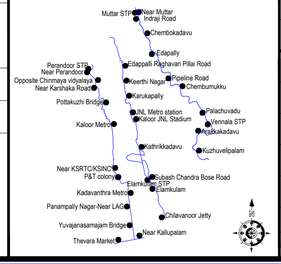
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

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REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM-BLOCK 3B SHEET-004

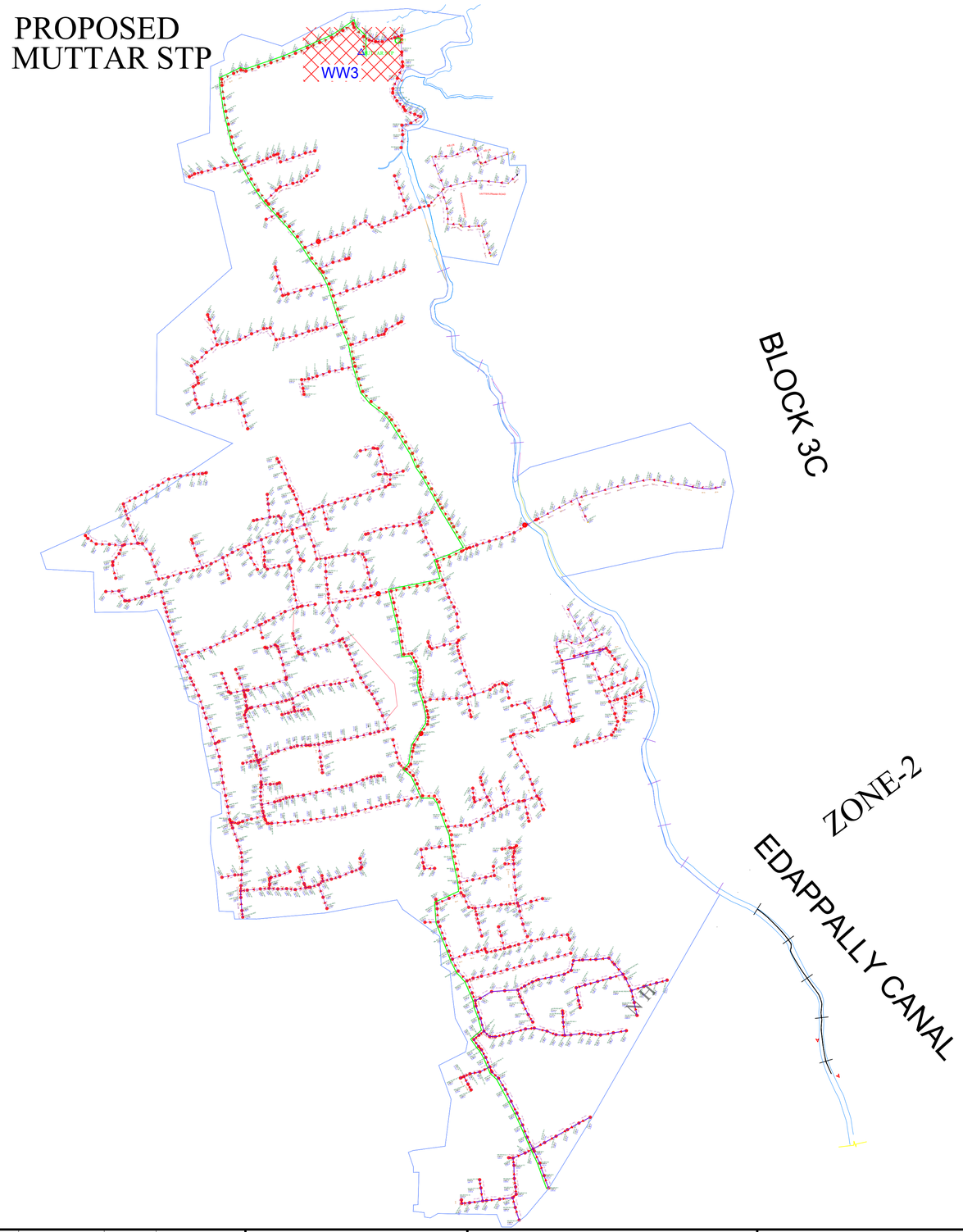
DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 1



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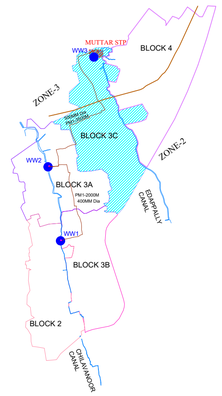
- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

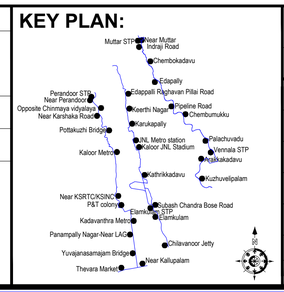
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM-BLOCK 3C SHEET-005

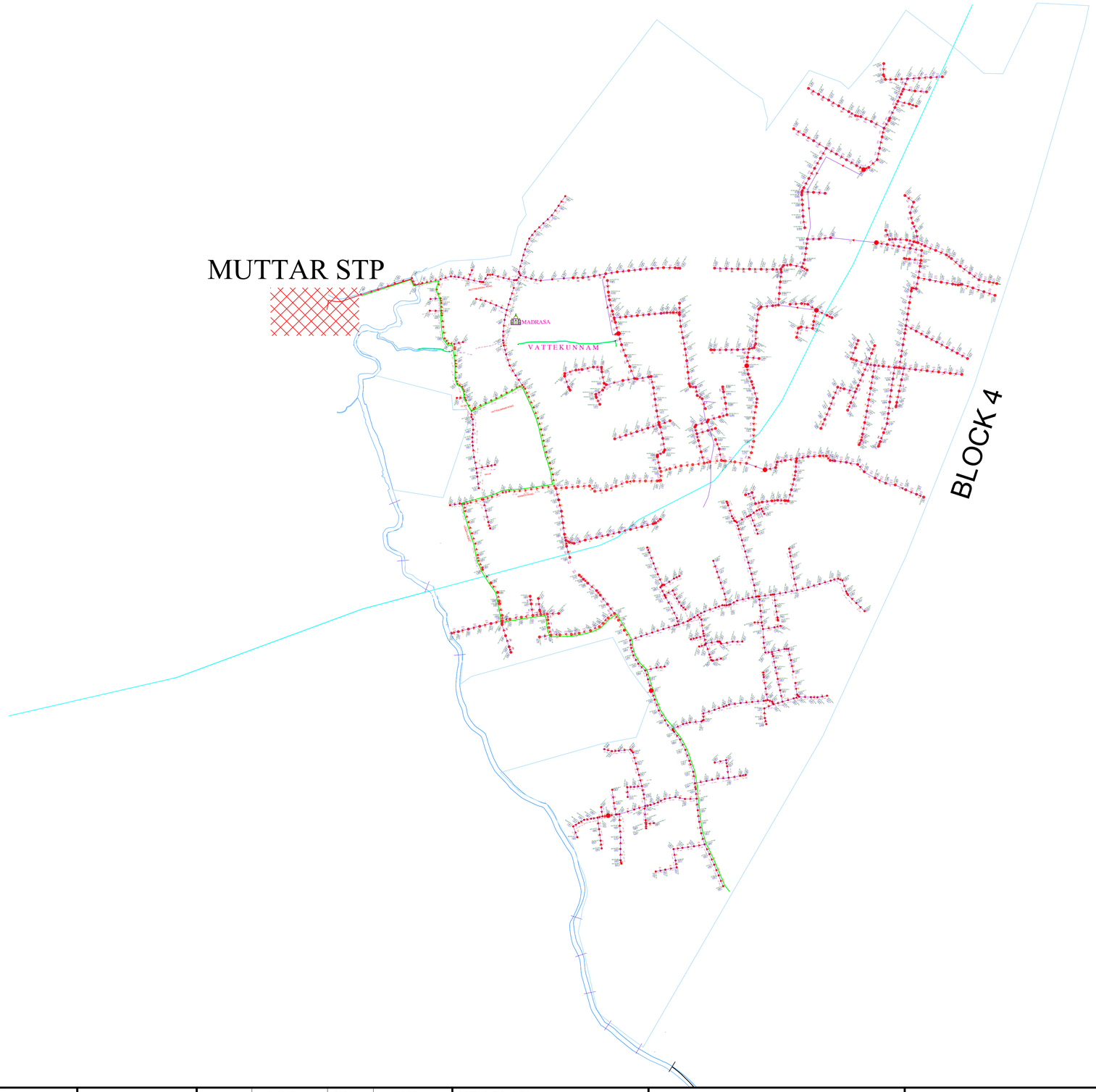
DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 1



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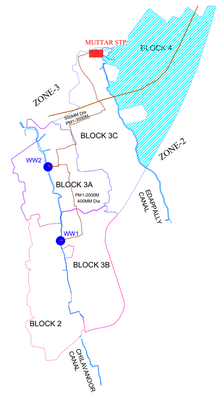
- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	31/08/2022
APPROVED	RENUKA MENON	RM	03/09/2022

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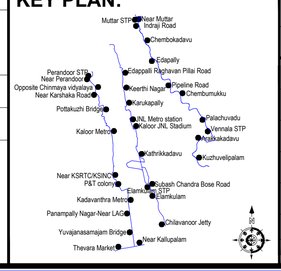


NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM-BLOCK 4 SHEET-006

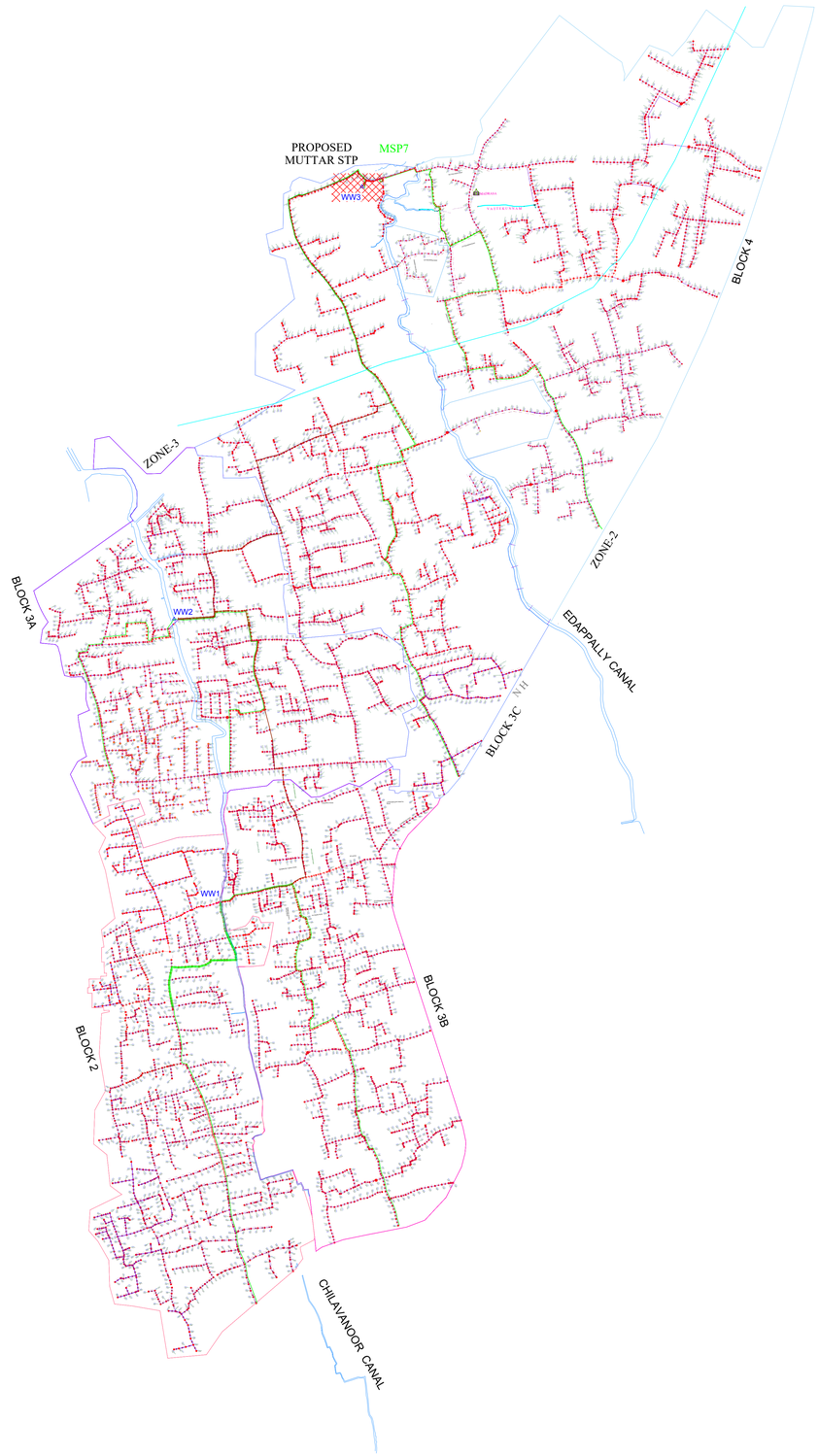
DATE: 05/09/2022

REV.: R3

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 1



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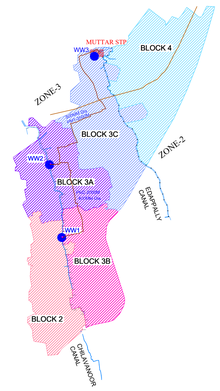
- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

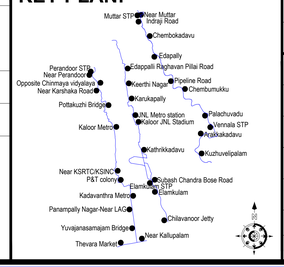
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-001

DATE: 18/10/2022

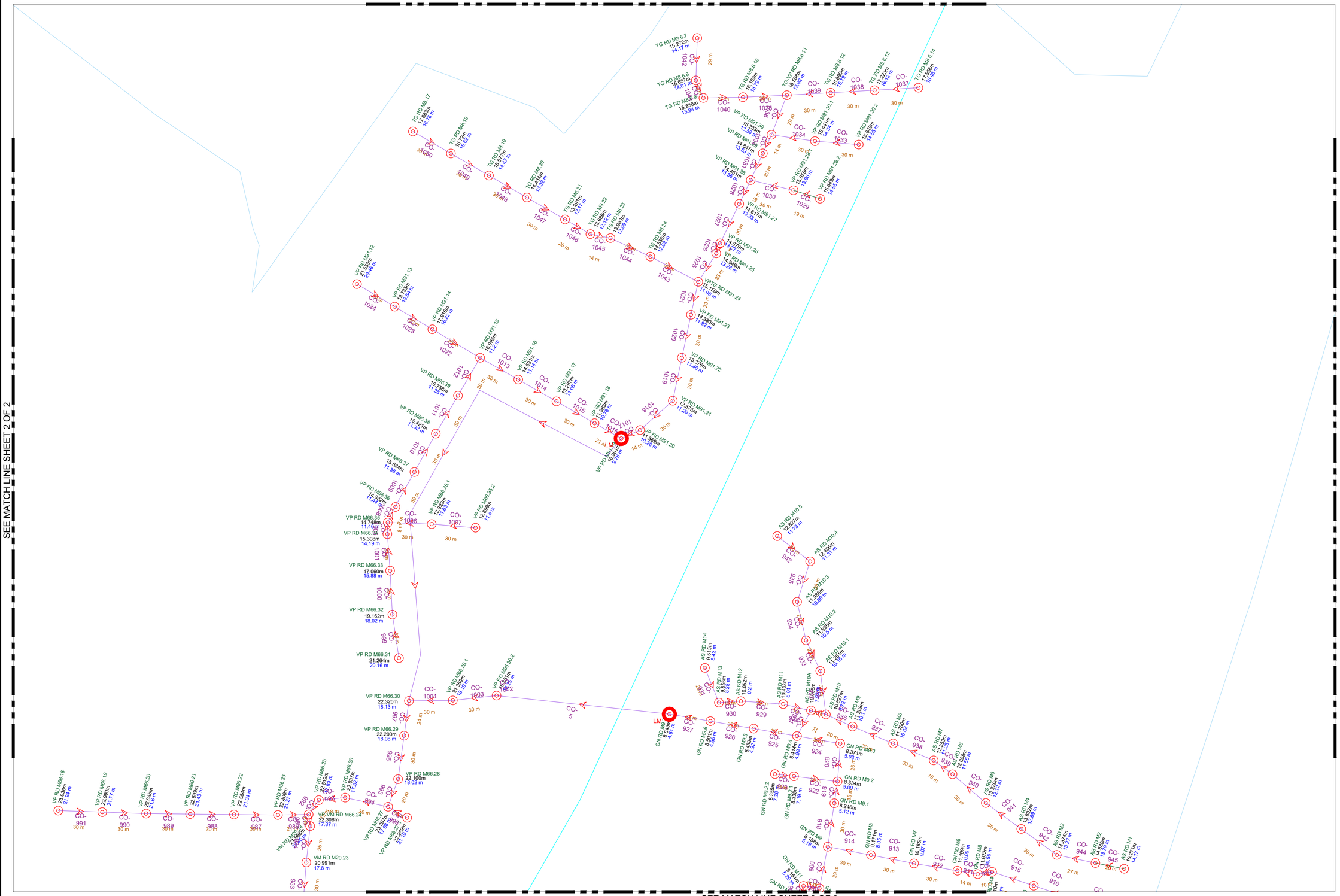
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 1

SEE MATCH LINE SHEET 2 OF 2



SEE MATCH LINE SHEET 3 OF 3

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- 200mm Dia PIPE
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- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
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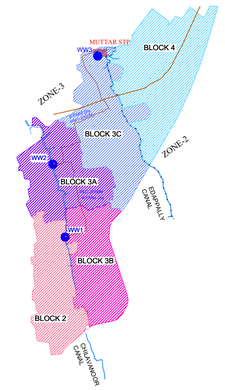
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

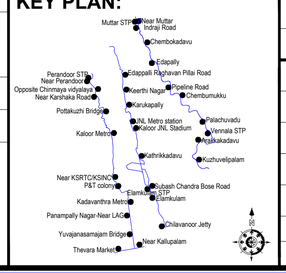
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-01

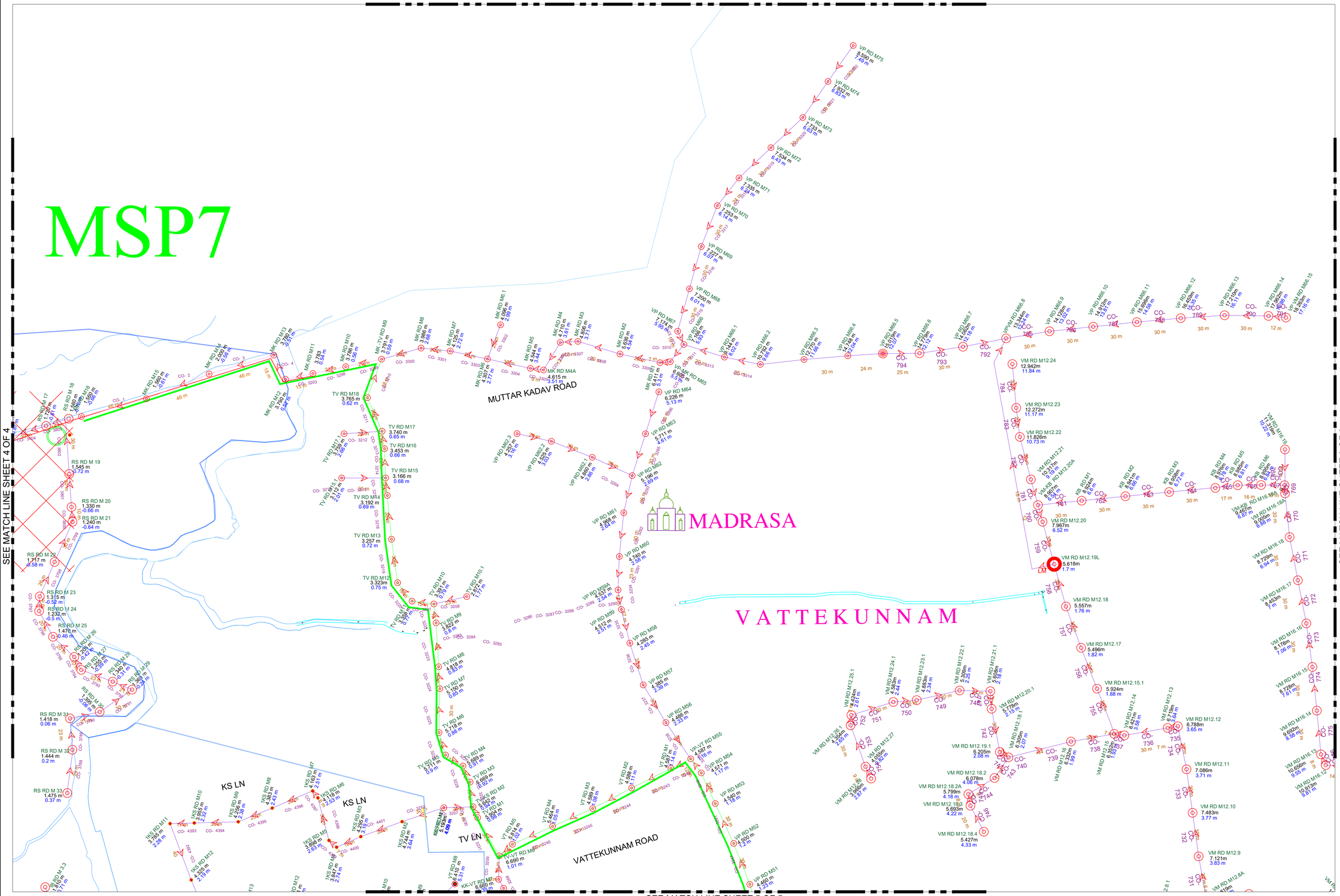
DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 1 OF 24



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- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
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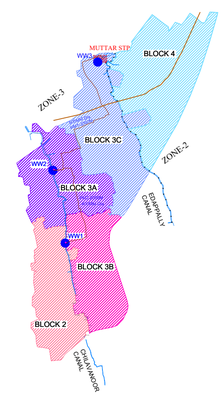
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

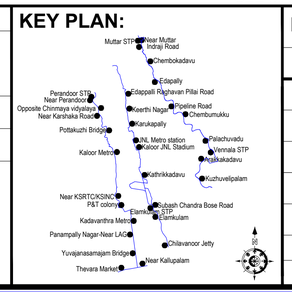
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-02

DATE: 18/10/2022

REV.: R4

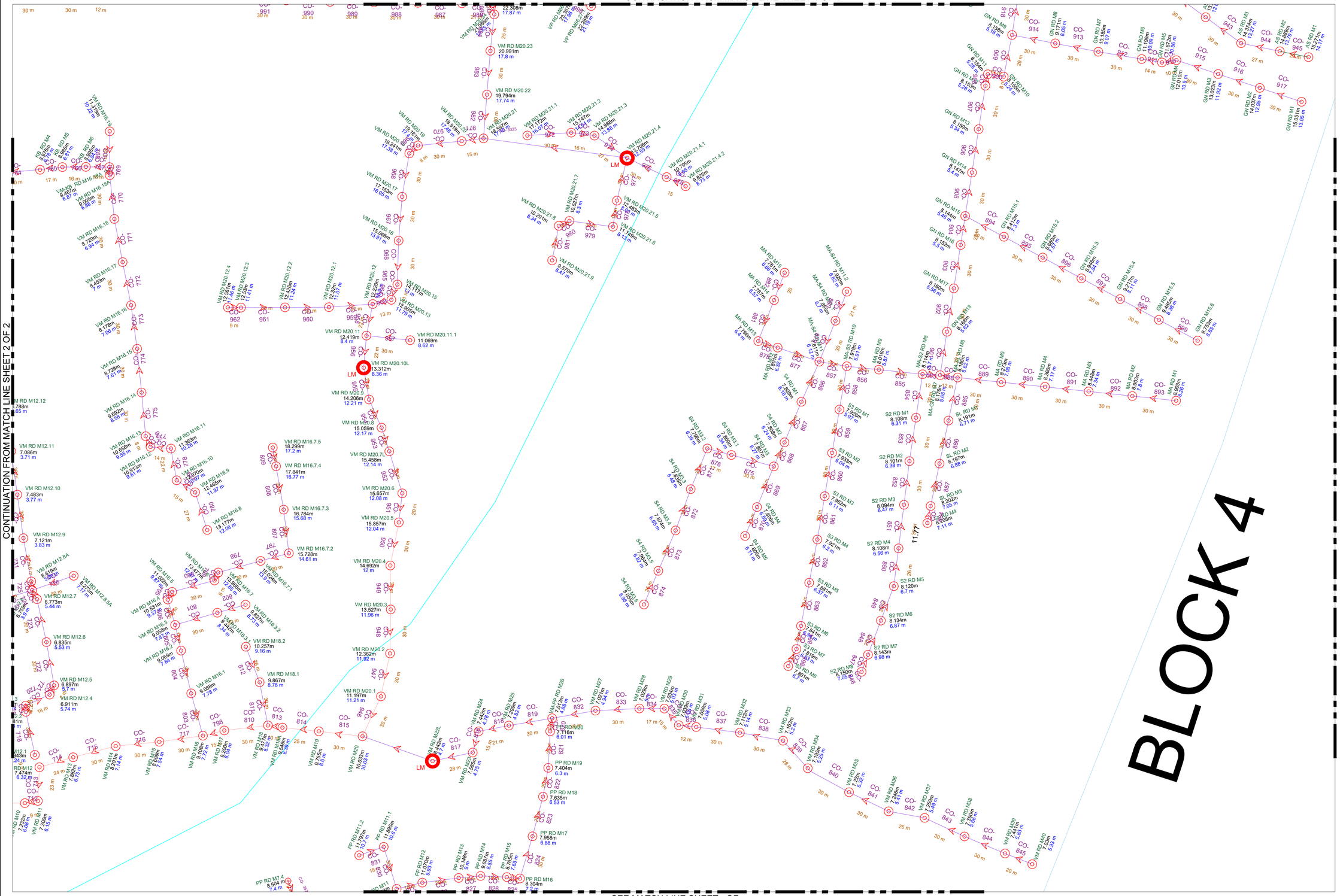
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 2 OF 24

CONTINUATION FROM MATCH LINE SHEET 1 OF 1

CONTINUATION FROM MATCH LINE SHEET 2 OF 2



SEE MATCH LINE SHEET - OF -

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- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
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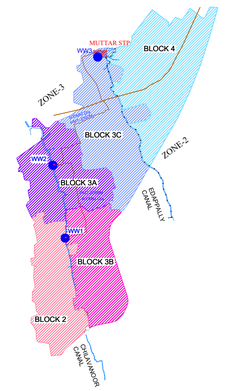
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

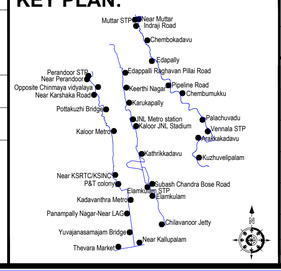
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-03

DATE: 18/10/2022

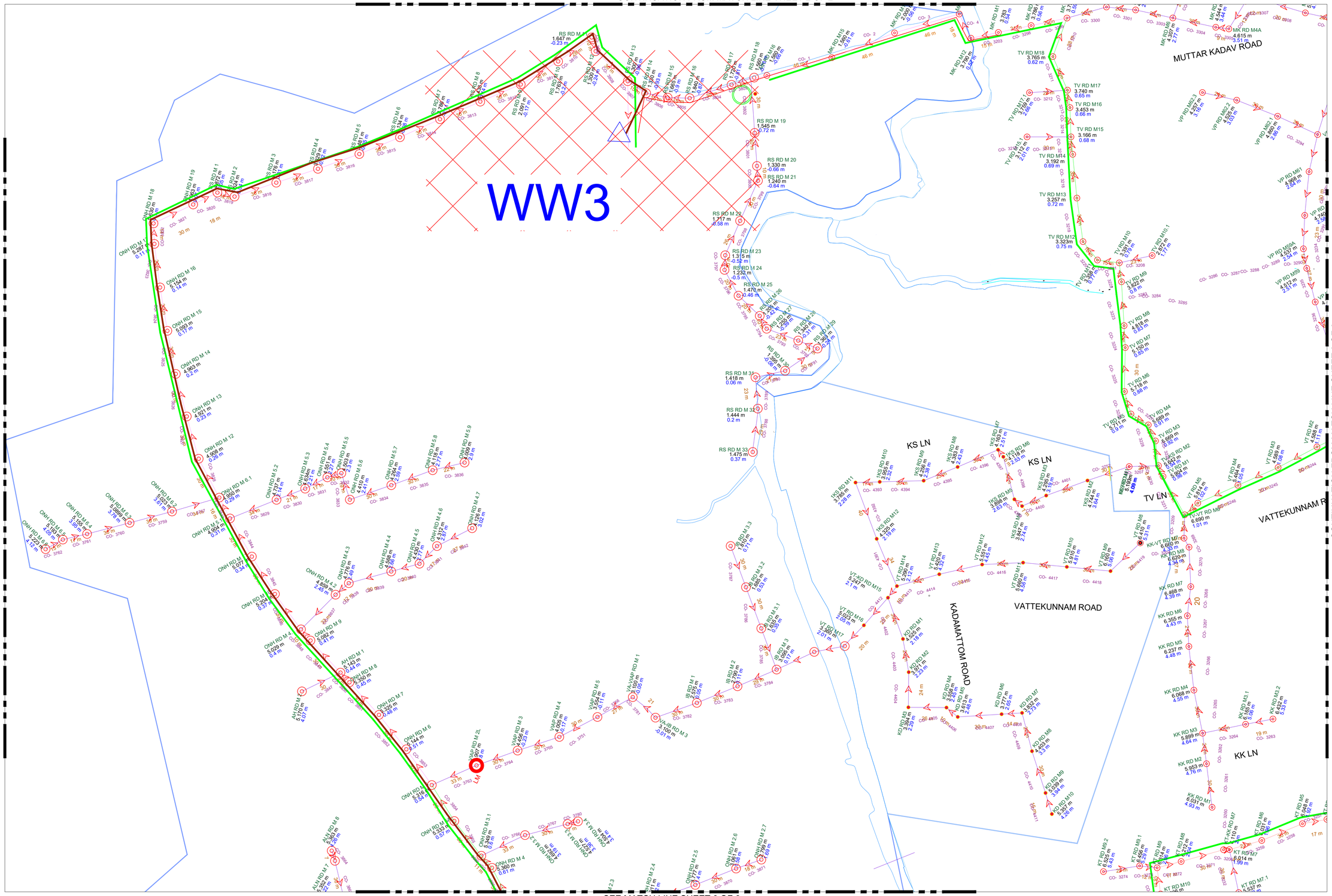
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 3 OF 24

CONTINUATION FROM MATCH LINE SHEET 2 OF 2



SEE MATCH LINE SHEET 6 OF 6

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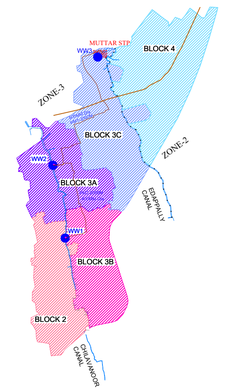
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

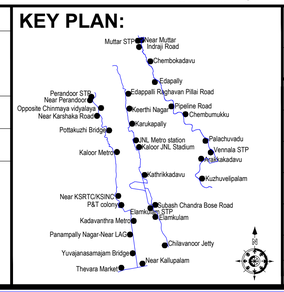
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-04

DATE: 18/10/2022

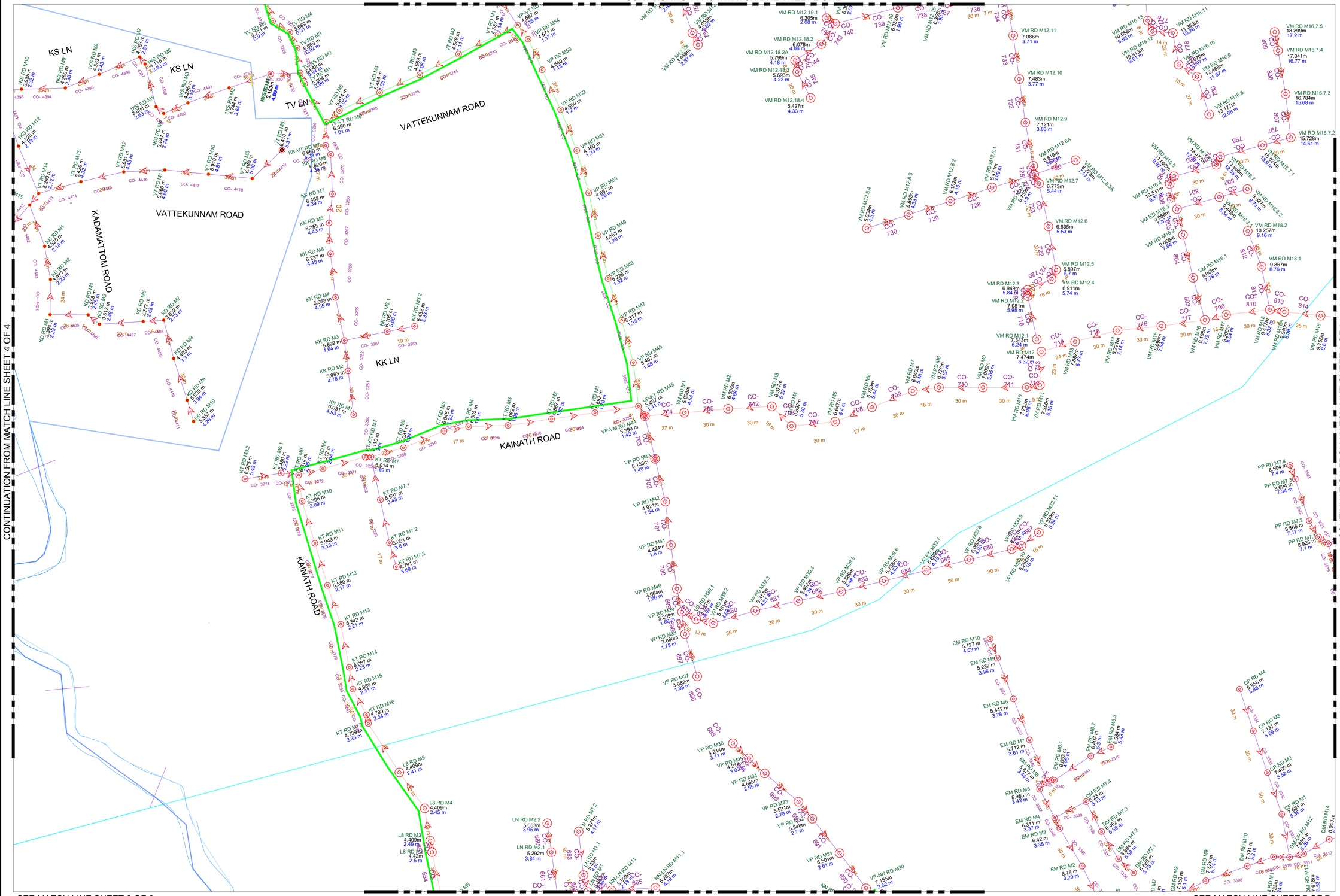
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 4 OF 24

CONTINUATION FROM MATCH LINE SHEET 2 OF 2



SEE MATCH LINE SHEET 6 OF 6

SEE MATCH LINE SHEET 7 OF 7

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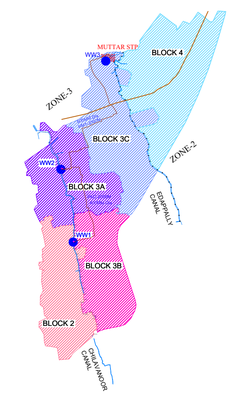
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

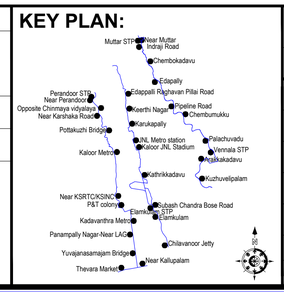
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-05

DATE: 18/10/2022

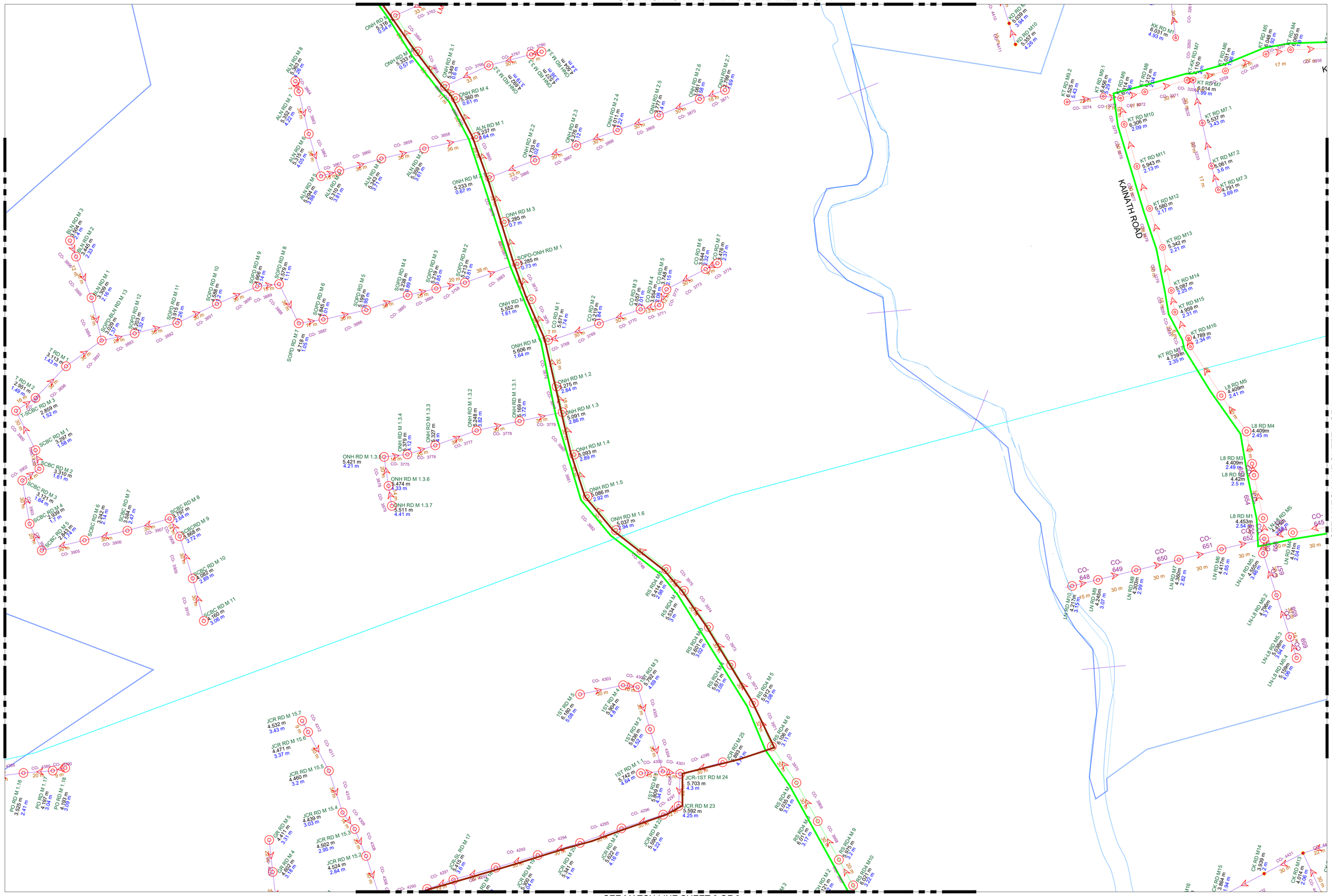
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 5 OF 24

CONTINUATION FROM MATCH LINE SHEET 4 OF 4



SEE MATCH LINE SHEET 9 OF 9

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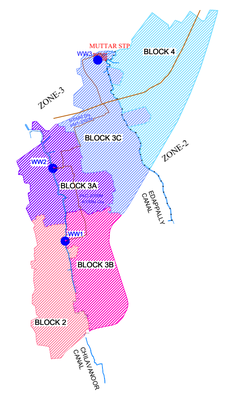
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

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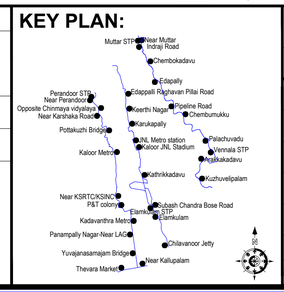


NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-06

DATE: 18/10/2022

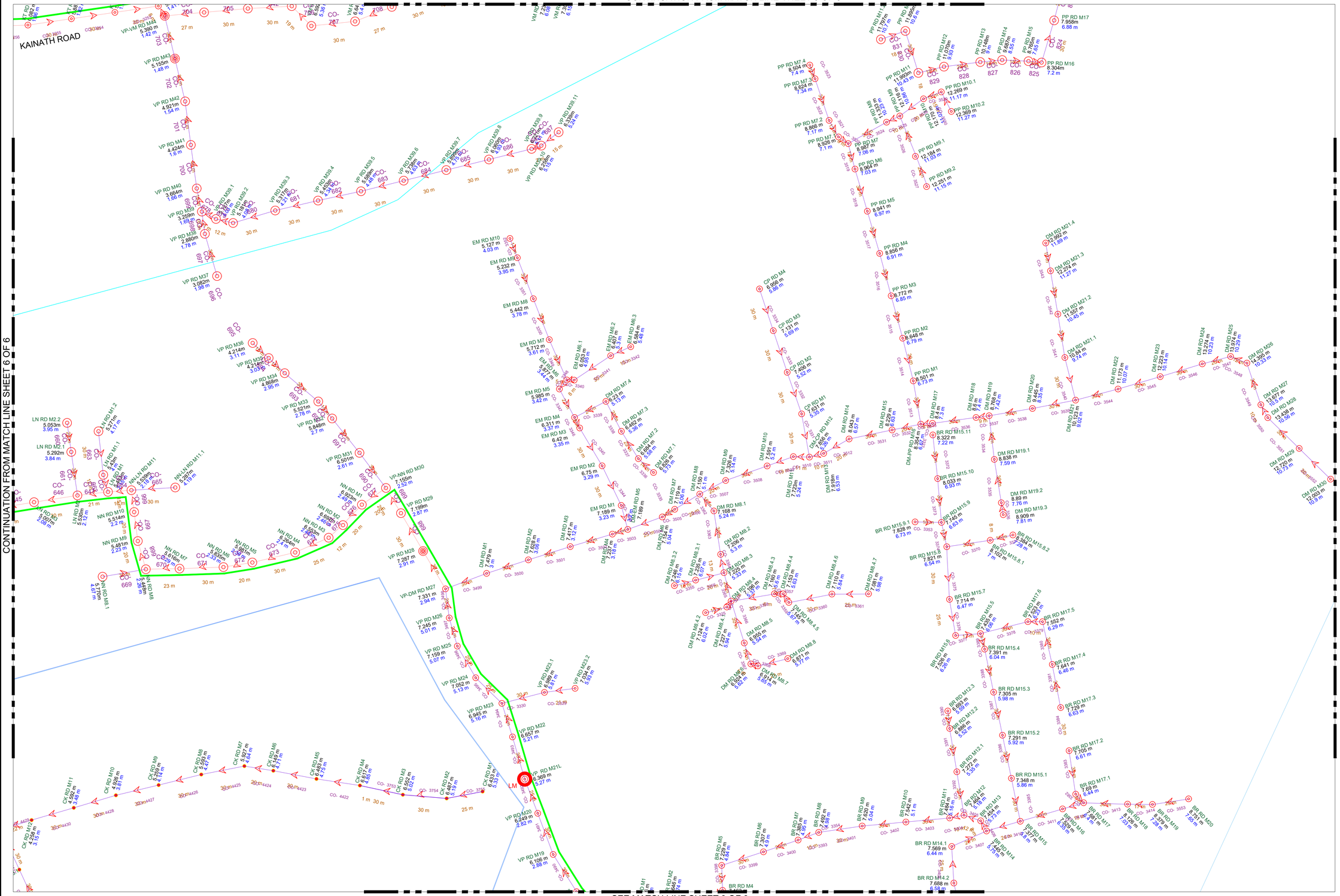
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 6 OF 24

CONTINUATION FROM MATCH LINE SHEET 5 OF 5



SEE MATCH LINE SHEET 8 OF 8

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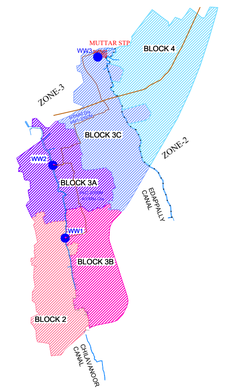
- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

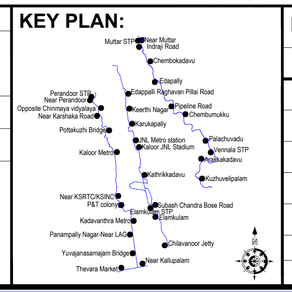
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-07

DATE: 18/10/2022

REV.: R4

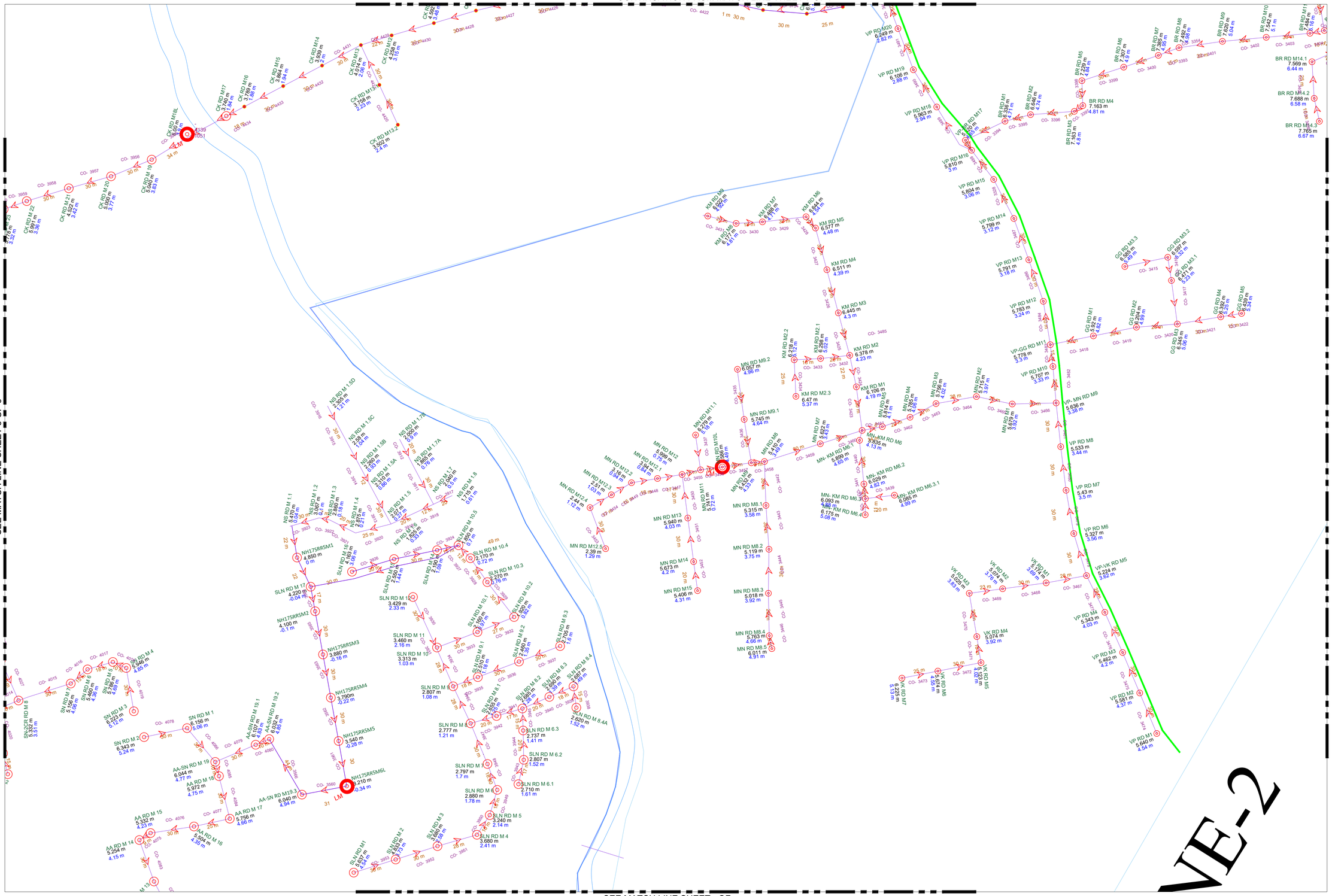
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 7 OF 24

CONTINUATION FROM MATCH LINE SHEET 7 OF 7

SEE MATCH LINE SHEET 9 OF 9



SEE MATCH LINE SHEET - OF -

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

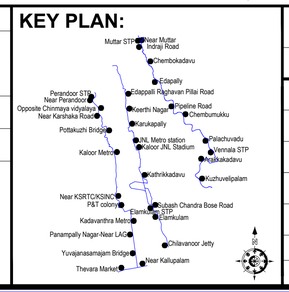
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

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R0	EDAPALLY & CHILAVANNOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANNOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-08

DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 8 OF 24

CONTINUATION FROM MATCH LINE SHEET 6 OF 6

CONTINUATION FROM MATCH LINE SHEET 8 OF 8

SEE MATCH LINE SHEET 11 OF 11

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- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
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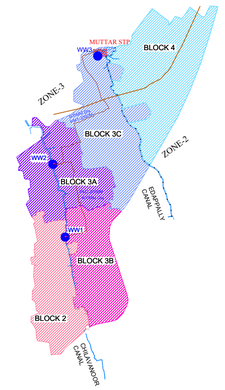
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-10

DATE: 18/10/2022

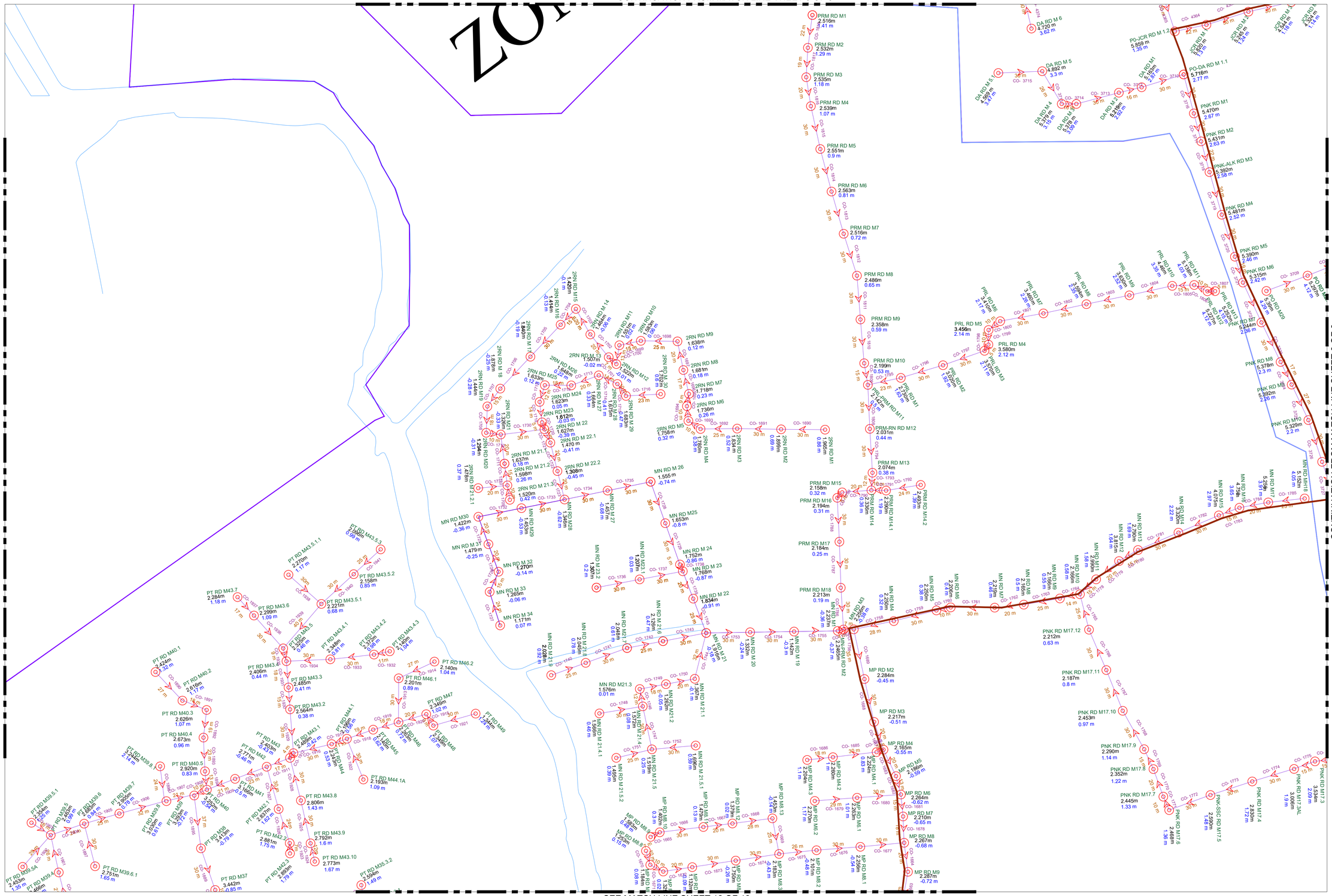
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 9 OF 24

CONTINUATION FROM MATCH LINE SHEET 9 OF 9



SEE MATCH LINE SHEET 12 OF 12

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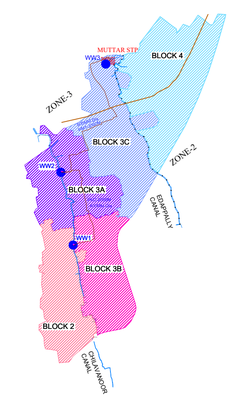
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
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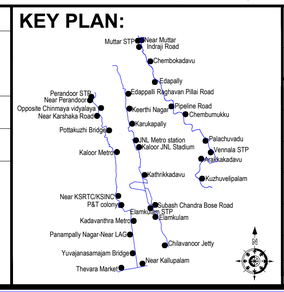
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-10

DATE: 18/10/2022

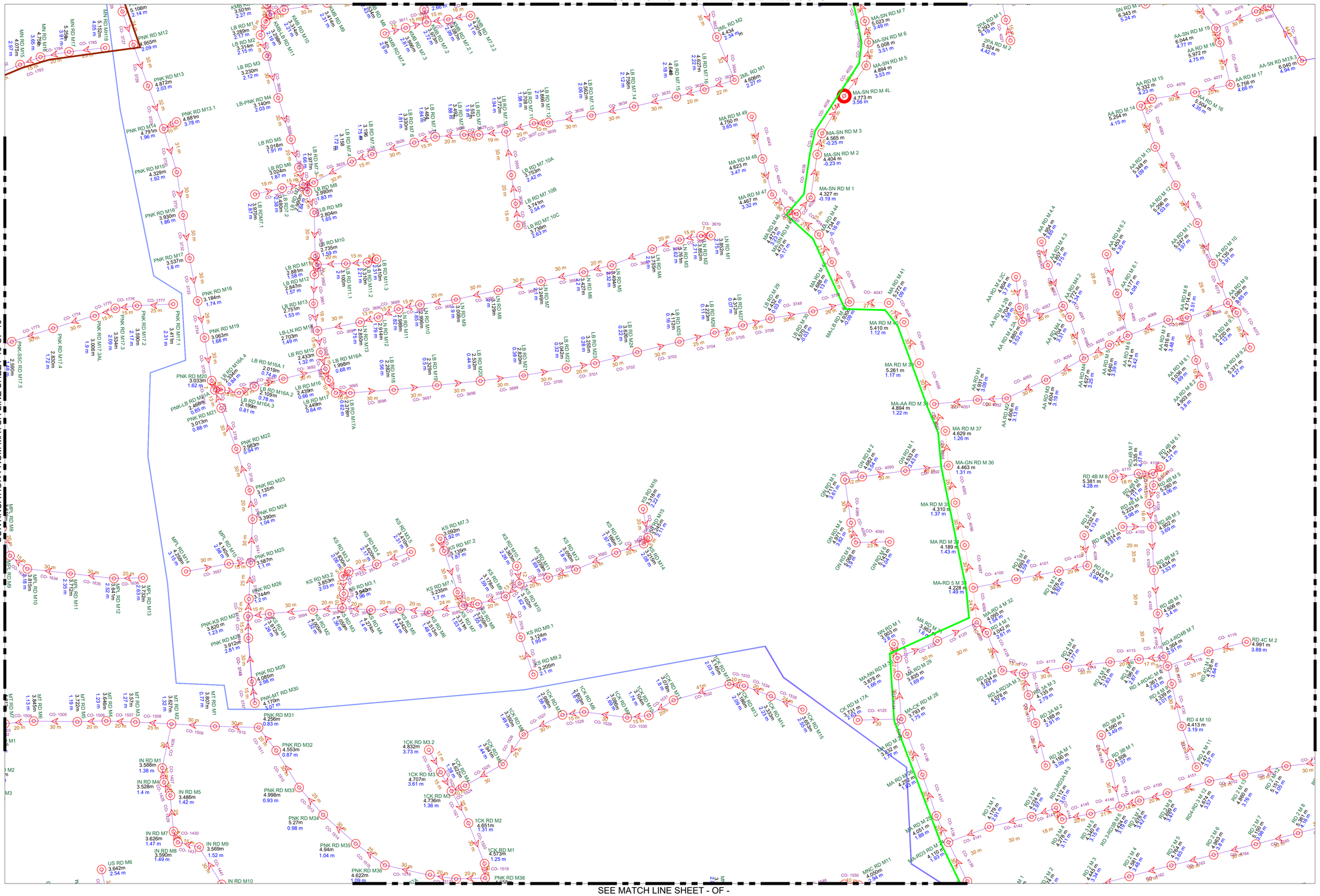
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 10 OF 24

CONTINUATION FROM MATCH LINE SHEET 9 OF 9



CONTINUATION FROM MATCH LINE SHEET 10 OF 10

SEE MATCH LINE SHEET - OF -

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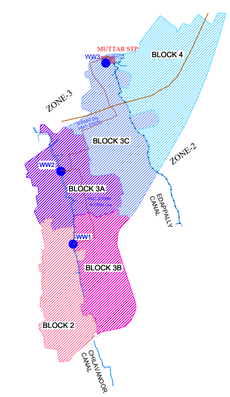
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

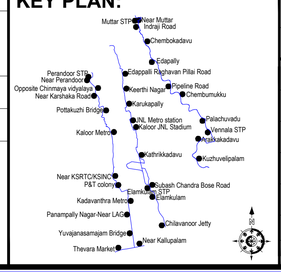
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-11

DATE: 18/10/2022

REV.: R4

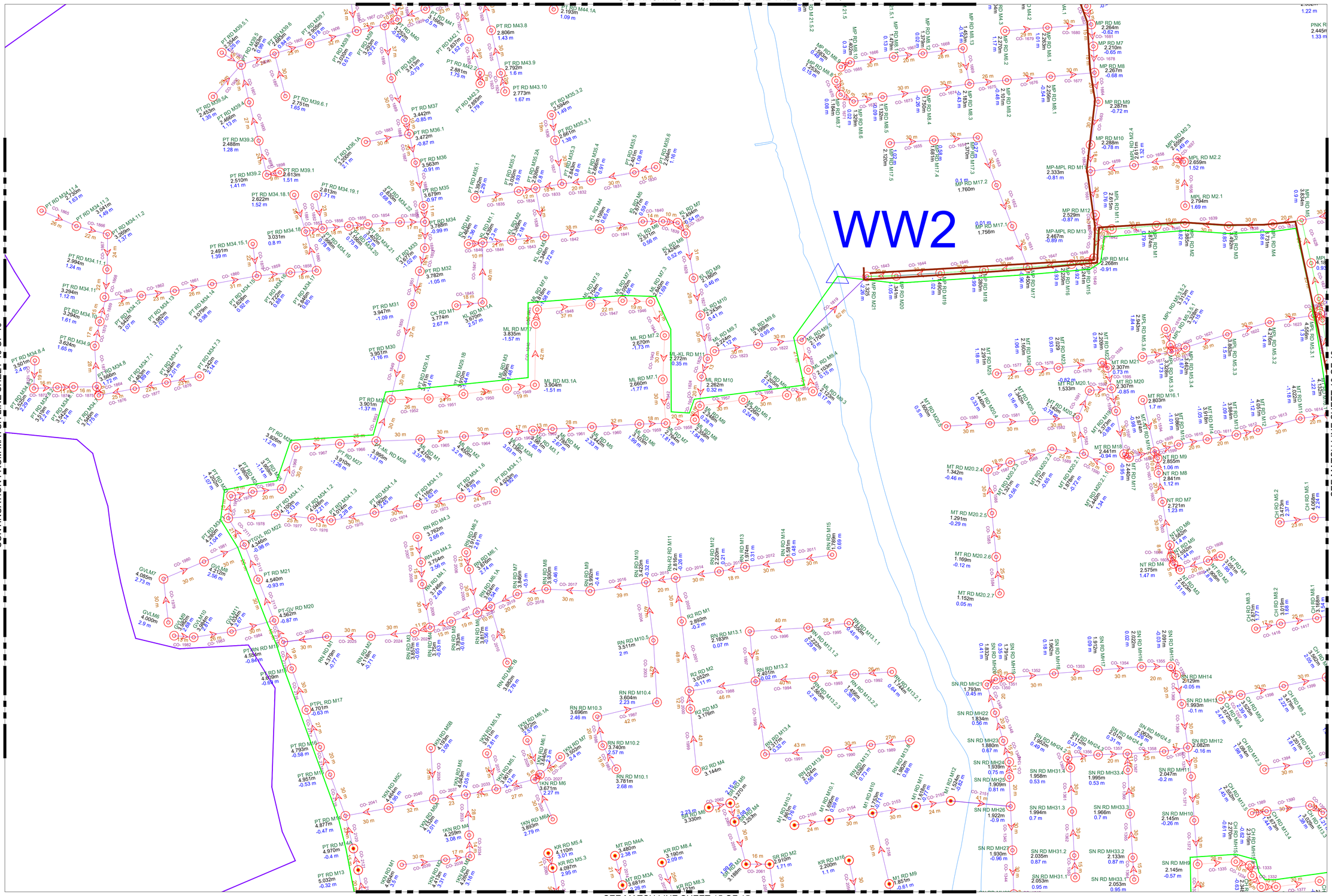
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 11 OF 24

CONTINUATION FROM MATCH LINE SHEET 10 OF 10

CONTINUATION FROM MATCH LINE SHEET 10 OF 10



SEE MATCH LINE SHEET 13 OF 13

SEE MATCH LINE SHEET 15 OF 15

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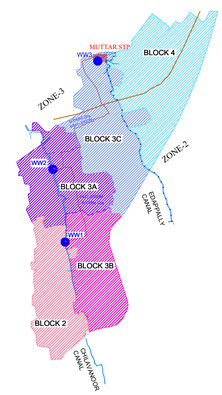
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

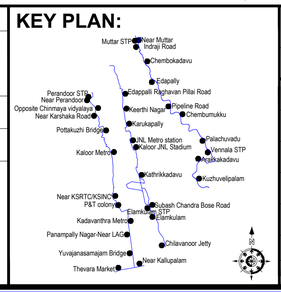
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-12

DATE: 18/10/2022

REV.: R4

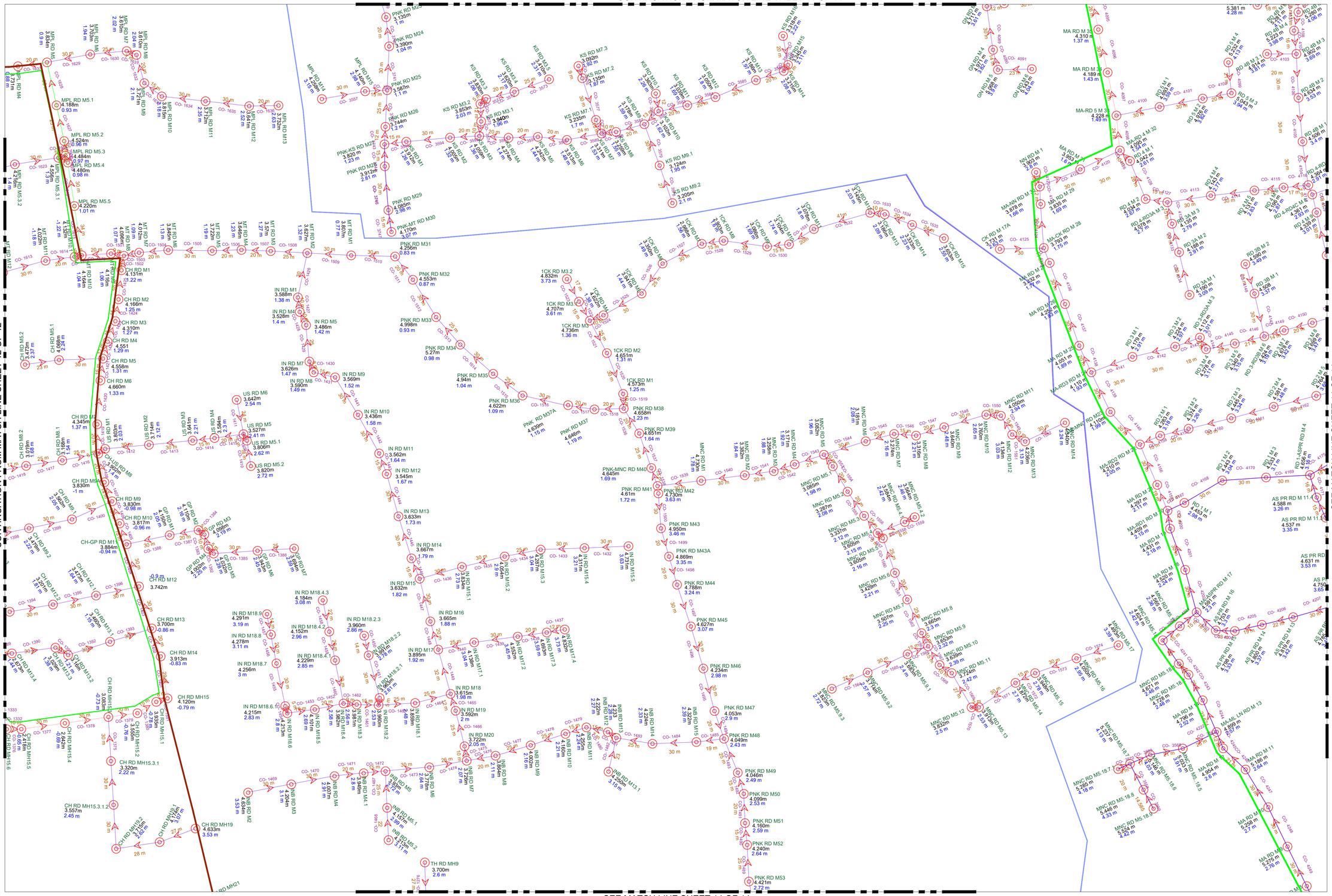
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 12 OF 24

CONTINUATION FROM MATCH LINE SHEET 11 OF 11

CONTINUATION FROM MATCH LINE SHEET 12 OF 12



SEE MATCH LINE SHEET 14 OF 14

SEE MATCH LINE SHEET 14 OF 14

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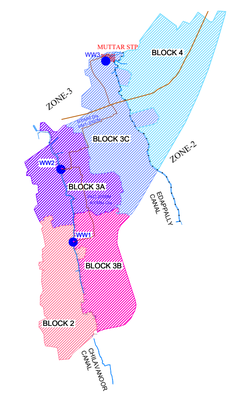
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

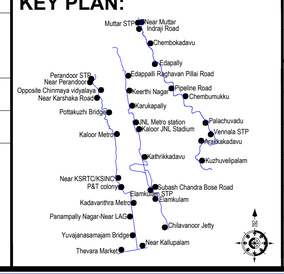
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-13

DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 13 OF 24

CONTINUATION FROM MATCH LINE SHEET 13 OF 13

CONTINUATION FROM MATCH LINE SHEET 13 OF 13

SEE MATCH LINE SHEET 16 OF 16

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LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
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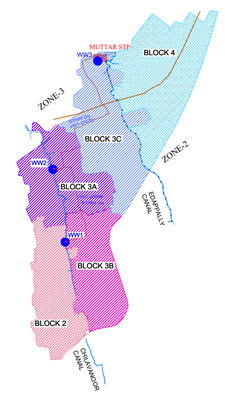
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

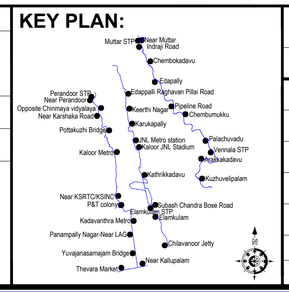
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

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REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-14

DATE: 18/10/2022

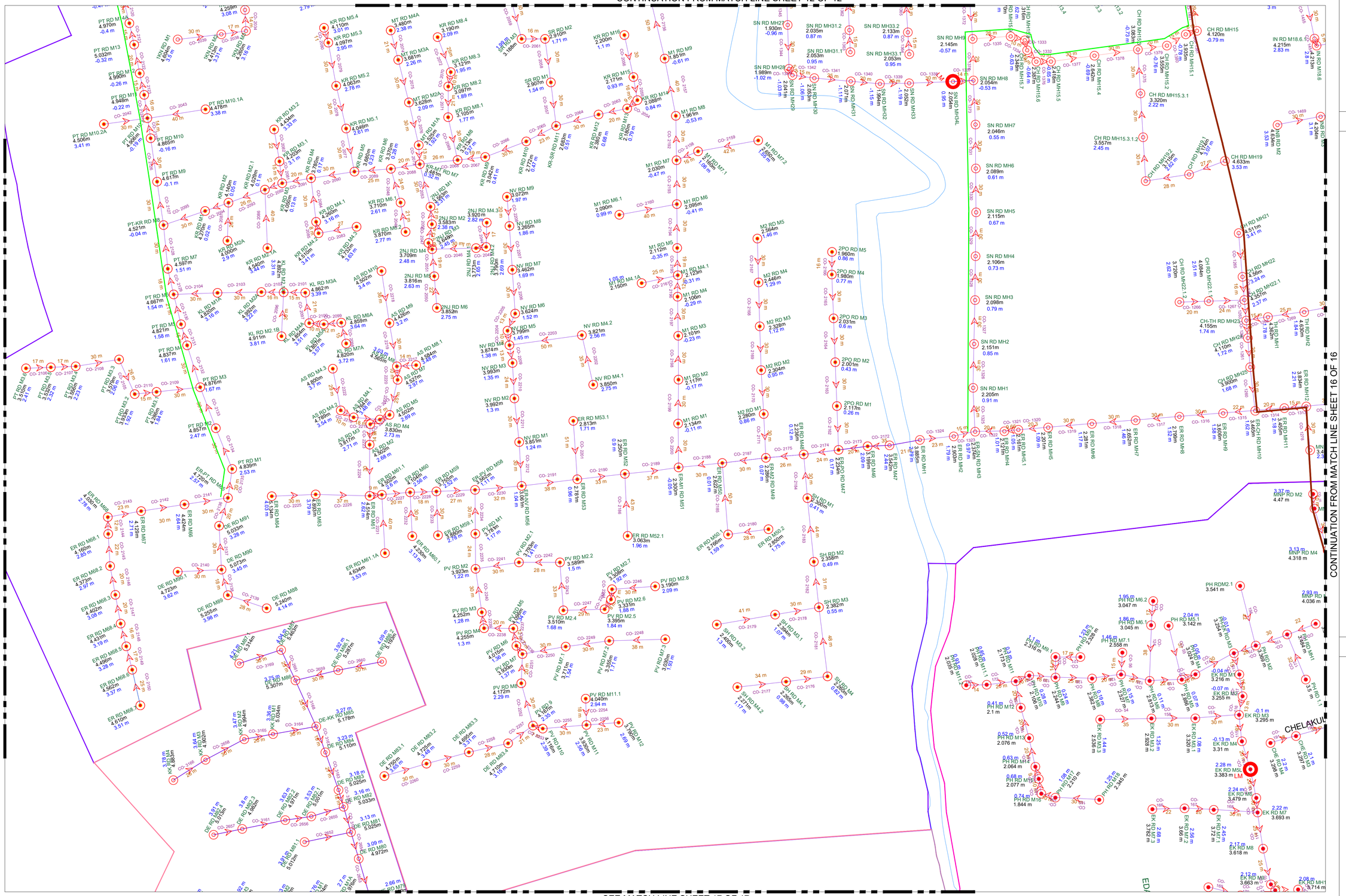
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 14 OF 24

CONTINUATION FROM MATCH LINE SHEET 12 OF 12



SEE MATCH LINE SHEET 17 OF 17

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- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
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- TEXT — MANHOLE/WET WELLID
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- MANHOLES
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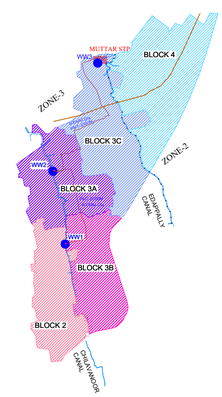
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

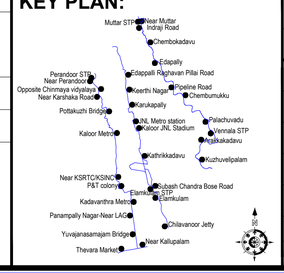
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-15

DATE: 18/10/2022

REV.: R4

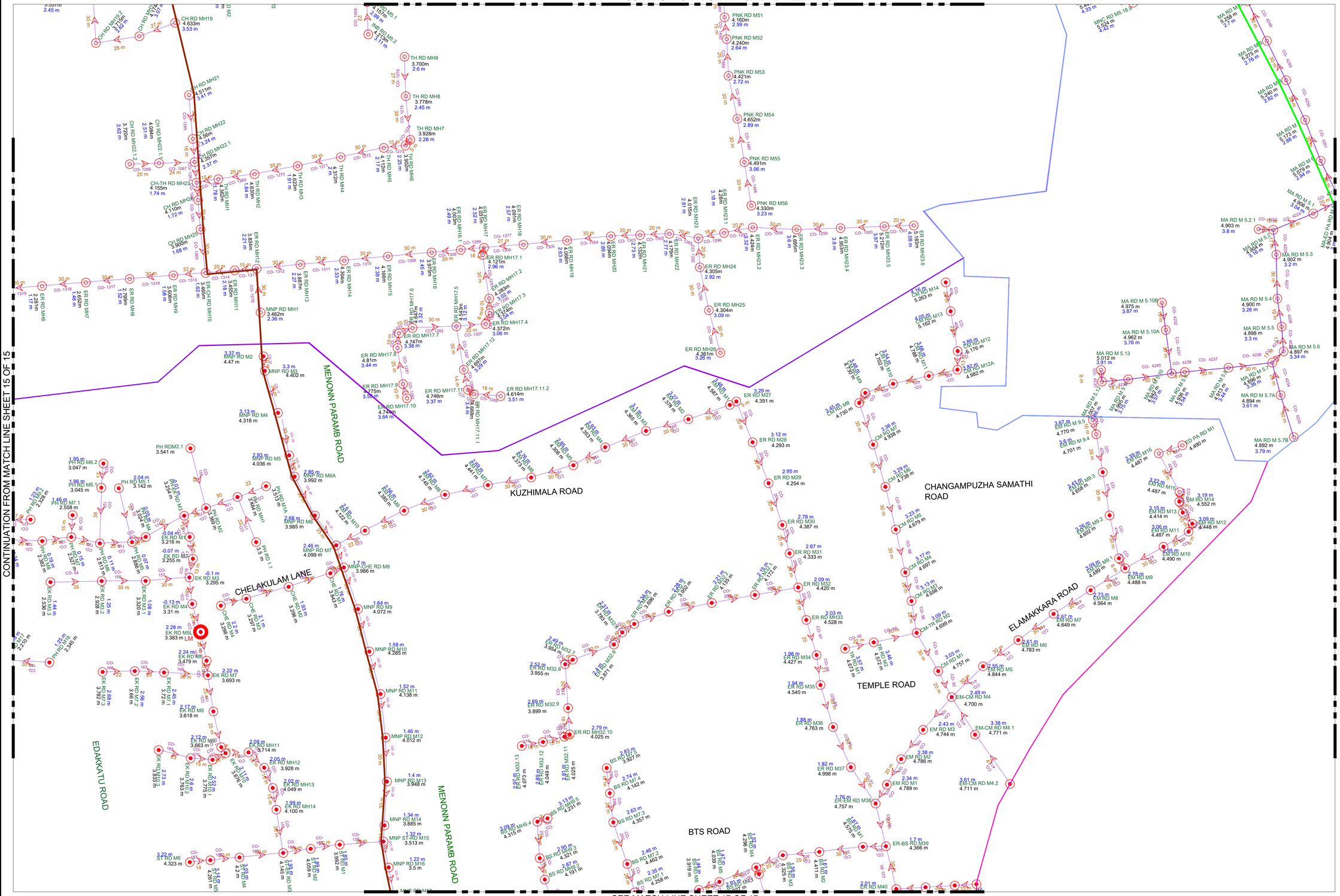
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 15 OF 24

CONTINUATION FROM MATCH LINE SHEET 14 OF 14

CONTINUATION FROM MATCH LINE SHEET 15 OF 15



SEE MATCH LINE SHEET 17 OF 17

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LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
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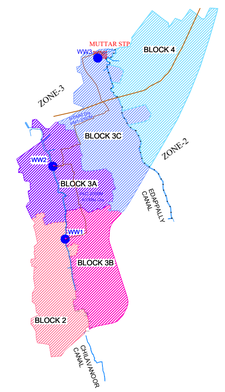
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

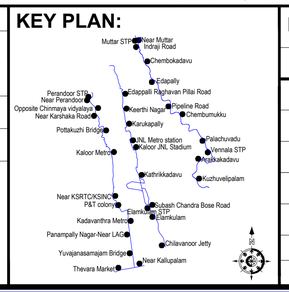
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-16

DATE: 18/10/2022

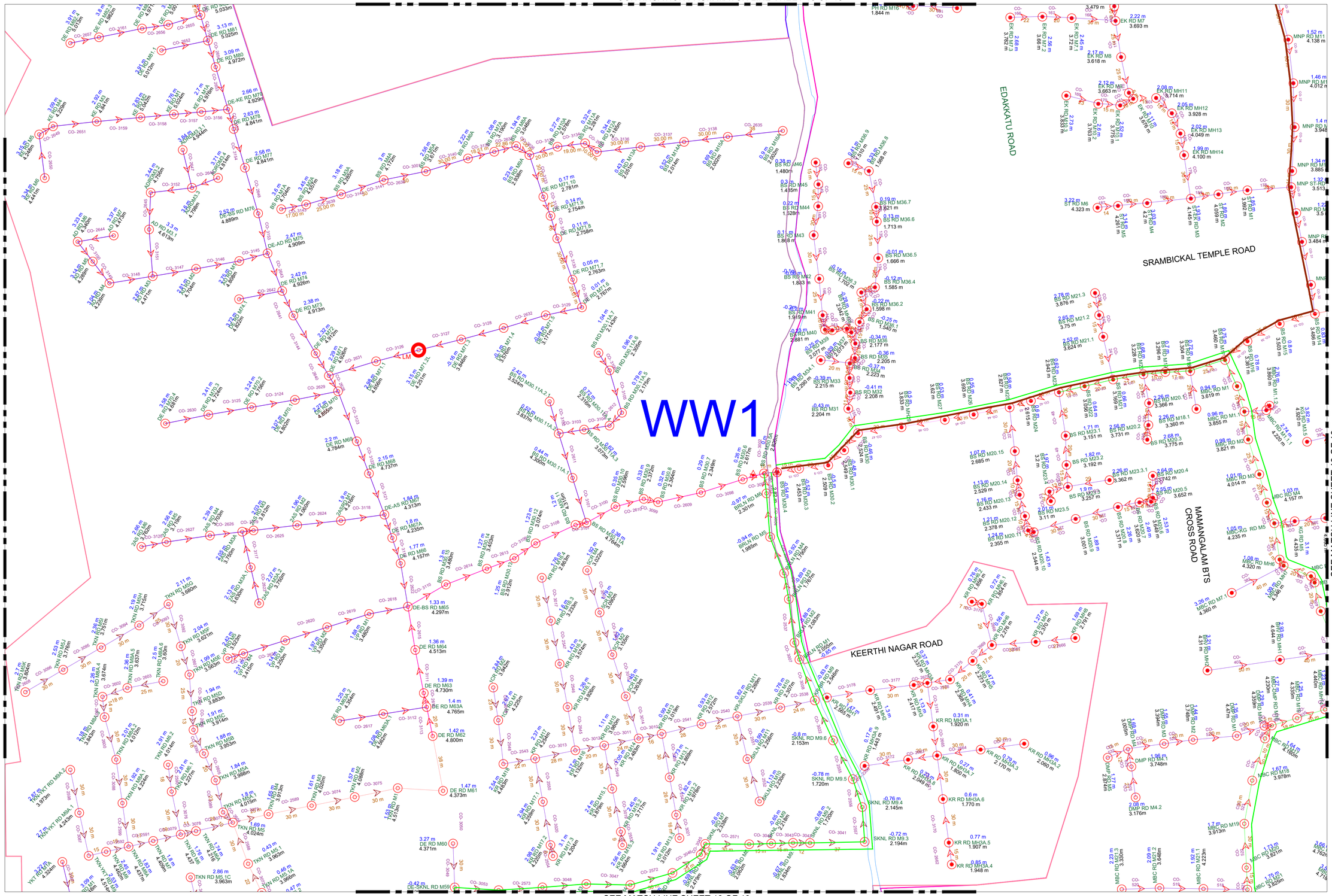
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 16 OF 24

CONTINUATION FROM MATCH LINE SHEET 15 OF 15



SEE MATCH LINE SHEET 18 OF 18

SEE MATCH LINE SHEET 19 OF 19

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LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
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- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
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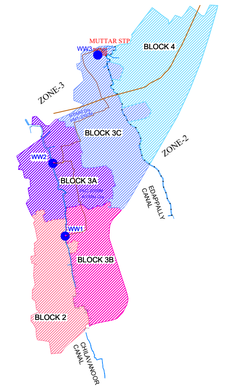
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-17

DATE: 18/10/2022

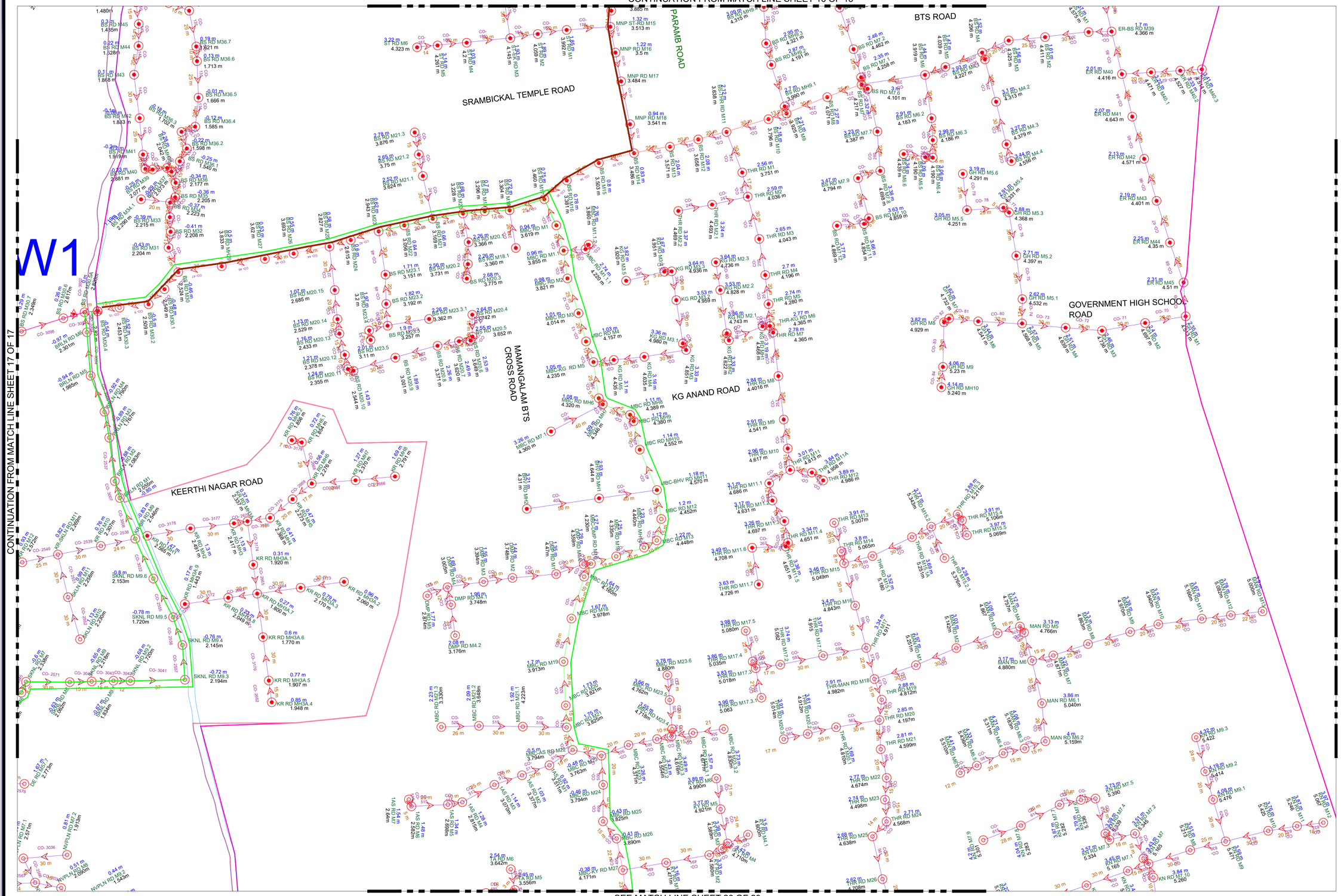
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 17 OF 24

CONTINUATION FROM MATCH LINE SHEET 16 OF 16



SEE MATCH LINE SHEET 20 OF 20

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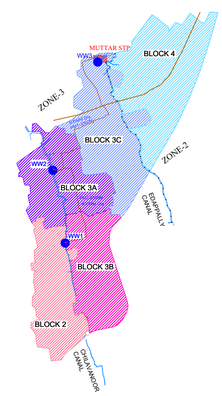
LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT — MANHOLE/WET WELLID
- TEXT — INVERT LEVEL
- TEXT — MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

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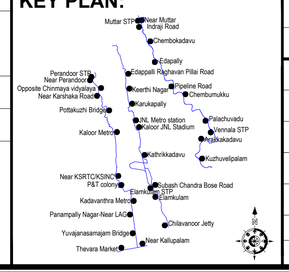

NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
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NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-18

DATE: 18/10/2022

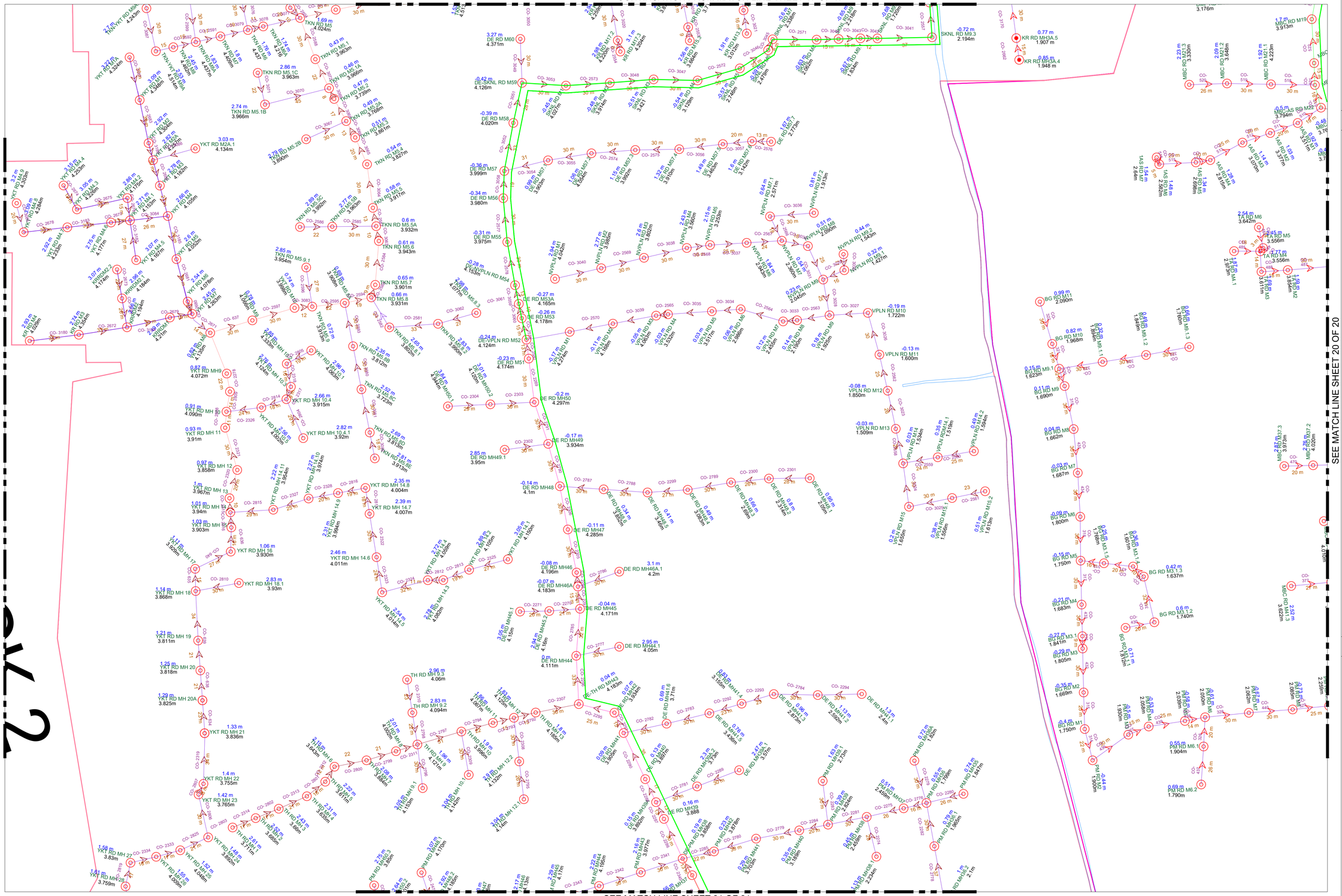
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 18 OF 24

CONTINUATION FROM MATCH LINE SHEET 17 OF 17



SEE MATCH LINE SHEET 21 OF 21

SEE MATCH LINE SHEET 20 OF 20

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- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
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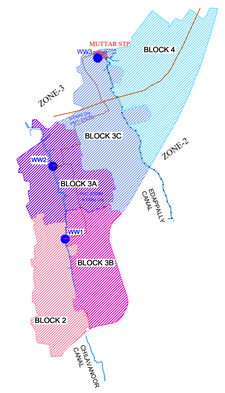
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



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PROJECT:

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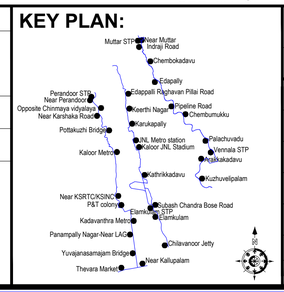

NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
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NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-19

DATE: 18/10/2022

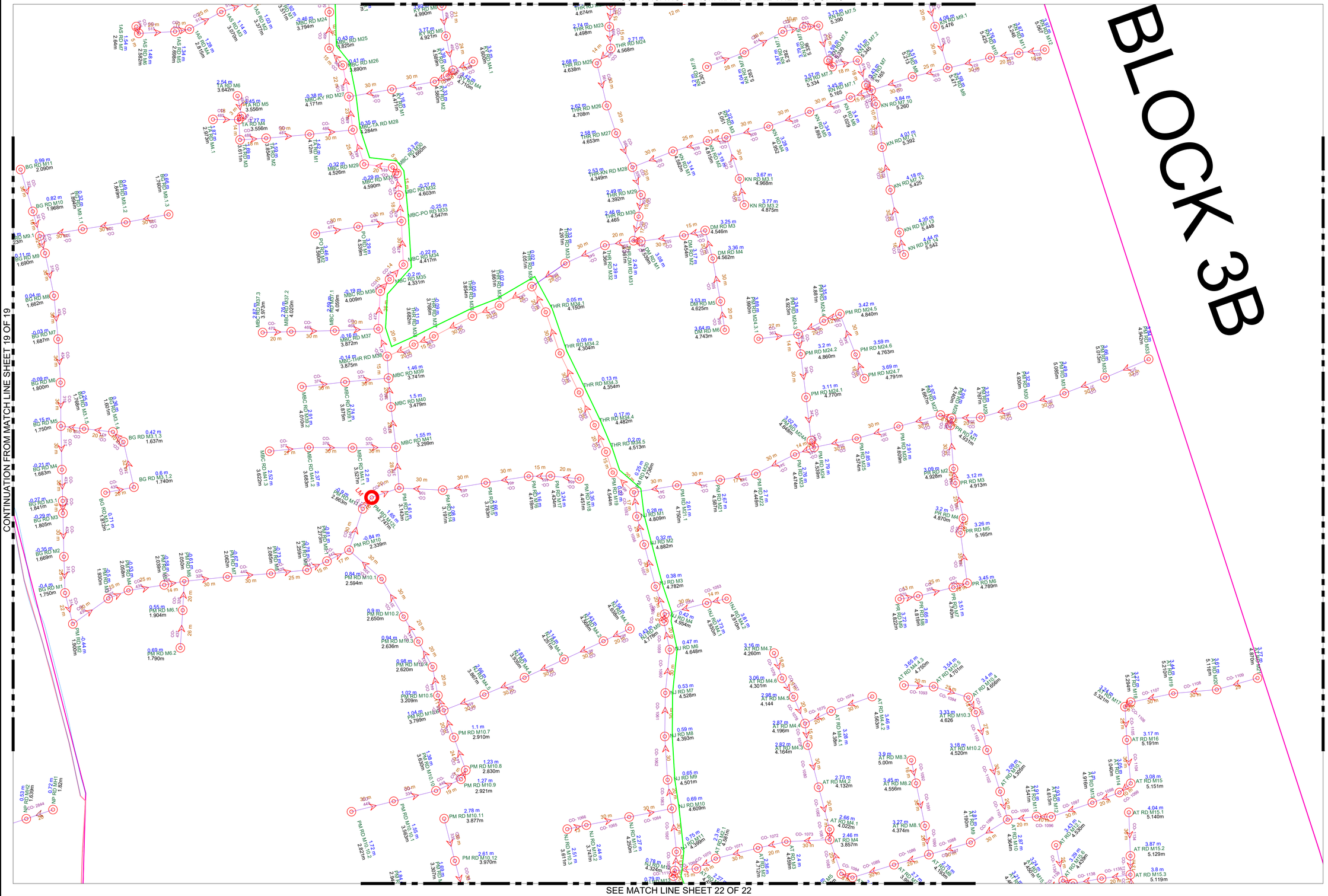
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 19 OF 24

CONTINUATION FROM MATCH LINE SHEET 18 OF 18



SEE MATCH LINE SHEET 22 OF 22

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- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
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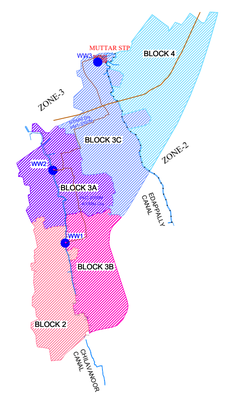
- WET WELLS
- PROPOSED STP AREA, MUTTAR

KEY PLAN



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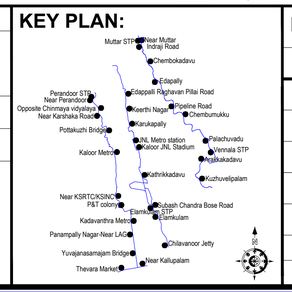

NO OBJECTION BY KMRL :

CIVIL	MEP

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NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-20

DATE: 18/10/2022

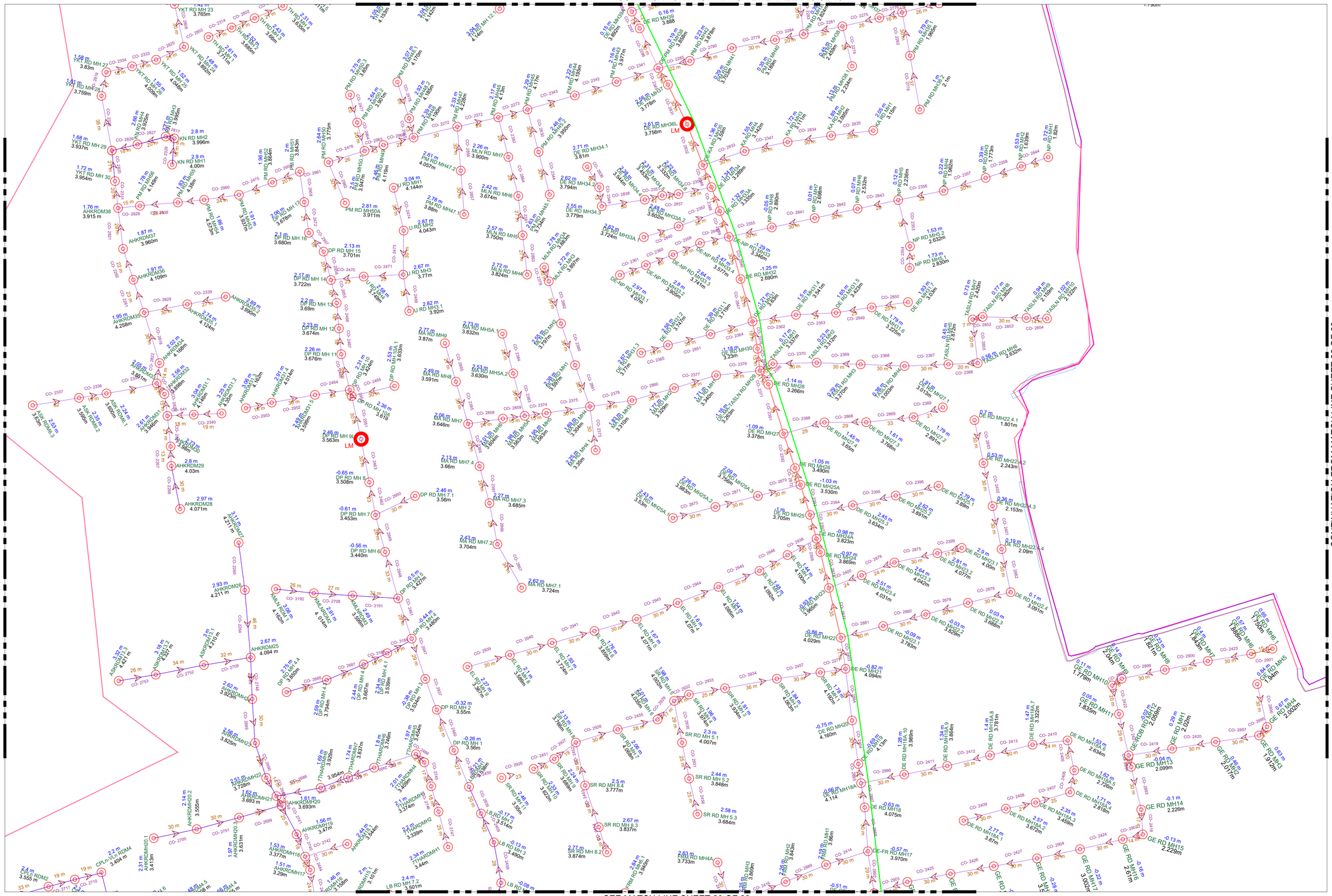
REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 20 OF 24

CONTINUATION FROM MATCH LINE SHEET 19 OF 19



CONTINUATION FROM MATCH LINE SHEET 22 OF 22

SEE MATCH LINE SHEET 23 OF 23

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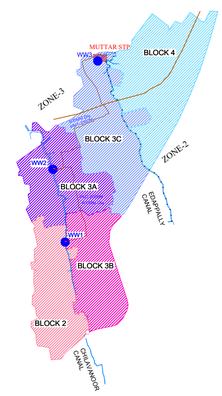
KEY PLAN



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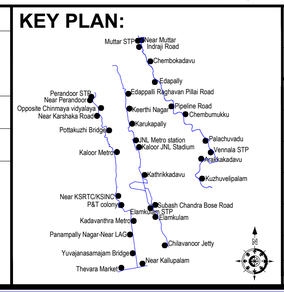

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R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-21

DATE: 18/10/2022

REV.: R4

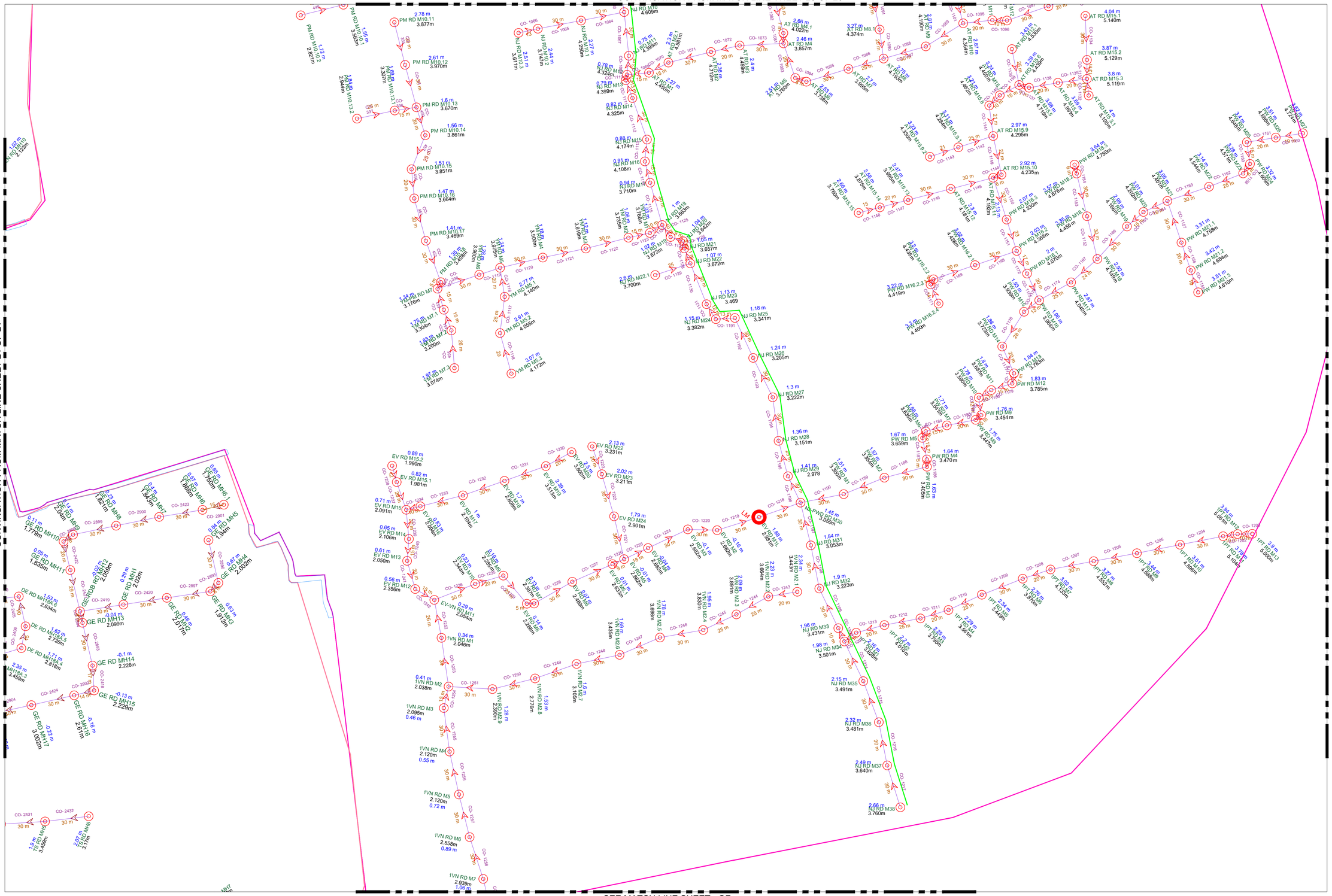
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 21 OF 24

CONTINUATION FROM MATCH LINE SHEET 20 OF 20

CONTINUATION FROM MATCH LINE SHEET 21 OF 21



SEE MATCH LINE SHEET - OF -

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- 200mm Dia PIPE
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- 300mm Dia PIPE
- 315mm Dia PIPE
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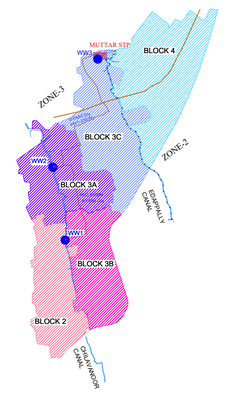
- PROPOSED STP AREA, MUTTAR

KEY PLAN



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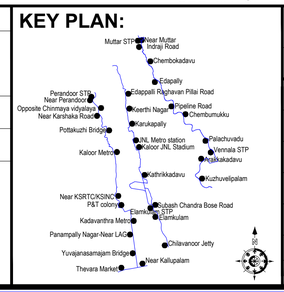

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CIVIL		MEP	

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NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-22

DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 22 OF 24

CONTINUATION FROM MATCH LINE SHEET 21 OF 21

CONTINUATION FROM MATCH LINE SHEET 24 OF 24

SEE MATCH LINE SHEET 24 OF 24

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- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- 315mm Dia PIPE
- 400mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
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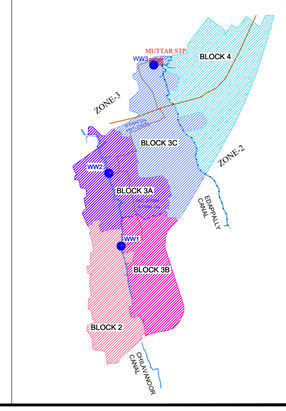
KEY PLAN



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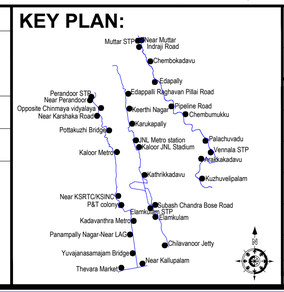

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R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-23

DATE: 18/10/2022

REV.: R4

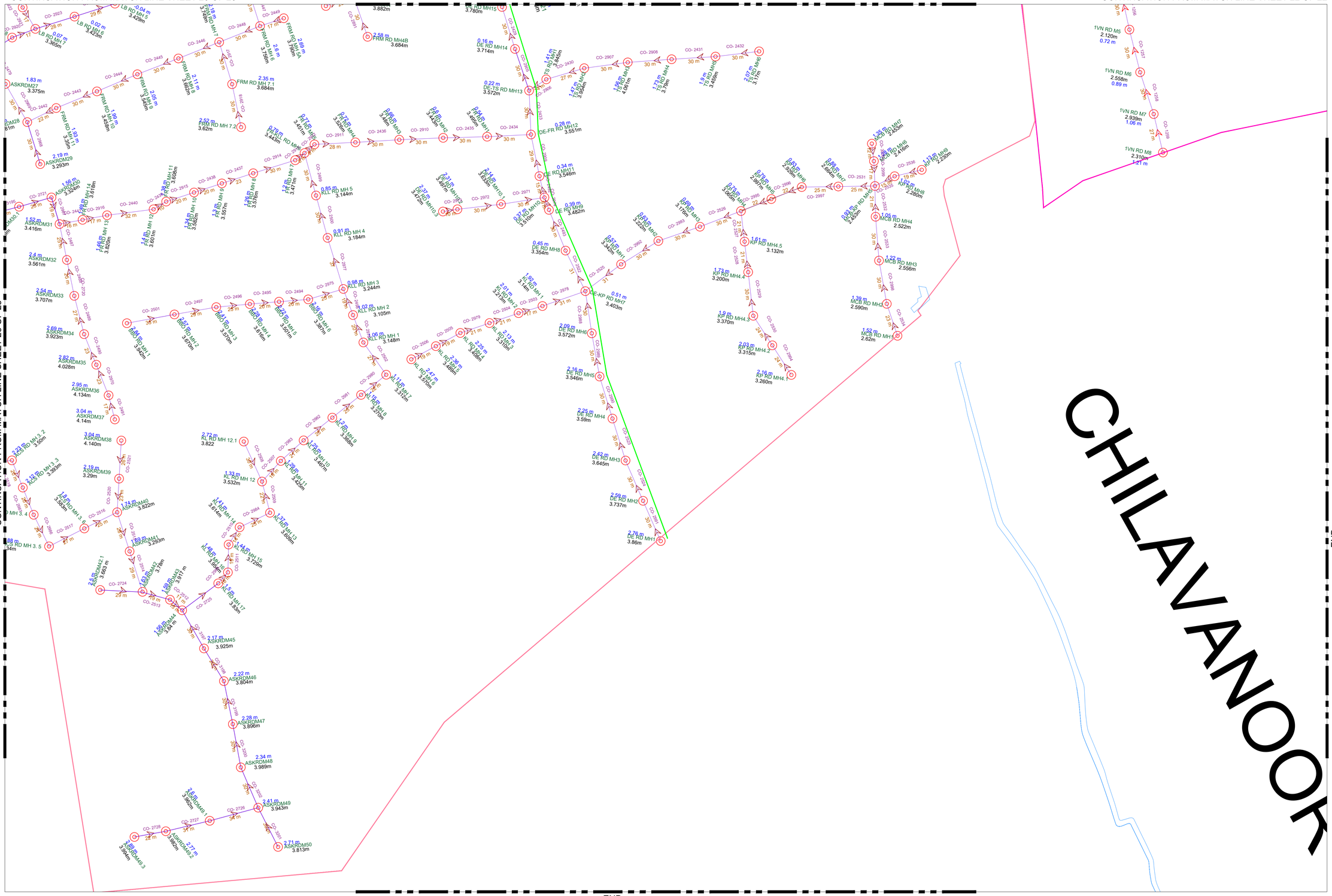
DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 23 OF 24

CONTINUATION FROM MATCH LINE SHEET 23 OF 23

CONTINUATION FROM MATCH LINE SHEET 22 OF 22



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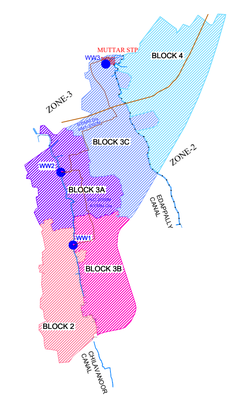
- PROPOSED STP AREA, MUTTAR

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

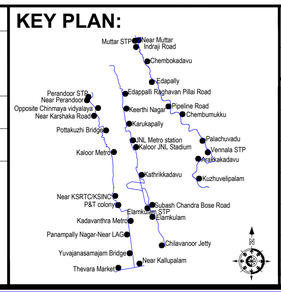
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	25/08/2022
DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/08/2022
CHECKED	RENUKA MENON	RM	17/10/2022
APPROVED	RENUKA MENON	RM	18/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	30/06/2021	RR
R1	EDAPALLY & CHILAVANOOR CANAL NORTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM ZONE II & III	12/05/2022	RR
R2	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	12/07/2022	RR
R3	CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM	05/09/2022	RR

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION &WATER TRANSPORT SYSTEM**

LOCATION: MUTTAR,KOCHI

SCALE: NTS

TITLE:

CHILAVANNOOR CANAL & EDAPALLY CANAL NORTH CATCHMENT ZONE II , III SEWER NETWORK TENTATIVE FLOW DIAGRAM SHEET-24

DATE: 18/10/2022

REV.: R4

DRG. NO : IURWTS-WT2024-ED-CIVIL-1786

DIMENSIONS: in MTS

SHEET: 24 OF 24

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	WW1	BSRDM30.4	BSRDM30.3	BSRDM30.2	BSRDM30.1	BSRDM30	BSRDM29	BSRDM27	BSRDM26	BSRDM25	BSRDM24	BSRDM23	BSRDM22	BSRDM21	BSRDM20	BSRDM19	BSRDM18	BSRDM17	BSRDM16	BSRDM15	BSRDM14	MNPRDM18	MNPRDM17	MNPRDM16	MNPSTRDM15	MNPRDM14
GROUND ELEVATION	2.820 m	2.820 m	2.453 m	2.509 m	2.549 m	2.524 m	3.833 m	3.620 m	3.693 m	2.827 m	2.615 m	2.943 m	3.056 m	3.169 m	3.228 m	3.296 m	3.304 m	3.460 m	3.381 m	3.503 m	3.486 m	3.541 m	3.484 m	3.500 m	3.513 m	
INVERT LEVEL	1.470 m	1.470 m	1.103 m	1.159 m	1.199 m	1.174 m	2.483 m	2.270 m	2.343 m	1.477 m	1.265 m	1.593 m	1.706 m	1.819 m	1.878 m	1.946 m	1.954 m	2.110 m	2.031 m	2.153 m	2.136 m	2.191 m	2.134 m	2.150 m	2.163 m	
LENGTH	15 m	19 m	20 m	15 m	15 m	23 m	30 m	20 m	25 m	15 m	20 m	18 m	20 m	21 m	15 m	17 m	25 m	20 m	25 m	25 m	20 m	30 m	20 m	18 m	11 m	

0 m

500 m

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	MNPRDM14	MNPRDM13	MNPRDM12	MNPRDM11	MNPRDM10	MNPRDM9	MNPCHERDM8	MNPRDM7	MNPRDM6	MNPRDM6A	MNPRDM5	MNPRDM4	MNPRDM3	MNPRDM2	MNPRDM1	ERRDMH12	ERRDMH11	ERCHRDMH10	CHRDMH25	CHRDMH24	CHRDMH23	CHRDMH22.1
GROUND ELEVATION	3.885 m	3.948 m	4.012 m	4.138 m	4.285 m	4.072 m	3.986 m	4.099 m	3.985 m	3.992 m	4.036 m	4.318 m	4.402 m	4.470 m	3.462 m	3.834 m	3.455 m	3.465 m	3.900 m	4.110 m	4.155 m	4.357 m
INVERT LEVEL	2.535 m	2.598 m	2.662 m	2.788 m	2.935 m	2.722 m	2.636 m	2.749 m	2.635 m	2.642 m	2.686 m	2.968 m	3.052 m	3.120 m	2.112 m	2.484 m	2.105 m	2.115 m	2.550 m	2.760 m	2.805 m	3.007 m
LENGTH	30 m	30 m	30 m	30 m	30 m	30 m	16 m	25 m	30 m	15 m	30 m	30 m	10 m	30 m	30 m	15 m	20 m	30 m	20 m	12 m	14 m	17 m

500 m

1000 m

CLIENT: KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT: anteagroup — Antea Nederland B.V and Antea India(JV)

PROJECT: IURWTS — Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	PHILIP	PDP	20-10-2022
DESIGNED	DIVYA RESHMA	DR RR	
CHECKED	RENUKA	RM	21-10-2022
APPROVED	RENUKA	RM	21-10-2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL & PLUMBING	E & M

LEGENDS:

- GROUND PROFILE -
- PUMPING MAIN -
- AIR VALVE -
- SCOUR VALVE -

NOTE : *The Pumping Main transverse in the direction of those Manholes in the sewer grid.*

REVISIONS:

NO	DESCRIPTION	DATE	SIGN

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION : **MUTTAR, KOCHI**

TITLE : **PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION**

LONGITUDINAL SECTION OF PM1 400mm (WW1 TO WW2)

SCALE: NTS

DATE: 20-10-2022

REV. : R0

DRG. NO : IURWTS-WT2024-E-D-CIVIL-1816

DIMENSIONS: in MTS

SHEET NO : 1 OF 2

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	CHRDMH22.1	CHRDMH22	CHRDMH21	CHRDMH19	CHRDMH15	CHRDMH14	CHRDMH13	CHRDMH12	CH-GPRDM11	CHRDMH10	CHRDMH9	CHRDMH9A	CHUSRDM8	CHRDMH7	CHRDMH6	CHRDMH5	CHRDMH4	CHRDMH3	CHRDMH2	CHRDMH1	MTRDM8	MTRDM9
GROUND ELEVATION	4.357 m	4.560 m	4.511 m	4.633 m	4.120 m	3.913 m	3.700 m	3.742 m	3.884 m	3.817 m	3.830 m	3.830 m	3.902 m	4.345 m	4.660 m	4.558 m	4.551 m	4.310 m	4.166 m	4.131 m	4.096 m	4.114 m
INVERT LEVEL	3.007 m	3.210 m	3.161 m	3.283 m	2.770 m	2.563 m	2.350 m	2.392 m	2.534 m	2.467 m	2.480 m	2.480 m	2.552 m	2.995 m	3.310 m	3.208 m	3.201 m	2.960 m	2.816 m	2.781 m	2.746 m	2.764 m
LENGTH	17 m	30 m	51 m	90 m	29 m	20 m	30 m	30 m	15 m	17 m	14 m	20 m	20 m	30 m	15 m	12 m	15 m	15 m	20 m	10 m	9 m	20 m

1000 m

1500 m

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	MTRDM8	MTRDM9	MTRDM10	MPLRDM5.5	MPLRDM5.4	MPLRDM5.3	MPLRDM5.2	MPLRDM5.1	MPLRDM5	MPLRDM4	MPLRDM3	MPLRDM2	MPLRDM1	MPLRDM1.1	MPMPLRDM13	MPRDM14	MPRDM15	MPRDM16	MPRDM17	MPRDM18	MPRDM19	MPRDM20	MPRDM21	WW2
GROUND ELEVATION	4.096 m	4.114 m	4.164 m	4.220 m	4.480 m	4.484 m	4.524 m	4.188 m	3.834 m	3.731 m	3.492 m	2.985 m	2.874 m	2.615 m	2.467 m	2.268 m	2.241 m	2.239 m	1.450 m	1.280 m	1.490 m	1.345 m	1.325 m	
INVERT LEVEL	2.746 m	2.764 m	2.814 m	2.870 m	3.130 m	3.134 m	3.174 m	2.838 m	2.484 m	2.381 m	2.142 m	1.635 m	1.524 m	1.265 m	1.117 m	0.918 m	0.891 m	0.889 m	0.100 m	-0.070 m	0.140 m	-0.005 m	-0.025 m	
LENGTH	9 m	20 m	34 m	30 m	5 m	10 m	25 m	30 m	20 m	30 m	30 m	30 m	30 m	10 m	20 m	5 m	11 m	30 m	30 m	30 m	30 m	20 m	20 m	

1500 m

2018 m

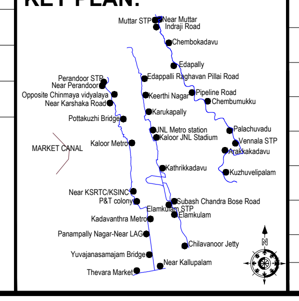
CLIENT: KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT: anteagroup — Antea Nederland B.V and Antea India(JV)

PROJECT: IURWTS — Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	PHILIP	PGP	20-10-2022
DESIGNED	DIVYA RESHMA	DR RR	
CHECKED	RENUKA	RM	21-10-2022
APPROVED	RENUKA	RM	21-10-2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL & PLUMBING	E & M

LEGENDS:

GROUND PROFILE -

PUMPING MAIN -

AIR VALVE -

SCOUR VALVE -

NOTE : *The Pumping Main transverse in the direction of those Manholes in the sewer grid.*

REVISIONS:

NO.	DESCRIPTION	DATE	BY

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: **MUTTAR, KOCHI**

SCALE: NTS

TITLE: **PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION**

LONGITUDINAL SECTION OF PM1 400mm (WW1 TO WW2)

DATE: 20-10-2022

REV.: R0

DRG. NO : IURWTS-WT2024-ED-CIVIL-1818

DIMENSIONS: in MTS

SHEET NO : 2 OF 2

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	WW2	MPRDM21	MPRDM20	MPRDM19	MPRDM18	MPRDM17	MPRDM16	MPRDM15	MPRDM14	MPMPLRDM13	MPRDM12	MPMPLRDM11	MPRDM10	MPRDM9	MPRDM8	MPRDM7	MPRDM6	MPRDM5	MPRDM4	MPRDM3	MPRDM2	MNRDM3	MNRDM4	MNRDM5
GROUND ELEVATION	1.300 m	1.325 m	1.345 m	1.490 m	1.280 m	1.450 m	2.239 m	2.241 m	2.268 m	2.467 m	2.529 m	2.333 m	2.288 m	2.287 m	2.267 m	2.210 m	2.264 m	4.713 m	4.825 m	2.217 m	2.284 m	2.256 m	2.250 m	2.250 m
INVERT LEVEL	-0.100 m	-0.075 m	-0.055 m	0.090 m	-0.120 m	0.050 m	0.839 m	0.841 m	0.868 m	1.067 m	1.129 m	0.933 m	0.888 m	0.887 m	0.867 m	0.810 m	0.864 m	3.313 m	3.425 m	0.817 m	0.884 m	0.856 m	0.850 m	0.850 m
LENGTH	20 m	20 m	30 m	30 m	30 m	30 m	11 m	5 m	20 m	10 m	30 m	18 m	30 m	20 m	18 m	15 m	13 m	20 m	20 m	30 m	35 m	28 m	30 m	10 m

0 m 500 m

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	MNRDM5	MNRDM6	MNRDM7	MNRDM8	MNRDM9	MNRDM10	MNRDM11	MNRDM12	MNRDM13	MNRDM14	MNRDM15	MNRDM16	MNRDM17	MNRDM18	PNKRDM12	PNKRDM11	PNKRDM10	PNKRDM9	PNKRDM8	PNKRDM7	PNKRDM6	PNKRDM5	PNKRDM4
GROUND ELEVATION	2.250 m	2.206 m	2.219 m	2.165 m	2.166 m	2.166 m	2.990 m	3.815 m	2.790 m	3.320 m	4.075 m	4.750 m	5.256 m	5.152 m	4.955 m	5.103 m	5.329 m	5.392 m	5.378 m	5.244 m	5.312 m	5.390 m	5.481 m
INVERT LEVEL	0.850 m	0.806 m	0.819 m	0.765 m	0.766 m	0.766 m	1.590 m	2.415 m	1.390 m	1.920 m	2.675 m	3.350 m	3.856 m	3.752 m	3.555 m	3.703 m	3.929 m	3.992 m	3.978 m	3.844 m	3.912 m	3.990 m	4.081 m
LENGTH	10 m	30 m	20 m	25 m	14 m	15 m	20 m	15 m	30 m	30 m	15 m	20 m	25 m	20 m	24 m	30 m	27 m	17 m	30 m	30 m	19 m	30 m	30 m

500 m 1000 m

CLIENT: KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT: anteagroup Antea Nederland B.V and Antea India(JV)

PROJECT: IURWTS Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	PHILIP	PGP	20-10-2022
DESIGNED	DIVYA RESHMAN	DR RR	
CHECKED	RENUKA	RM	21-10-2022
APPROVED	RENUKA	RM	21-10-2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL & PLUMBING E & M

LEGENDS:

GROUND PROFILE -

PUMPING MAIN -

AIR VALVE -

SCOUR VALVE -

NOTE : The Pumping Main transverse in the direction of those Manholes in the lower grid

REVISIONS:

NO	DESCRIPTION	DATE	BY

NAME OF PROJECT : INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM

LOCATION: MUTTAR, KOCHI

TITLE: PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION

LONGITUDINAL SECTION OF PM2 450mm (WW2 TO STP)

SCALE: NTS

DATE: 20-10-2022

REV.: R0

DRG. NO : IURWTS-WT2024-ED-CIVIL-1819

DIMENSIONS: in MTS

SHEET NO : 1 OF 4

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	PNKRDM4	PNKALKRDM3	PNKRDM2	PNKRDM1	PODARDM1.1	PODARDM1.2	JCRRDM1	JCRRDM2	JCRRDM3	JCRRDM4	JCRRDM5	JCRYARDM6	JCRRDM7	JCRRDM8	JCRRDM9	JCRTCRDM10	JCRRDM11	JCRGRRDM12	JCRRDM13	JCRPSTRDM14	JCRRDM15
GROUND ELEVATION	5.481 m	5.392 m	5.431 m	5.470 m	5.716 m	5.859 m	5.820 m	5.245 m	4.544 m	4.324 m	4.147 m	3.970 m	3.828 m	3.913 m	4.719 m	4.505 m	4.539 m	4.596 m	4.479 m	4.562 m	4.7
INVERT LEVEL	4.081 m	3.992 m	4.031 m	4.070 m	4.316 m	4.459 m	4.420 m	3.845 m	3.144 m	2.924 m	2.747 m	2.570 m	2.428 m	2.513 m	3.319 m	3.105 m	3.139 m	3.196 m	3.079 m	3.162 m	3.3
LENGTH	30 m	22 m	20 m	30 m	30 m	22 m	30 m	30 m	21 m	22 m	30 m	25 m	30 m	12 m	30 m	30 m	22 m	22 m	30 m	24 m	2

1000 m

1500 m

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	JCRRDM15	JCRRDM16	JCRSLRDM17	JCRRDM18	JCRRDM19	JCRRDM20	JCRRDM21	JCRRDM22	JCRRDM23	JCR1STRDM24	JCRRDM25	RSRD4M6	RSRD4M5	RSRD4M4	RSRD4M3	RSRD4M2	RSRD4M1	ONHRDM1.6	ONHRDM1.5	ONHRDM1.4
GROUND ELEVATION	4.713 m	5.098 m	5.415 m	5.370 m	5.300 m	5.341 m	5.622 m	5.590 m	5.592 m	5.703 m	5.893 m	6.106 m	5.912 m	5.671 m	5.601 m	5.534 m	5.414 m	5.032 m	5.086 m	
INVERT LEVEL	3.313 m	3.698 m	4.015 m	3.970 m	3.900 m	3.941 m	4.222 m	4.190 m	4.192 m	4.303 m	4.493 m	4.706 m	4.512 m	4.271 m	4.201 m	4.134 m	4.014 m	3.632 m	3.686 m	
LENGTH	24 m	30 m	19 m	30 m	30 m	30 m	30 m	12 m	22 m	30 m	36 m	32 m	30 m	30 m	19 m	18 m	40 m	24 m	30 m	

1500 m

2000 m

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India(JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	PHILIP	PDP	20-10-2022
DESIGNED	DIVYA RESHMA	DR RR	
CHECKED	RENUKA	RM	21-10-2022
APPROVED	RENUKA	RM	21-10-2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL & PLUMBING	E & M

LEGENDS:

GROUND PROFILE -

PUMPING MAIN -

AIR VALVE -

SCOUR VALVE -

NOTE :
The Pumping Main transverse in the direction of those Manholes in the sewer grid.

REVISIONS:

NO	DESCRIPTION	DATE	SIGN

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION : **MUTTAR, KOCHI**

TITLE : **PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION**

LONGITUDINAL SECTION OF PM2 450mm (RWQ TO STP)

SCALE: NTS

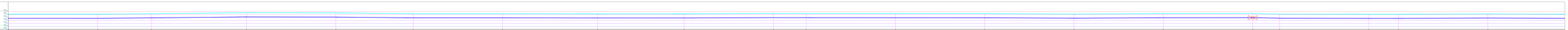
DATE: 20-10-2022

REV.: R0

DRG. NO : IURWTS-WT2024-ED-CIVIL-1819

DIMENSIONS: in MTS

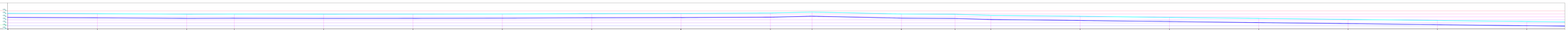
SHEET NO : 2 OF 4



MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	ONHRDM1.4	ONHRDM1.3	ONHRDM1.2	ONHRDM1.1	ONHRDM2	SOPDONHRDM1	ONHRDM3	ONHRDM2.1	ALNRDM1	ONHRDM4	ONHRDM3.1	ONHRDM5A	ONHRDM5	ONHRDM6	ONHRDM7	ONHRDM8	AHRDM1	ONHRDM9	ONHRDM4.1	ONHRDM10
GROUND ELEVATION	5.093 m	5.091 m	5.275 m	5.606 m	5.552 m	5.285 m	5.285 m	5.233 m	5.234 m	5.360 m	5.349 m	5.333 m	5.316 m	5.144 m	5.325 m	5.350 m	5.143 m	5.082 m	5.029 m	5.204 m
INVERT LEVEL	3.693 m	3.691 m	3.875 m	4.206 m	4.152 m	3.885 m	3.885 m	3.833 m	3.834 m	3.960 m	3.949 m	3.933 m	3.916 m	3.744 m	3.925 m	3.950 m	3.743 m	3.682 m	3.629 m	3.804 m
LENGTH	30 m	18 m	32 m	30 m	26 m	30 m	32 m	29 m	30 m	11 m	30 m	30 m	30 m	30 m	30 m	9 m	30 m	10 m	30 m	30 m

2000 m

2500 m



MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	ONHRDM10	ONHRDM11	ONHRDM5.1	ONHRDM6.1	ONHRDM12	ONHRDM13	ONHRDM14	ONHRDM15	ONHRDM16	ONHRDM17	ONHRDM18	ONHRDM19	RSRDM1	RSRDM2	RSRDM3	RSRDM4	RSRDM5	RSRDM6	RSRDM7	RSRDM8
GROUND ELEVATION	5.204 m	5.077 m	4.904 m	4.950 m	4.904 m	4.921 m	4.963 m	5.093 m	5.154 m	5.287 m	5.630 m	4.963 m	4.872 m	4.524 m	4.176 m	3.829 m	3.481 m	3.134 m	2.786 m	2.
INVERT LEVEL	3.804 m	3.677 m	3.504 m	3.550 m	3.504 m	3.521 m	3.563 m	3.693 m	3.754 m	3.887 m	4.230 m	3.563 m	3.472 m	3.124 m	2.776 m	2.429 m	2.081 m	1.734 m	1.386 m	1.
LENGTH	30 m	30 m	16 m	30 m	30 m	30 m	30 m	30 m	30 m	14 m	30 m	18 m	12 m	30 m	30 m	30 m	30 m	30 m	30 m	

2500 m

3000 m

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India(JV)

PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	PHILIP	PDP	20-10-2022
DESIGNED	DIVYA RESHMA	DR RR	
CHECKED	RENUKA	RM	21-10-2022
APPROVED	RENUKA	RM	21-10-2022

KEY PLAN:

NO OBJECTION BY KMRL :

CIVIL & PLUMBING	E & M	

LEGENDS:

GROUND PROFILE -

PUMPING MAIN -

AIR VALVE -

SCOUR VALVE -

NOTE :

The Pumping Main transverse in the direction of those Manholes in the sewer grid.

REVISIONS:

NO	DESCRIPTION	DATE	SIGN

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION : **MUTTAR, KOCHI**

TITLE : **PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION**

LONGITUDINAL SECTION OF PM2 450mm (WWQ TO STP)

SCALE: NTS

DATE: 20-10-2022

REV. : R0

DRG. NO : IURWTS-WT2024-ED-CIVIL-1819

DIMENSIONS: in MTS

SHEET NO : 3 OF 4

MANHOLE ID (ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)	RSRDM4	RSRDM5	RSRDM6	RSRDM7	RSRDM8	RSRDM9	RSRDM10	RSRDM11	RSRDM12	RSRDM13	STP
GROUND ELEVATION	3.829 m	3.481 m	3.134 m	2.786 m	2.438 m	2.091 m	1.763 m	1.650 m	1.300 m	1.300 m	
INVERT LEVEL	2.429 m	2.081 m	1.734 m	1.386 m	1.038 m	0.691 m	0.363 m	0.250 m	-0.100 m	-0.100 m	
LENGTH	30 m	30 m	30 m	30 m	30 m	30 m	28 m	10 m	30 m	15 m	

3000 m

3187 m

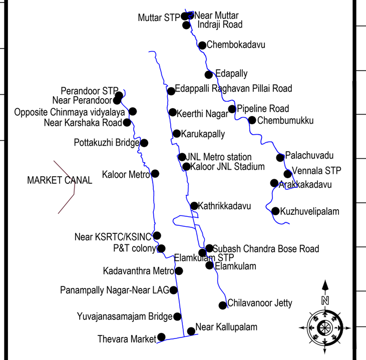
CLIENT: KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT: anteagroup — Antea Nederland B.V and Antea India(JV)

PROJECT: IURWTS — Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	PHILIP	PGP	20-10-2022
DESIGNED	DIVYA RESHMA	DR RR	
CHECKED	RENUKA	RM	21-10-2022
APPROVED	RENUKA	RM	21-10-2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL & PLUMBING	E & M

LEGENDS:

- GROUND PROFILE -
- PUMPING MAIN -
- AIR VALVE -
- SCOUR VALVE -

NOTE : *The Pumping Main transverse in the direction of those Manholes in the sewer grid.*

REVISIONS:

NO.	DESCRIPTION	DATE	BY

NAME OF PROJECT **: INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: **MUTTAR, KOCHI**

TITLE: **PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION**

LONGITUDINAL SECTION OF PM2 450mm (WW2 TO STP)

SCALE: NTS

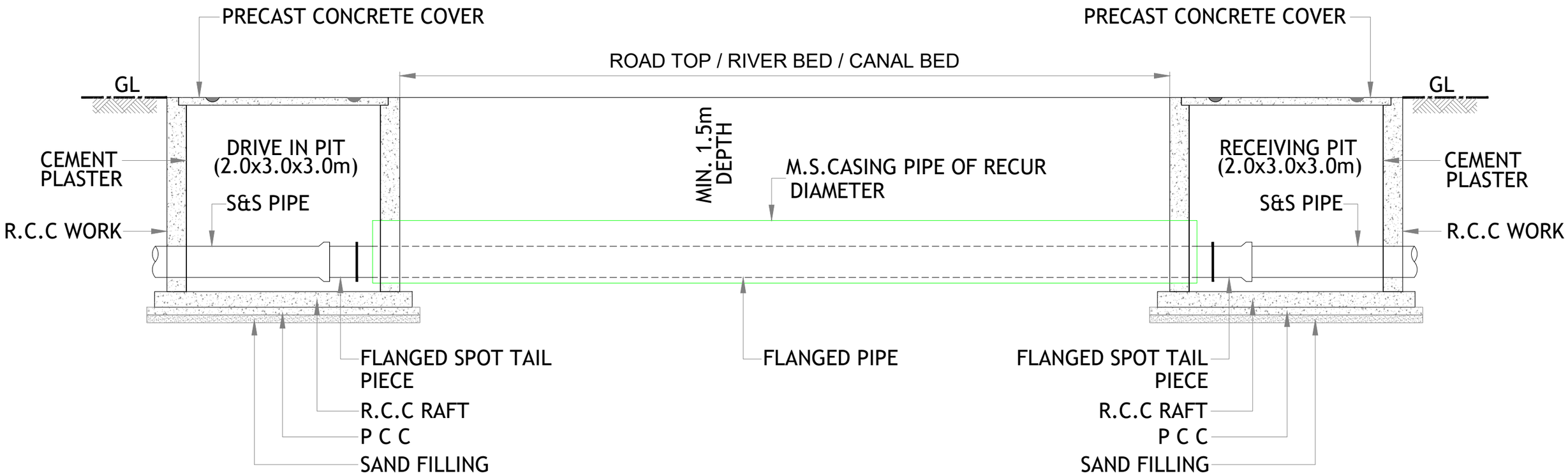
DATE: 20-10-2022

REV.: R0

DRG. NO : IURWTS-WT2024-ED-CIVIL-1819

DIMENSIONS: in MTS

SHEET NO : 4 OF 4



TYPICAL DETAILS OF HIGHWAY / RIVER / CANAL CROSSING-HORIZONTAL DIRECTIONAL DRILLING SECTION

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

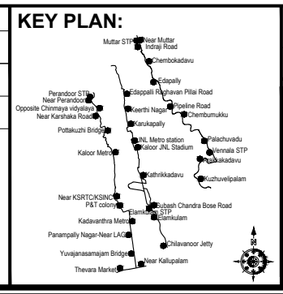
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	24/09/2022
DESIGNED	RENUKA M	RM	24/09/2022
CHECKED	RENUKA M	RM	29/09/2022
APPROVED	RENUKA M	RM	29/09/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: KOCHI

SCALE: NTS

TITLE: TYPICAL DETAILS OF HIGHWAY / RIVER / CANAL CROSSING HORIZONTAL DIRECTIONAL DRILLING SECTION

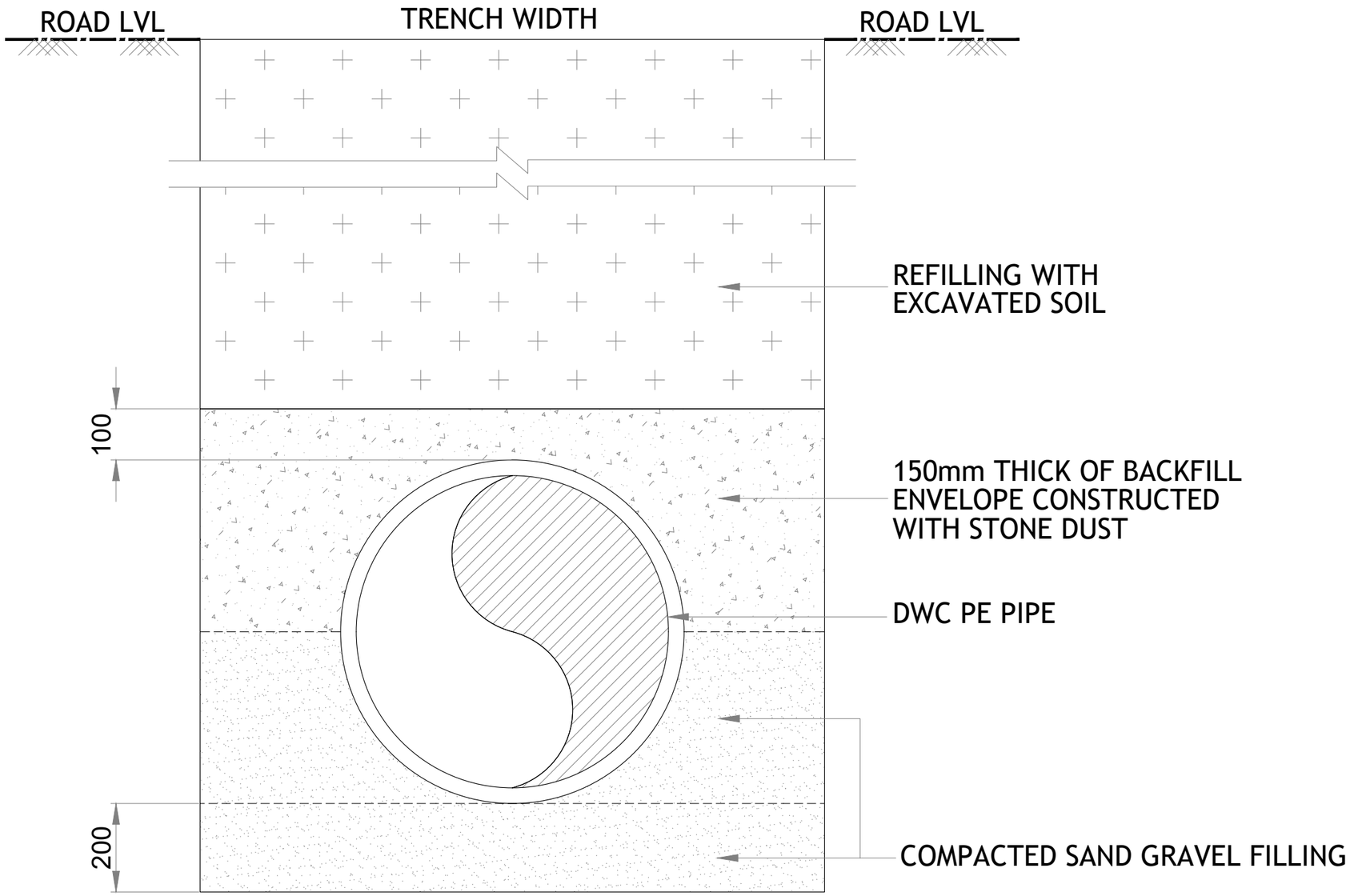
DATE: 29/09/2022

REV.: R0

DRG. NO : IURWTS-WT2024-TP-CIVIL-1804

DIMENSIONS: in MTS

SHEET: 1 OF 1



CROSS SECTION OF PIPE BEDDING FOR DWC PIPE

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

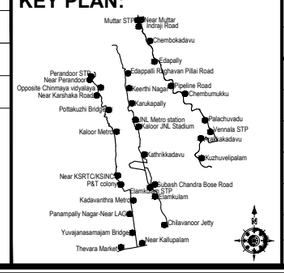
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	24/09/2022
DESIGNED	RENUKA M	RM	24/09/2022
CHECKED	RENUKA M	RM	29/09/2022
APPROVED	RENUKA M	RM	29/09/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	DETAILED DESIGN DRAWING	24/09/2021	BALAJI

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: KOCHI

SCALE: NTS

TITLE:

TYPICAL DETAILS FOR PIPE BEDDING

DATE: 24/09/2022

REV.: R0

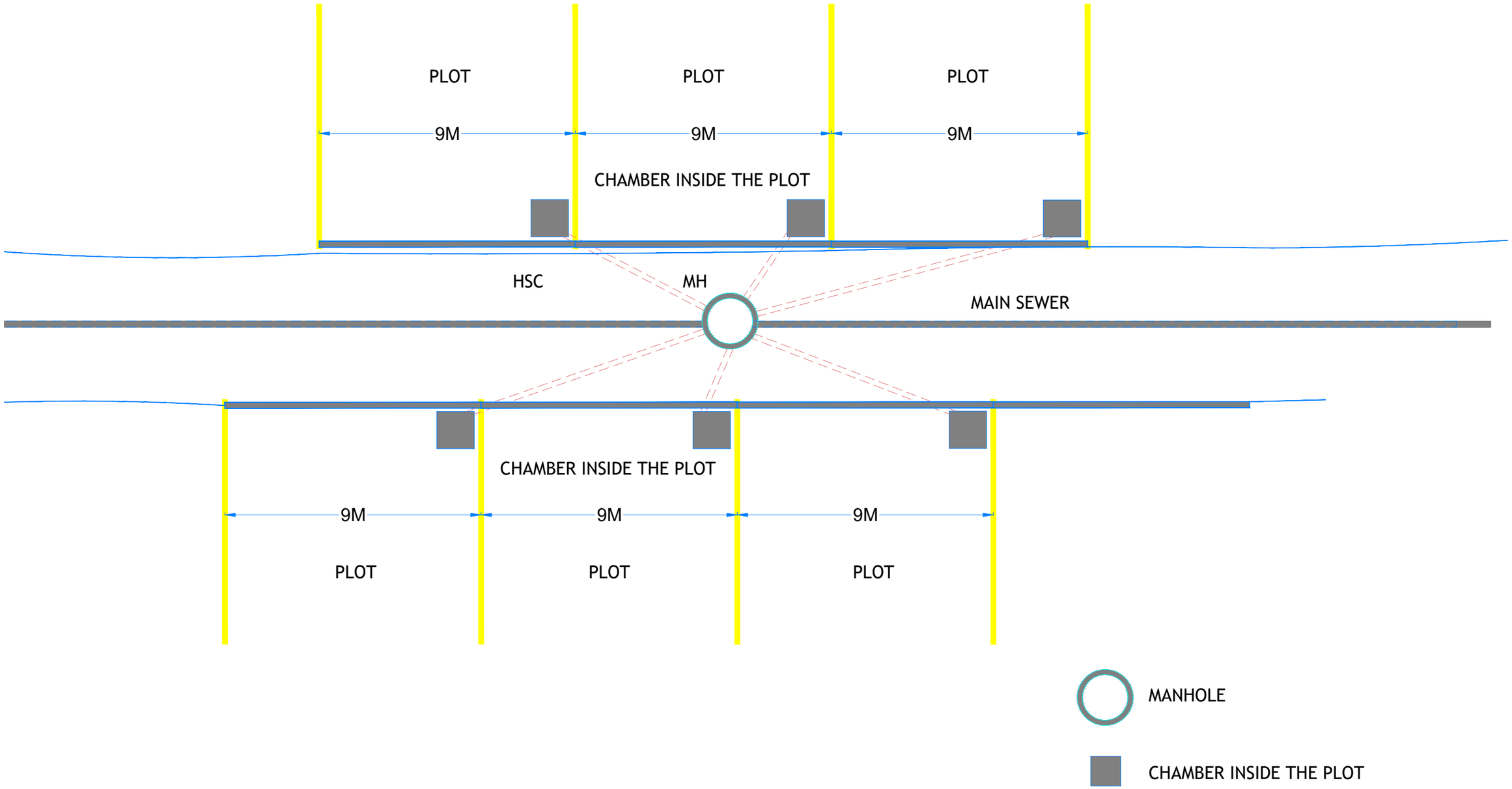
DRG. NO : IURWTS-WT2024-TP-CIVIL-1805

DIMENSIONS: in MTS

SHEET: 1 OF 1

HOUSE SERVICE CONNECTION

Annexure - 3A
(Refer Para 4 of CUBE Ltr.No: CUBE/ENVT/KMRL/106/2022-23 Dt.11 Oct 2022)



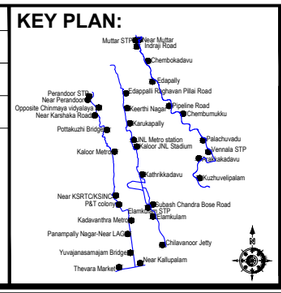
CLIENT: KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT: anteagroup
Antea Nederland B.V and Antea India (JV)

PROJECT: IURWTS
Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	12/10/2022
DESIGNED	RENUKA M	RM	12/10/2022
CHECKED	RENUKA M	RM	12/10/2022
APPROVED	RENUKA M	RM	12/10/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R1	DESIGN DRAWING	12/10/2022	
R0	DESIGN DRAWING	06/10/2022	

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: KOCHI

SCALE: NTS

TITLE: TYPICAL DETAILS FOR PROPERTY CONNECTION

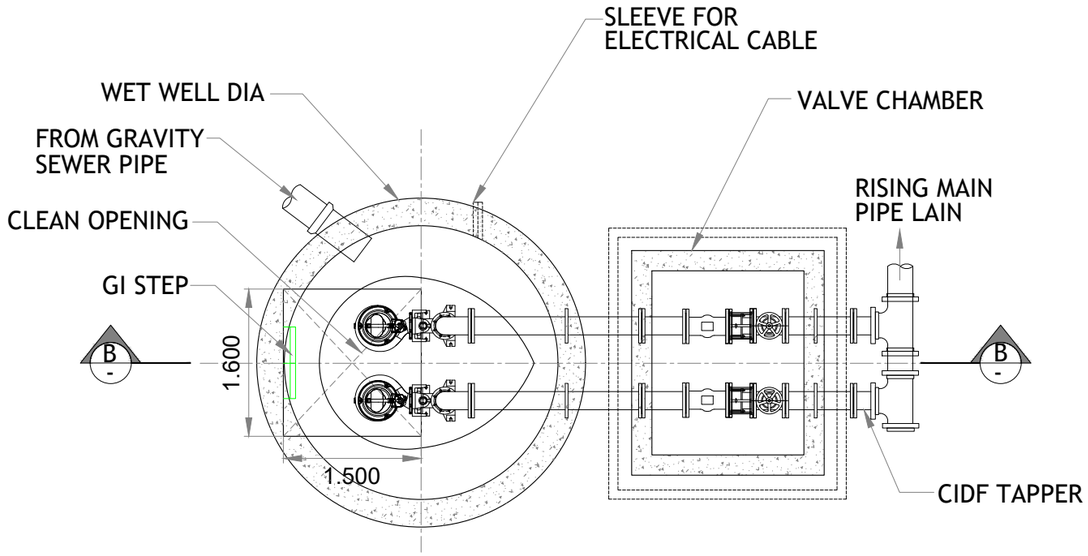
DATE: 12/10/2022

REV.: R1

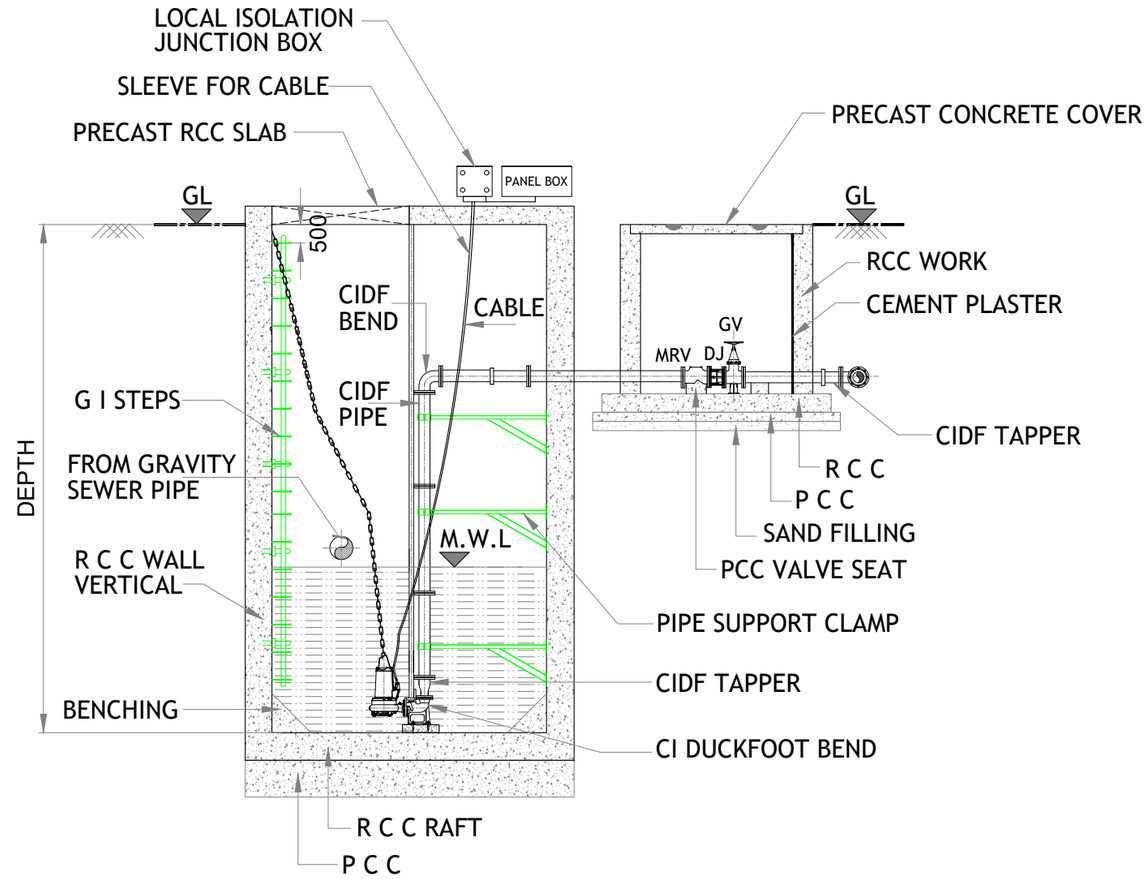
DRG. NO : IURWTS-WT2024-TP-CIVIL-1806

DIMENSIONS: in MTS

SHEET: 1 OF 1



PLAN



SECTION - B B

TYPICAL DETAILS FOR LIFTING STATION

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

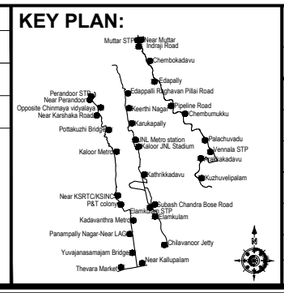
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	27/09/2022
DESIGNED	RENUKA M	RM	27/09/2022
CHECKED	RENUKA M	RM	29/09/2022
APPROVED	RENUKA M	RM	29/09/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	DETAILED DESIGN DRAWING	24/09/2021	BALAJI

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: KOCHI

SCALE: NTS

TITLE: TYPICAL DETAILS FOR LIFTING STATION

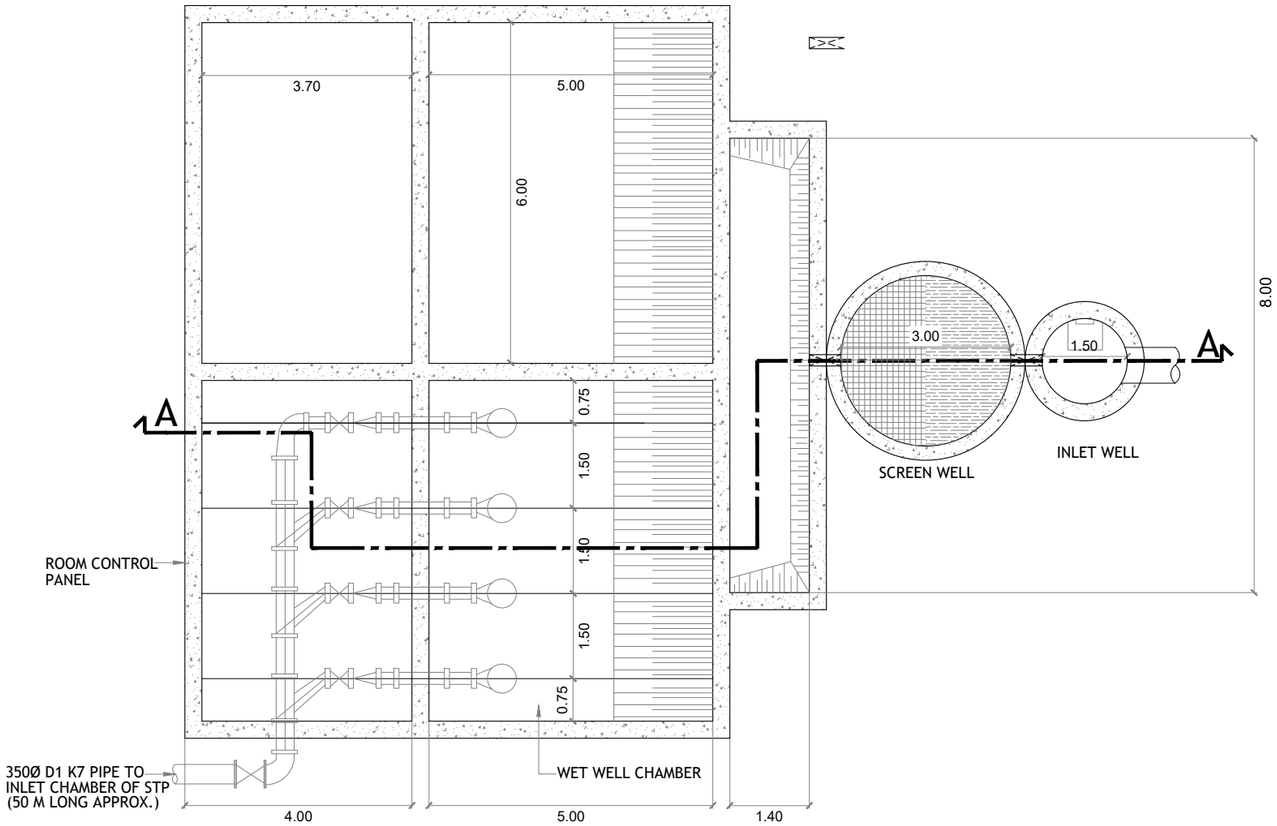
DATE: 27/09/2022

REV.: R0

DRG. NO : IURWTS-WT2024-TP-CIVIL-1808

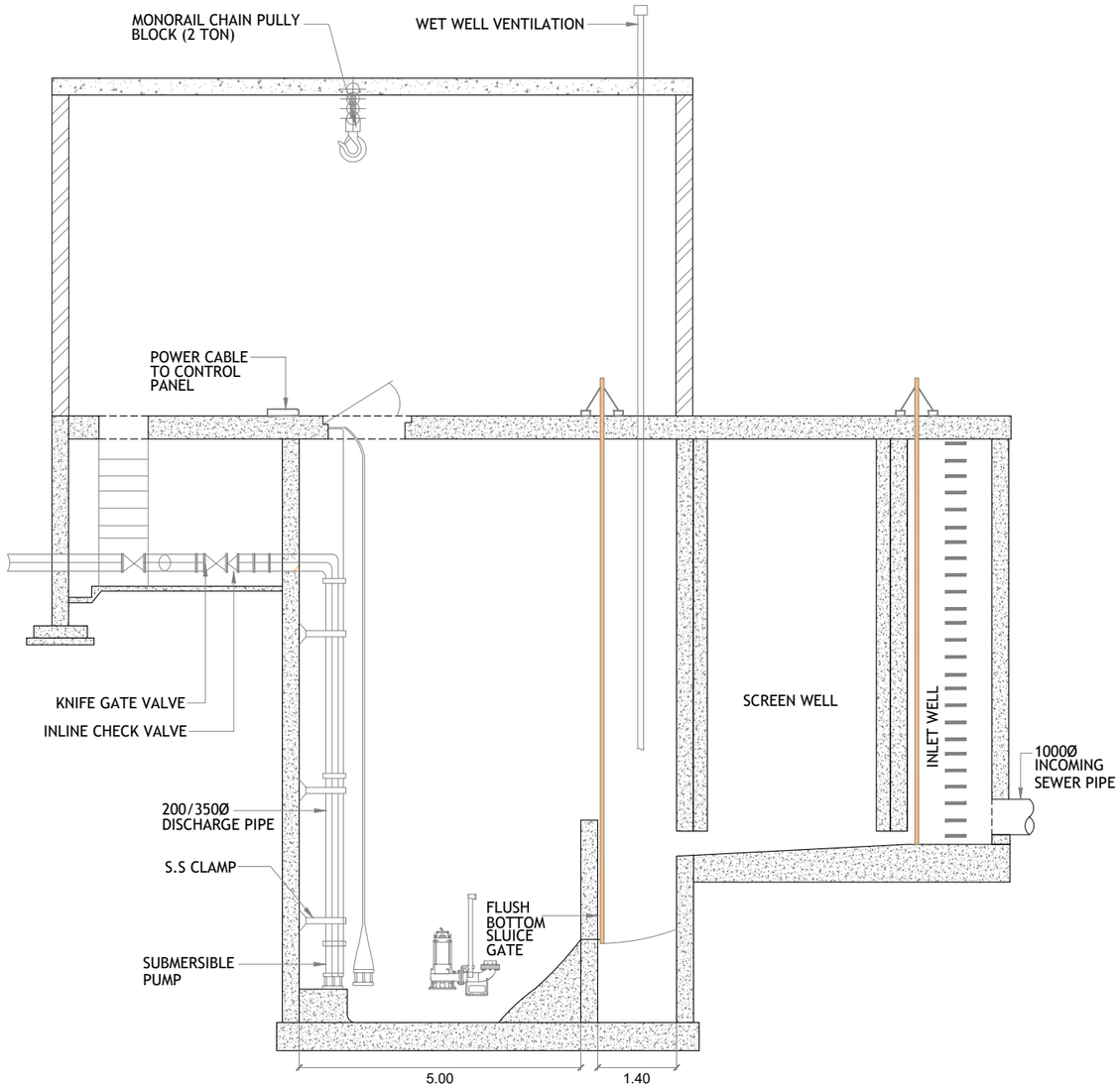
DIMENSIONS: in MTS

SHEET: 1 OF 1



ILLUSTRATIVE WET WELL DESIGN FOR SUBMERSIBLE PUMP SET

PLAN



SECTION - A A

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

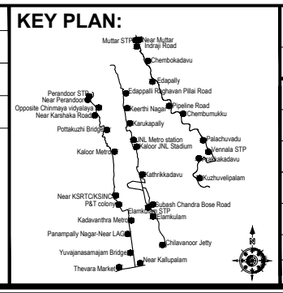
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	06/10/2022
DESIGNED	RENUKA M	RM	06/10/2022
CHECKED	RENUKA M	RM	06/09/2022
APPROVED	RENUKA M	RM	06/09/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL		MEP	

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	DETAILED DESIGN DRAWING	24/09/2021	BALAJI

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: KOCHI

SCALE: NTS

TITLE: ILLUSTRATIVE WET WELL DESIGN FOR SUBMERSIBLE PUMP SET (PLAN & SECTION)

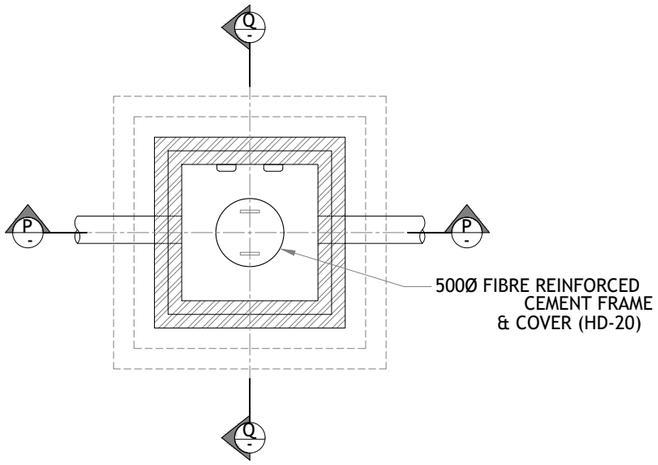
DATE: 06/10/2022

REV.: R0

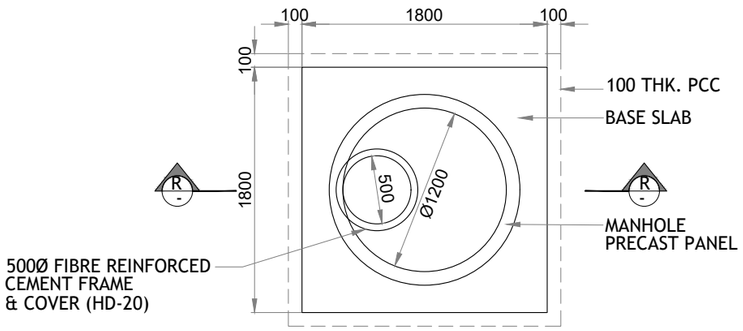
DRG. NO : IURWTS-WT2024-TP-CIVIL-1809

DIMENSIONS: in MTS

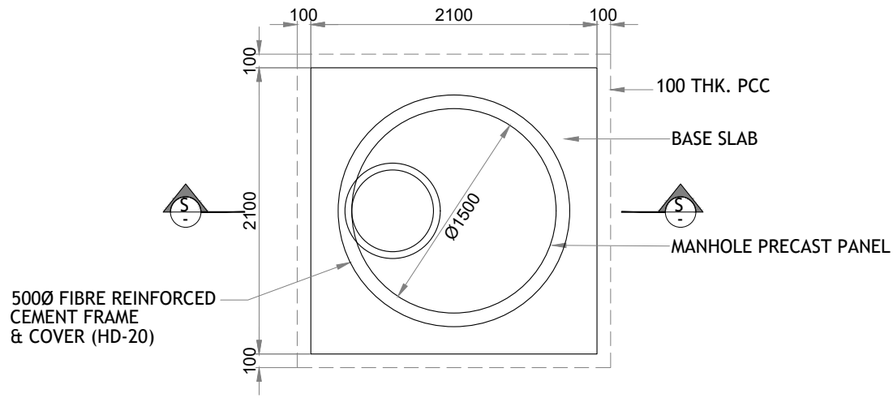
SHEET: 1 OF 1



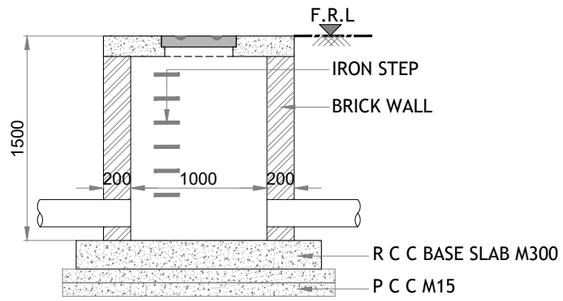
PLAN FOR RECTANGULAR MANHOLE (BRICK)



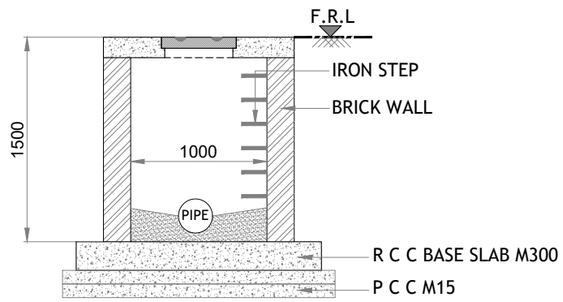
PLAN FOR 1200Ø CIRCULAR MANHOLE



PLAN FOR 1500Ø CIRCULAR MANHOLE



SECTION - P P



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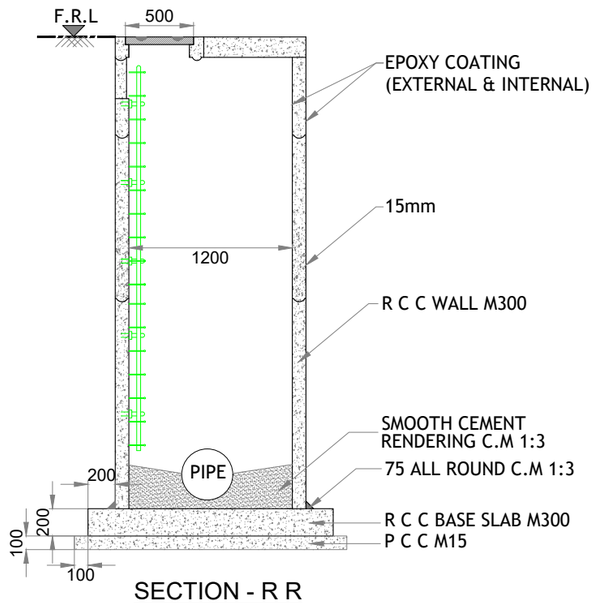

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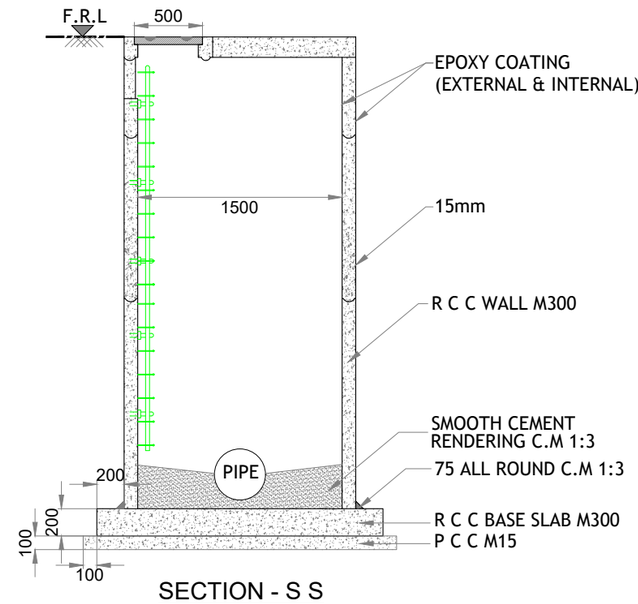


SECTION - S S

TYPICAL DETAILS FOR RECTANGULAR AND CIRCULAR MANHOLES

CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

anteagroup

Antea Nederland B.V and Antea India (JV)

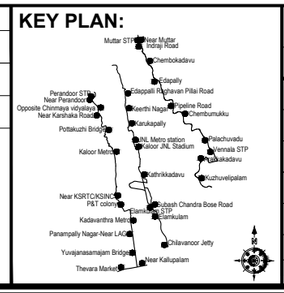
PROJECT:

IURWTS

Integrated Urban Regeneration & Water Transport System

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	28/09/2022
DESIGNED	RENUKA M	RM	28/09/2022
CHECKED	RENUKA M	RM	29/09/2022
APPROVED	RENUKA M	RM	29/09/2022

KEY PLAN:



NO OBJECTION BY KMRL :

CIVIL	MEP

REVISIONS:

NO.	DESCRIPTION	DATE	BY
R0	DETAILED DESIGN DRAWING	24/09/2021	BALAJI

NAME OF PROJECT : **INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM**

LOCATION: KOCHI

SCALE: NTS

TITLE: TYPICAL DETAILS FOR RECTANGULAR AND CIRCULAR MANHOLES

DATE: 28/09/2022

REV.: R0

DRG. NO : IURWTS-WT2024-TP-CIVIL-1811

DIMENSIONS: in MTS

SHEET: 1 OF 1

ANNEXURE 6

DESIGN : STP

DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS
MUTTAR STP-From WW@STP site to Inlet Chamber

Note:
(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.
During execution the total head for pumpsets should be calculated considering the wastage due to valves and specials actually used.
In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
2	WW1	-0.01	91.954	WW1	WW2	2000	91.954+58.537 = 150.491 lps	2.82	1.3
3B	WW1	-0.56	58.537						
3A	WW2	-2.28	76.064	WW2	IC@STP	3500	150.491+76.064 = 226.555 lps	1.3	2.05
3C	STP	-0.96	68.901	WW@STP	IC@STP	20	68.901+66.985 = 135.886 lps	2.05	2.05
4	STP	-0.67	66.985						

Pumping main fro WW1 to WW2
Ultimate peak flow 135.886 lps

Flow in MLD

Stage	Year	Flow in MLD
Initial	**2025**	**9.85**
Intermediate	**2040**	**10.75**
Ultimate	**2055**	**11.74**

Length of Pumping Main	20.00	m
Top level of Inlet chamber	9.60	m
Hours of pumping	24.00	hrs
Residual Head	2.00	m
FOOT VALVE LEVEL	-4.17	m
Static head including Residual Head	15.77	m

RESULTS

SEWAGE QUANTITY

Discharge (3 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		**Pipe size and type**	Pumpset Capacity (HP) **(Intermediate)**	**Pipe size and type**	Pumpset Capacity (HP) **(Base year to Intermediate)**	Pumpset Capacity (HP) **(Inter. To Ultimate)**	**Inter.**	**Ultimate**
							Available		Available	Available	mps	mps
Initial	2025	9.85	6840	114.00	ECP-3-DWF	**450 DI K9**	**40.00**	**350 DI K9**	**40.00**	**45.00**	**1.29**	**1.41**
Intermediate	2040	10.75	7465	124.42								
Ultimate	2055	11.74	8153	135.88								

Discharge (2 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		**Pipe size and type**	Pumpset Capacity (HP) **(Intermediate)**	**Pipe size and type**	Pumpset Capacity (HP) **(Base year to Intermediate)**	Pumpset Capacity (HP) **(Inter. To Ultimate)**	**Inter.**	**Ultimate**
							Available		Available	Available	mps	mps
Initial	2025	6.56	4556	75.93	ECP-2-DWF	**400 DI K9**	**25.00**	**350 DI K9**	**25.00**	**30.00**	**0.86**	**0.94**
Intermediate	2040	7.16	4972	82.87								
Ultimate	2055	7.82	5431	90.51								

Discharge (1 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		**Pipe size and type**	Pumpset Capacity (HP) **(Intermediate)**	**Pipe size and type**	Pumpset Capacity (HP) **(Base year to**	Pumpset Capacity (HP) **(Inter. To Ultimate)**	**Inter.**	**Ultimate**
							Available		Available	Available	mps	mps
Initial	2025	3.28	2278	37.96	ECP-1-DWF	**300 DI K9**	**15.00**	**350 DI K9**	**15.00**	**15.00**	**0.43**	**0.47**
Intermediate	2040	3.58	2486	41.44								
Ultimate	2055	3.91	2715	45.25								

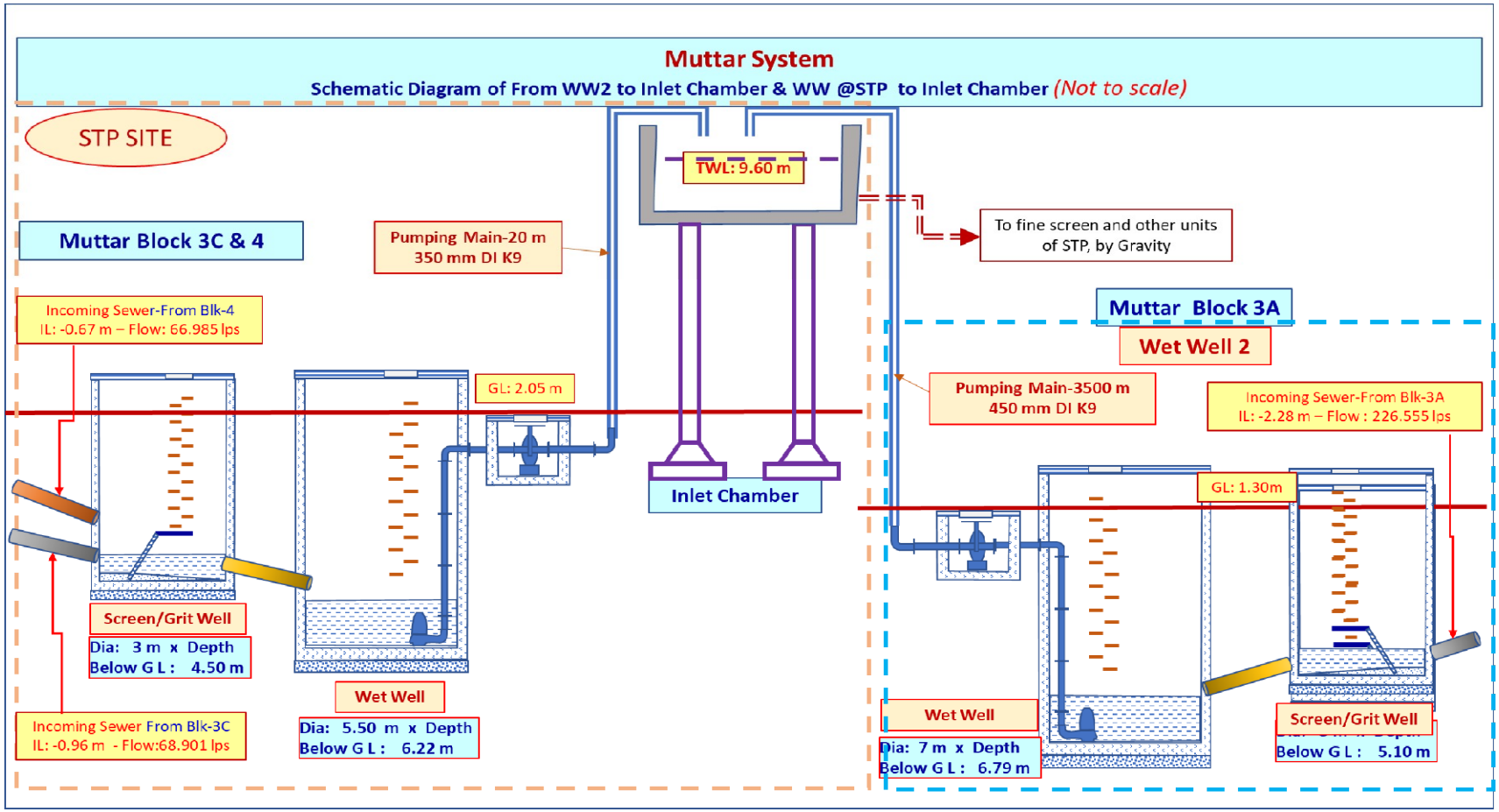
PROVIDE PUMPING MAIN OF **350 DI K9** SIZE

RESULTS

		Size of main	**350 DI K9**		
PUMPSETS					
During the period from 2025 to 2040 (considering 15 years as life of pumpset)				CHECK	
Provide	15 HP x	2 NO.		30	40
Provide	10 HP x	1 NO.		10	
Standby	10 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 DWF)	15 HP x	1 NO.		15	15.00
Ave, flow (2 DWF)	15 HP x	1 NO.		15	25.00
+	10 HP x	1 NO.		10	
Peak, flow (3 DWF)	15 HP x	2 NO.		30	40.00
+	10 HP x	1 NO.		10	
During the period from 2040 to 2055 (considering 15 years as life of pumpset)					
Provide	15 HP x	3 NO.		45	45
Standby	15 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 DWF)	15 HP x	1 NO.		15	15.00
Ave, flow (2 DWF)	15 HP x	2 NO.		30	30.00
Peak, flow (3 DWF)	15 HP x	3 NO.		45	45.00

For Estimate of pump sets propose (Intermediate)
15 HP x 2 No. + 10 HP x 1 No. + 10 HP x 1 No. Standby

MUTTAR STP-From WW@STP site to Inlet Chamber					
Design/Input Data					
Sr. No.	**Description**	**Values**	**Unit**		
Input values					
1	Average Flow	9.85	MLD	6840	lpm
2	Intermediate Flow	*10.75*	MLD	7465	lpm
3	Peak Flow	*11.74*	MLD	8153	lpm
4	GL at STP site	*2.05*	m	3.010	
5	IL of Incoming Sewer	*-0.96*	m		
6	Length of Rising Main	*20.00*	m		
7	Inlet chamber TWL	*9.60*	m		
8	Dia of incoming sewer	*0.45*	m		
9	d/D of incoming sewer	*0.80*			
10	Velocity in sewer at peak design Ultimate flow	*1.09*	m/s		
11	Residual Head	*2.00*	m		
Output values					
1	Average Flow	410.42	m^3/hr		
2	Peak Flow	489.17	m^3/hr		
3	Suction Depth (Depth of SPS)	**6.22**	m		


Muttar System
Schematic Diagram of From WW2 to Inlet Chamber & WW @STP to Inlet Chamber (Not to scale)
STP SITE
Muttar Block 3C & 4
Pumping Main-20 m
350 mm DI K9
TWL: 9.60 m
To fine screen and other units
of STP, by Gravity
Incoming Sewer-From Blk-4
IL: -0.67 m – Flow: 66.985 lps
GL: 2.05 m
Inlet Chamber
Screen/Grit Well
Dia: 3 m x Depth
Below G L : 4.50 m
Wet Well
Dia: 5.50 m x Depth
Below G L : 6.22 m
Incoming Sewer From Blk-3C
IL: -0.96 m - Flow:68.901 lps
Muttar Block 3A
Wet Well 2
Pumping Main-3500 m
450 mm DI K9
Incoming Sewer-From Blk-3A
IL: -2.28 m – Flow : 226.555 lps
GL: 1.30m
Wet Well
Dia: 7 m x Depth
Below G L : 6.79 m
Screen/Grit Well
Below G L : 5.10 m

MUTTAR STP-From WW@STP site to Inlet Chamber				
Diameter required for Screen/Grit well				
Data				
Average Flow		9.850	MLD	
Peak Design Flow		11.740	MLD	
		0.136	m^3/s	0.136
Inner Dia of incoming sewer		0.450	m	OD: 0.23
d/D		0.800		
Depth of flow in sewer at peak flow		0.360	m	0.2
Velocity in sewer at peak design Ultimate flow		1.090	m/s	
Drop of screen chamber floor to invert		0.080	m	
G.L of Screen well		2.050	m	
I.L of Screen Well		-0.960	m	
Assumed width of bars		10	mm	
Clear spacing between bars		25	mm	
Design of Bar Rack (Screen)				
Type of Screening		**Manual**		
Assume Velocity through screen		0.7	m/s	0.7
Clear area of openings through the rack		0.194	m^2	0.194
Clear width of openings through the rack		0.539	m	0.971
Number of clear spacings		22.000		
So number of bars		21.000		
Total width of the Screen		0.800	m	
Projected fixtures width each side		0.150	m	
Total width of the Screen		1.100	m	
Angle of Inclination of Bar		45 °		
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually Cleaned.				
Height above G.L		1.000	m	
Total depth of Bar Rack		1.250	m	
Sin 45°		0.707		
Slant height of Screen		1.800	m	
Tan 45°		1.000		
Horizontal length of Screen		1.300		
Length between pipe and screen		0.600	m	
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)		1.500	m	
Total Length of the chamber		3.000	m	
Providing Manual Screen of Size 1.1 m Width X 1.8 m Height				
Providing well internal diameter of Screen/Grit Well 3 m				

Design of Grit Well

Peak Flow	=	8153.000	lpm
Average Flow	=	6840.000	lpm
Ground Level	=	2.050	m
Invert Level of Incoming	=	-0.960	m
Size of Approach Sewer	=	450.000	mm

Diameter required for Screen/Grit well

Volume of grit collection

As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

hence, take maximum,	0.15	=	0.15 x 1000	m^3 / Mm^3	
		=	150	m^3 / Mm^3	
This quantity is for 24 hrs, hence, per hour flow		=	150 / 24		
		=	6.25	m^3 / mm^3	
The quantity increases 3 to 4 times during peak					
Taking average, 3.5		=	3.5 x	6.25	
		=	21.875	m^3 / mm^3	
This quantity lasts for 2 to 3 hours in Morning and evening					
Hence, taking the maximum hours of		=	3		
Volume = 3 x	21.88	=	65.625	m^3 / mm^3	
For 5 hours of normal flow =		=	6.250	x 5	
		=	31.250	m^3 / mm^3	
Therefore for total / day		=	96.875	m^3 / mm^3	
Volume of grit collected / day		=	8153	x 60 x 24x	96.88
				1000	10^6
		=	1.137	cu.m	
Volume of Storage required		=	1.137	cu.m	
Assuming dia of well as		=	3.00	m	
Area of well		=	7.069	sq.m	
Depth of Storage required		=	0.161	m	
Total depth of Bar Rack		=	1.250		
Total depth requird.			1.411		
Provide a minimum depth of		=	1.40	Min. 1.30 m(1.0 m +	

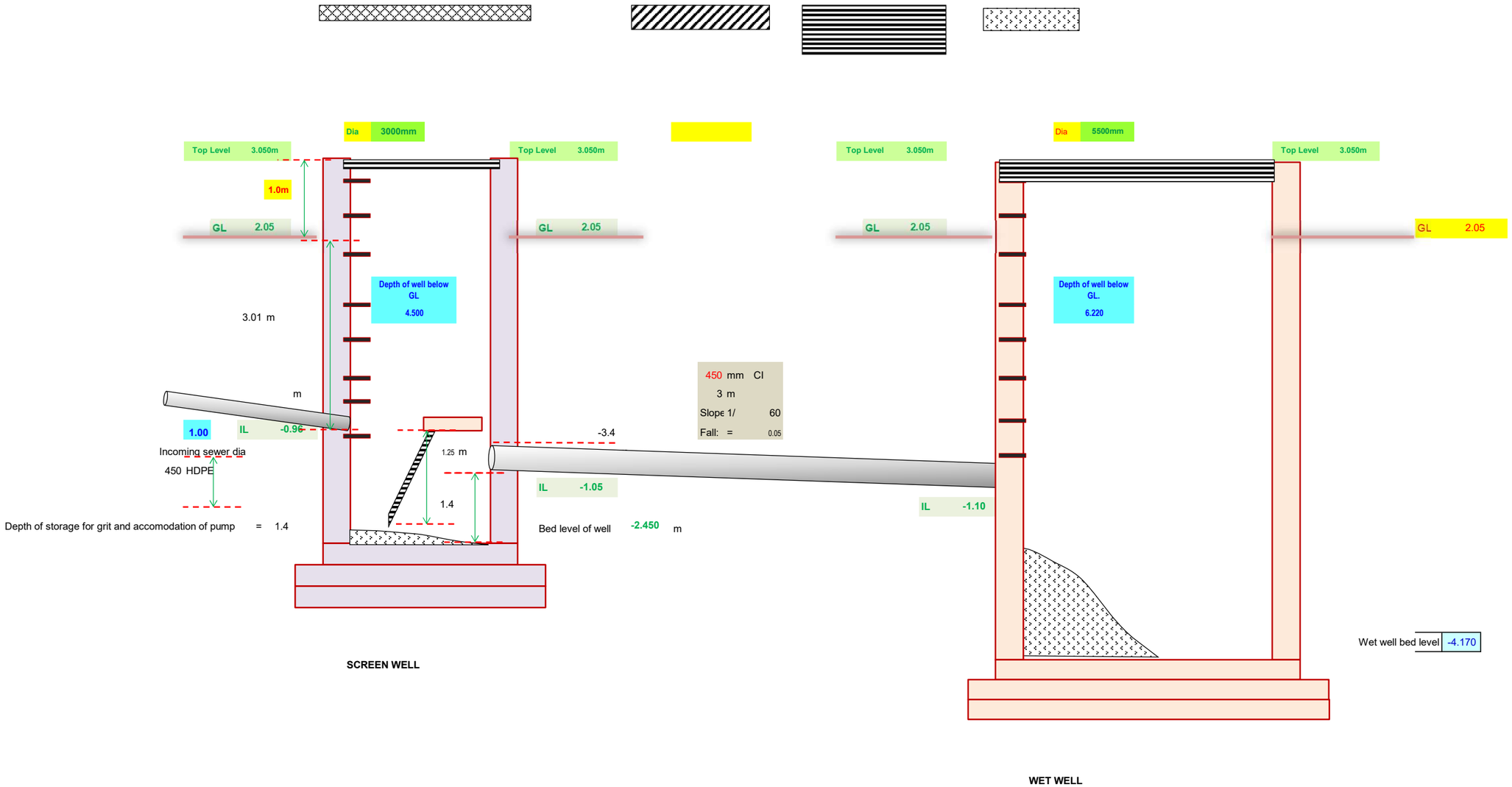
Check:

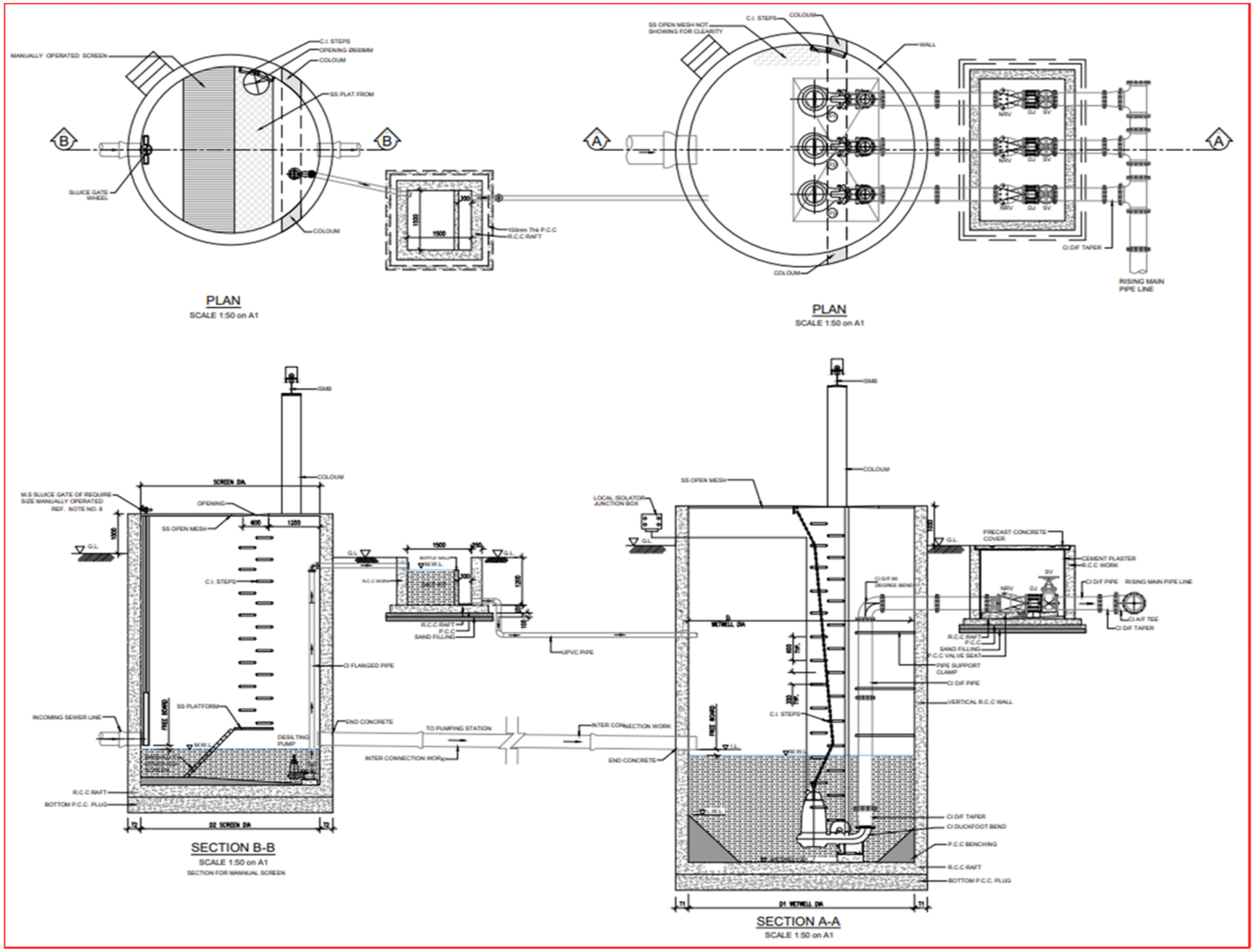
Volume provided	=	22 x 3 x 3 x 1.4 x 2	
	=	7 x 4	
	=	6.600	cu.m
No. of days	=	6.600	/ 1.14
	=	5.803	**days**

Depth of Grit well

G.L	=	2.050	m
I.L of incoming pipe	=	-0.960	m
Depth of storage for grit and accomodation of pump	=	1.400	m
Total depth	=	4.410	m
Provide a Total depth below GL.	=	**4.500**	m

MUTTAR STP-From WW@STP site to Inlet Chamber				
Design/Input Data				
Wet Well Calculations				
Sr. No.	**Description**	**Unit**	**Value**	**Remark**
Basic details				
1	Peak Flow	m^3/hr	**489.167**	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m^3	30.573	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m^2	20.382	
5	Diameter required for wet well	m	5.094	
6	Diameter provided for wet well	m	**5.500**	
7	Actual provided wet well area	m^2	23.758	
8	Actual provided wet well capacity	m^3	35.637	
9	Ground level at wet well site	m	2.050	
10	Invert level of incoming sewer in wet well	m	**-1.070**	
11	Difference between MWL in wet well and incoming IL	m	0.100	
12	Maximum water level in wet well (MWL)	m	-1.170	
13	Lowest water level in wet well (LWL)	m	-2.670	
14	Required pump submergence depth	m	1.500	
15	Wet well bed level	m	-4.170	
wet well dimensions				
1	Total wet well depth	**m**	6.220	
2	Wet well diameter required	**m**	5.500	
3	Wet well diameter to be provided	**m**	**5.500**	


Dia 3000mm
Top Level 3.050m
Top Level 3.050m
1.0m
GL 2.05
GL 2.05
Depth of well below GL
4.500
3.01 m
m
1.00
IL -0.96
Incoming sewer dia
450 HDPE
1.25 m
1.4
Depth of storage for grit and accomodation of pump = 1.4
-3.4
IL -1.05
Bed level of well -2.450 m
450 mm CI
3 m
Slope 1/ 60
Fall: = 0.05
IL -1.10
SCREEN WELL
Dia 5500mm
Top Level 3.050m
Top Level 3.050m
GL 2.05
GL 2.05
Depth of well below GL.
6.220
Wet well bed level -4.170
WET WELL


PLAN
SCALE 1:50 on A1
PLAN
SCALE 1:50 on A1
SECTION B-B
SCALE 1:50 on A1
SECTION FOR MANNUAL SCREEN
SECTION A-A
SCALE 1:50 on A1

Valve Chamber		
Length	**2.30**	m
Breadth	**3.80**	m
Total Depth	**1.90**	m
penstock depth-Grit /screen	**3.50**	m
penstock depth-Suction well	**3.50**	m
Silt Pit		
Length	**1.5**	m
Width	**1.5**	m
Depth	**1.2**	m

SPS DATA		
Depth of Suction Well	**7.22**	m
Dia of Suction Well	**5.50**	m
Pump HP	**25.00**	HP
RM Delivery Pipe Dia.	**400.00**	mm
SCREEN WELL DATA		
G.L	**2.05**	m
I.L of incoming pipe	**-0.96**	m
Dia of Grit Well	**3.00**	m
Incoming Pipe Dia. Of Network	**450.00**	mm
Total width of the Screen	**1.30**	m
Slant height of Screen	**1.80**	m
Depth	**5.50**	m

Valve Chamber*			
Dia, mm	**L, m**	**B, m**	**D, m**
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SOURCE :

wt.of 25x3 mm flat=0.59 kg/m	**0.59**
wt.of 12x3 mm flat=0.28 kg/m	**0.28**
wt.of 25x6 mm flat=1.18 kg/m	**1.18**
wt.of 50x10 mm flat=3.92 kg/m	**3.92**
wt.of 50x50 x6mm angle=4.47 kg/m	**4.47**
wt.of 150x75 x10mm angle=16.9 kg/m	**16.9**
wt.of ISMB 300mm =42.2 kg/m	**42.2**
wt.of ISMB 400mm =66.3 kg/m	**66.3**
wt.of ISMB 600mm =122 kg/m	**122**

Pipe Depth at IntCon.	**3.50**	m

Grit Well					
Design of Grit Well					
Depth of Grit Well	5.50	m		Total Depth(m)	6.40
Parapet Height	1.00	m		outer dia (m)	3.9
Total Height of well + Parapet	6.50	m		centre dia(m)	3.45
Dia of Grit Well	**3**	m		raft dia(m)	3.00
Thickness of wall	0.45	m		Screen Horizontal platform width(m)	1.5
Thickness of Raft Slab	0.45	m		Screen Mesh Opening(m)	0.6
Thickness of Plugging	0.30	m			
Design of kerb					
Diameter of grit well	3.00	m		**Extra width for Excavation for working including both sides**	**1.2**
Well wall thickness	0.45	m		**Benching depth assumed**	**0.25**
Kerb wall thickness at top	0.53	m			
Kerb wall thickness at bottom	0.15	m			
kerb height outer	1.05	m			
kerb height inner	0.45	m			
kerb height outer excluding inner	0.60	m			
kerb slope	0.71	m			
Thickness of raft	0.45	m			
Thickness of plugging	0.30	m			
Circumference of well kerb (l)	11.07	m			
Volume of Kerb	4.86	cu.m			

Suction Well		
Design Data		
Depth of Suction Well	**7.22**	m
Parapet Height	1.00	m
Total Height of well + Parapet	8.22	m
Dia of Suction Well	**5.50**	m
Thickness of wall	0.6	m
Thickness of Raft Slab	0.6	m
Thickness of Plugging	0.4	m
Design of kerb		
Diameter of wall	5.50	m
Well wall thickness	0.60	m
Kerb wall thickness at top	0.68	m
Kerb wall thickness at bottom	0.15	m
kerb height outer	1.33	m
kerb height inner	0.60	m
kerb height outer excluding inner	0.73	m
kerb slope	0.90	m
Thickness of raft	0.60	m
Thickness of plugging	0.40	m
Circumference of well kerb (l)	19.40	m
Volume of Kerb	4.21	cu.m

Screen Mesh Opening for Pump	
Length(m)	1.4
Breadth(m)	1.5
Outer Dia (m)	6.7
Center Dia (m)	6.10
Raft Dia (m)	5.50
Total Depth	8.22

DESIGN OF PUMPING MAIN FROM WET WELL for Perandoor 1A at STP to Receving Chamber

BASIC DATA		
GL AT Wet well site	**2.050**	m
Top level of receiving chamber	**9.600**	m
Residual Head	**2.000**	m
TOTAL HGL REQUIRED AT END	**9.600**	m
FOOT VALVE LEVEL	**-4.170**	m
Static head including Residual Head	**15.770**	m
Number of reaches	**1**	
Length	**20**	m

Combination	Pipes selected	
I	250 DI K9	
II	300 DI K9	
III	350 DI K9	
IV	400 DI K9	
V	450 DI K9	

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.05											12.05	10.00	AT WET WELL
0	20	9.60	20	250	DI-K9	140	7465	2.535	49	0.41	0.04	0.45	11.60	2.00	AT STP SITE
									TOTAL	**0.41**	**0.04**	**0.45**			
Combination II															
	0	2.05											11.79	9.74	AT WET WELL
0	20	9.6	20	300	DI-K9	140	7465	1.76	119	0.17	0.02	0.19	11.60	2.00	AT STP SITE
									TOTAL	**0.17**	**0.02**	**0.19**			
Combination III															
	0	2.05											11.69	9.64	AT WET WELL
0	20	9.6	20	350	DI-K9	140	7465	1.293	252	0.08	0.01	0.09	11.60	2.00	AT STP SITE
									TOTAL	**0.08**	**0.01**	**0.09**			
Combination IV															
	0	2.05											11.64	9.59	AT WET WELL
0	20	9.6	20	400	DI-K9	140	7465	0.99	484	0.04	0.00	0.04	11.60	2.00	AT STP SITE
									TOTAL	**0.04**	**0.00**	**0.04**			

Combination V															
	0	2.05											11.62	9.57	AT WET WELL
0	20	9.6	20	450	DI-K9	140	7465	0.782	858	0.02	0.00	0.02	11.60	2.00	AT STP SITE
									TOTAL	**0.02**	**0.00**	**0.02**			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		**GL**	**Distance (m)**	**Pipe**			**Disc. In lpm**	**Velcity-mps**	**Grade**	**Friction Loss**	**OL**	**TL**	**HGL**	**RH**	**REMARKS**
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	2.05											12.13	10.08	AT WET WELL
0	20	9.6	20	250	DI-K9	140	8153	2.768	42	0.48	0.05	0.53	11.60	2.00	AT STP SITE
									TOTAL	**0.48**	**0.05**	**0.53**			
Combination II															
	0	2.05											11.82	9.77	AT WET WELL
0	20	9.6	20	300	DI-K9	140	8153	1.922	101	0.2	0.02	0.22	11.60	2.00	AT STP SITE
									TOTAL	**0.2**	**0.02**	**0.22**			
Combination III															
	0	2.05											11.70	9.65	AT WET WELL
0	20	9.6	20	350	DI-K9	140	8153	1.412	214	0.09	0.01	0.10	11.60	2.00	AT STP SITE
									TOTAL	**0.09**	**0.01**	**0.10**			
Combination IV															
	0	2.05											11.66	9.61	AT WET WELL
0	20	9.6	20	400	DI-K9	140	8153	1.081	411	0.05	0.01	0.06	11.60	2.00	AT STP SITE
									TOTAL	**0.05**	**0.01**	**0.06**			
Combination V															
	0	2.05											11.63	9.58	AT WET WELL
0	20	9.6	20	450	DI-K9	140	8153	0.854	729	0.03	0.00	0.03	11.60	2.00	AT STP SITE
									TOTAL	**0.03**	**0.00**	**0.03**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	15.77	0.41	0.041	16.22	0.48	0.048	16.30
II	15.77	0.17	0.017	15.96	0.2	0.02	15.99
III	15.77	0.08	0.008	15.86	0.09	0.009	15.87
IV	15.77	0.04	0.004	15.81	0.05	0.005	15.83
V	15.77	0.02	0.002	15.79	0.03	0.003	15.80

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	7465	16	38	40	8153	16	42	45
II	7465	16	37	40	8153	16	41	45
III	7465	16	37	40	8153	16	41	45
IV	7465	16	37	40	8153	16	40	45
V	7465	16	37	40	8153	16	40	45

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	40	47000	1880000	45	47000	2115000	506314	2386314
II	40	47000	1880000	45	47000	2115000	506314	2386314
III	40	47000	1880000	45	47000	2115000	506314	2386314
IV	40	47000	1880000	45	47000	2115000	506314	2386314
V	40	47000	1880000	45	47000	2115000	506314	2386314

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE	10					
Combinatio	**Intermediate Stage**				**Ultimate Stage**					**Total cost**
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**	
I	38	247740	2477400	22616396	42	271789	2717890	24811850	5939760	28556155
II	37	243689	2436890	22246577	41	266692	2666920	24346540	5828368	28074945
III	37	242186	2421860	22109366	41	264666	2646660	24161585	5784091	27893458
IV	37	241532	2415320	22049662	40	263947	2639470	24095947	5768378	27818040
V	37	241140	2411400	22013876	40	263555	2635550	24060161	5759811	27773687

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	250 DI K9	20	3367	67340
		TOTAL		**67340**
II	300 DI K9	20	4251	85020
		TOTAL		**85020**
III	350 DI K9	20	5188	103760
		TOTAL		**103760**
IV	400 DI K9	20	6226	124520
		TOTAL		**124520**
V	450 DI K9	20	7485	149700
		TOTAL		**149700**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	67340	2386314	2453654
II	85020	2386314	2471334
III	103760	2386314	2490074
IV	124520	2386314	2510834
V	149700	2386314	2536014

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size	Inter. Pump	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	2453654	28556155	31009809	250 DI K9	40	45
II	2471334	28074945	30546279	**300 DI**	**40**	45
III	2490074	27893458	30383532	350 DI K9	40	45
IV	2510834	27818040	30328874	400 DI K9	40	45
V	**2536014**	**27773687**	**30309701**	**450 DI**	**40**	45

Hence Combination V
consisting of 450 DI K9 20 m x 40 HP
is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	**2.050**	m
Top level of receiving chamber	**9.600**	m
Residual Head	**2.000**	m
TOTAL HGL REQUIRED AT END	**9.600**	m
FOOT VALVE LEVEL	**-4.170**	m
Static head including Residual Head	**15.770**	m
Number of reaches	**1**	
Length	**20**	m

Combination	Pipes selected
I	250 DI K9
II	300 DI K9
III	350 DI K9
IV	400 DI K9
V	450 DI K9

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.05											11.81	9.76	AT WET WELL
0	20	9.60	20	250	DI-K9	140	4972	1.688	104	0.19	0.02	0.21	11.60	2.00	AT STP SITE
									TOTAL	**0.19**	**0.02**	**0.21**			
Combination II															
	0	2.05											11.69	9.64	AT WET WELL
0	20	9.6	20	300	DI-K9	140	4972	1.172	253	0.08	0.01	0.09	11.60	2.00	AT STP SITE
									TOTAL	**0.08**	**0.01**	**0.09**			
Combination III															
	0	2.05											11.64	9.59	AT WET WELL
0	20	9.6	20	350	DI-K9	140	4972	0.861	536	0.04	0.00	0.04	11.60	2.00	AT STP SITE
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination IV															
	0	2.05											11.62	9.57	AT WET WELL
0	20	9.6	20	400	DI-K9	140	4972	0.659	1026	0.02	0.00	0.02	11.60	2.00	AT STP SITE
									TOTAL	**0.02**	**0.00**	**0.02**			

Combination V															
	0	2.05											11.61	9.56	AT WET WELL
0	20	9.6	20	450	DI-K9	140	4972	0.521	1822	0.01	0.00	0.01	11.60	2.00	AT STP SITE
									TOTAL	**0.01**	**0.00**	**0.01**			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		**GL**	**Distance (m)**	**Pipe**			**Disc. In lpm**	**Velcity-mps**	**Grade**	**Friction Loss**	**OL**	**TL**	**HGL**	**RH**	**REMARKS**
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	2.05											11.85	9.80	AT WET WELL
0	20	9.6	20	250	DI-K9	140	5431	1.844	88	0.23	0.02	0.25	11.60	2.00	AT STP SITE
									TOTAL	**0.23**	**0.02**	**0.25**			
Combination II															
	0	2.05											11.70	9.65	AT WET WELL
0	20	9.6	20	300	DI-K9	140	5431	1.28	215	0.09	0.01	0.10	11.60	2.00	AT STP SITE
									TOTAL	**0.09**	**0.01**	**0.10**			
Combination III															
	0	2.05											11.64	9.59	AT WET WELL
0	20	9.6	20	350	DI-K9	140	5431	0.941	455	0.04	0.00	0.04	11.60	2.00	AT STP SITE
									TOTAL	**0.04**	**0.00**	**0.04**			
Combination IV															
	0	2.05											11.62	9.57	AT WET WELL
0	20	9.6	20	400	DI-K9	140	5431	0.72	872	0.02	0.00	0.02	11.60	2.00	AT STP SITE
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination V															
	0	2.05											11.61	9.56	AT WET WELL
0	20	9.6	20	450	DI-K9	140	5431	0.569	1547	0.01	0.00	0.01	11.60	2.00	AT STP SITE
									TOTAL	**0.01**	**0.00**	**0.01**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	15.77	0.19	0.019	15.98	0.23	0.023	16.02
II	15.77	0.08	0.008	15.86	0.09	0.009	15.87
III	15.77	0.04	0.004	15.81	0.04	0.004	15.81
IV	15.77	0.02	0.002	15.79	0.02	0.002	15.79
V	15.77	0.01	0.001	15.78	0.01	0.001	15.78

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	4972	16	25	25	5431	16	27	30
II	4972	16	25	25	5431	16	27	30
III	4972	16	25	25	5431	16	27	30
IV	4972	16	25	25	5431	16	27	30
V	4972	16	25	25	5431	16	27	30

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	25	50000	1250000	30	50000	1500000	359088	1609088
II	25	50000	1250000	30	50000	1500000	359088	1609088
III	25	50000	1250000	30	50000	1500000	359088	1609088
IV	25	50000	1250000	30	50000	1500000	359088	1609088
V	25	50000	1250000	30	50000	1500000	359088	1609088

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**10**						
Combinatio	**Intermediate Stage**				**Ultimate Stage**							**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**				
I	25	162524	1625240	14836955	27	178012	1780120	16250867	3890328			18727283	
II	25	161283	1612830	14723663	27	176313	1763130	16095764	3853198			18576861	
III	25	160825	1608250	14681851	27	175660	1756600	16036151	3838927			18520778	
IV	25	160629	1606290	14663958	27	175464	1754640	16018258	3834644			18498602	
V	25	160499	1604990	14652091	27	175333	1753330	16006299	3831781			18483871	

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	250 DI K9	20	3367	67340
		TOTAL		**67340**
II	300 DI K9	20	4251	85020
		TOTAL		**85020**
III	350 DI K9	20	5188	103760
		TOTAL		**103760**
IV	400 DI K9	20	6226	124520
		TOTAL		**124520**
V	450 DI K9	20	7485	149700
		TOTAL		**149700**

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	67340	1609088	1676428
II	85020	1609088	1694108
III	103760	1609088	1712848
IV	124520	1609088	1733608
V	149700	1609088	1758788

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	1676428	18727283	20403711	250 DI K9	25	30
II	1694108	18576861	20270969	300 DI K9	25	30
III	1712848	18520778	20233626	350 DI K9	25	30
IV	**1733608**	**18498602**	**20232210**	**400 DI K9**	**25**	30
V	1758788	18483871	20242659	450 DI K9	25	30

Hence Combination IV consisting of 400 DI K9 20 m x 25 HP is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	2.05	m
Top level of receiving chamber	9.60	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	9.60	m
FOOT VALVE LEVEL	-4.17	m
Static head including Residual Head	15.77	m
Number of reaches	1	
Length	20	m

Combination	Pipes selected	
I	250 DI K9	
II	300 DI K9	
III	350 DI K9	
IV	400 DI K9	
V	450 DI K9	

INTERMEDIATE STAGE

TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.05											11.66	9.61	AT WET WELL
0	20	9.60	20	250	DI-K9	140	2486	0.844	376	0.05	0.01	0.06	11.60	2.00	AT STP SITE
									TOTAL	**0.05**	**0.01**	**0.06**			
Combination II															
	0	2.05											11.62	9.57	AT WET WELL
0	20	9.6	20	300	DI-K9	140	2486	0.586	913	0.02	0.00	0.02	11.60	2.00	AT STP SITE
									TOTAL	**0.02**	**0.00**	**0.02**			
Combination III															
	0	2.05											11.61	9.56	AT WET WELL
0	20	9.6	20	350	DI-K9	140	2486	0.431	1933	0.01	0.00	0.01	11.60	2.00	AT STP SITE
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	2.05											11.61	9.56	AT WET WELL
0	20	9.6	20	400	DI-K9	140	2486	0.33	3705	0.01	0.00	0.01	11.60	2.00	AT STP SITE
									TOTAL	**0.01**	**0.00**	**0.01**			

Combination V															
	0	2.05											11.60	9.55	AT WET WELL
0	20	9.6	20	450	DI-K9	140	2486	0.261	6575	0	0.00	0.00	11.60	2.00	AT STP SITE
									TOTAL	**0**	**0.00**	**0.00**			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		**GL**	**Distance (m)**	**Pipe**			**Disc. In lpm**	**Velcity-mps**	**Grade**	**Friction Loss**	**OL**	**TL**	**HGL**	**RH**	**REMARKS**
Start	**End**			**Size in mm**	**Type & Class**	**C' value**									
Combination I															
	0	2.05											11.67	9.62	AT WET WELL
0	20	9.6	20	250	DI-K9	140	2715	0.922	319	0.06	0.01	0.07	11.60	2.00	AT STP SITE
									TOTAL	**0.06**	**0.01**	**0.07**			
Combination II															
	0	2.05											11.63	9.58	AT WET WELL
0	20	9.6	20	300	DI-K9	140	2715	0.64	775	0.03	0.00	0.03	11.60	2.00	AT STP SITE
									TOTAL	**0.03**	**0.00**	**0.03**			
Combination III															
	0	2.05											11.61	9.56	AT WET WELL
0	20	9.6	20	350	DI-K9	140	2715	0.47	1642	0.01	0.00	0.01	11.60	2.00	AT STP SITE
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination IV															
	0	2.05											11.61	9.56	AT WET WELL
0	20	9.6	20	400	DI-K9	140	2715	0.36	3147	0.01	0.00	0.01	11.60	2.00	AT STP SITE
									TOTAL	**0.01**	**0.00**	**0.01**			
Combination V															
	0	2.05											11.60	9.55	AT WET WELL
0	20	9.6	20	450	DI-K9	140	2715	0.285	5585	0	0.00	0.00	11.60	2.00	AT STP SITE
									TOTAL	**0**	**0.00**	**0.00**			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	15.77	0.05	0.005	15.83	0.06	0.006	15.84
II	15.77	0.02	0.002	15.79	0.03	0.003	15.80
III	15.77	0.01	0.001	15.78	0.01	0.001	15.78
IV	15.77	0.01	0.001	15.78	0.01	0.001	15.78
V	15.77	0	0	15.77	0	0	15.77

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	2486	16	12	15	2715	16	13	15
II	2486	16	12	15	2715	16	13	15
III	2486	16	12	15	2715	16	13	15
IV	2486	16	12	15	2715	16	13	15
V	2486	16	12	15	2715	16	13	15

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	15	58000	870000	15	58000	870000	208271	1078271
II	15	58000	870000	15	58000	870000	208271	1078271
III	15	58000	870000	15	58000	870000	208271	1078271
IV	15	58000	870000	15	58000	870000	208271	1078271
V	15	58000	870000	15	58000	870000	208271	1078271

TABLE 5. COST OF ELECTRICAL ENERGY					**UNIT RATE**		**10**					
Combinatio	**Intermediate Stage**				**Ultimate Stage**						**Total cost**	
	BHP	**Units**	**Cost**	**Capitalised**	**BHP**	**Units**	**Cost**	**Capitalised cost**	**Equ.cost**			
I	12	80511	805110	7349918	13	87961	879610	8030035	1922326			9272244
II	12	80315	803150	7332025	13	87765	877650	8012142	1918043			9250068
III	12	80249	802490	7326000	13	87634	876340	8000183	1915180			9241180
IV	12	80249	802490	7326000	13	87634	876340	8000183	1915180			9241180
V	12	80184	801840	7320066	13	87568	875680	7994157	1913738			9233803

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	250 DI K9	20	3367	67340
		TOTAL		**67340**
II	300 DI K9	20	4251	85020
		TOTAL		**85020**
III	350 DI K9	20	5188	103760
		TOTAL		**103760**
IV	400 DI K9	20	6226	124520
		TOTAL		**124520**
V	450 DI K9	20	7485	149700
		TOTAL		**149700**

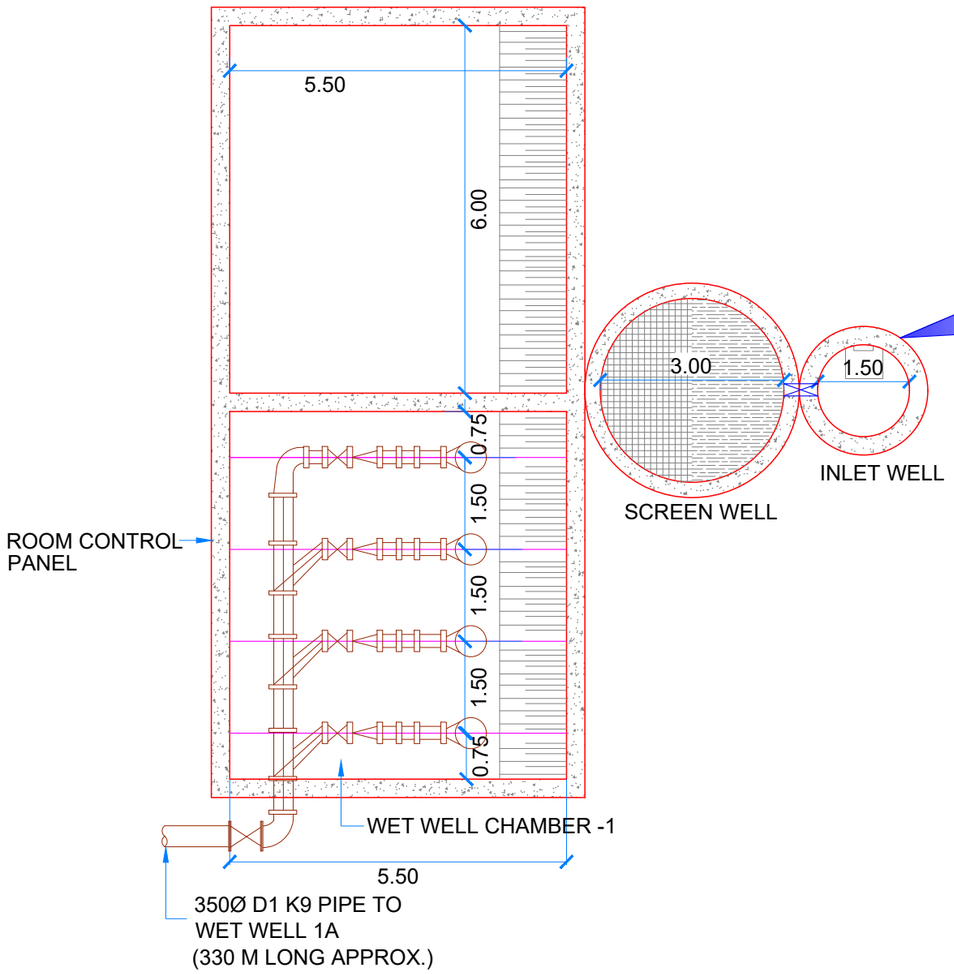
TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	*2*	*3*	*4. (2 + 3)*
I	67340	1078271	1145611
II	85020	1078271	1163291
III	103760	1078271	1182031
IV	124520	1078271	1202791
V	149700	1078271	1227971

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	*2*	*3*	*4. (2 + 3)*	*5.*	*6.*	*7.*
I	1145611	9272244	10417855	250 DI K9	15	15
II	**1163291**	**9250068**	**10413359**	**300 DI K9**	**15**	15
III	1182031	9241180	10423211	350 DI K9	15	15
IV	1202791	9241180	10443971	400 DI K9	15	15
V	1227971	9233803	10461774	450 DI K9	15	15

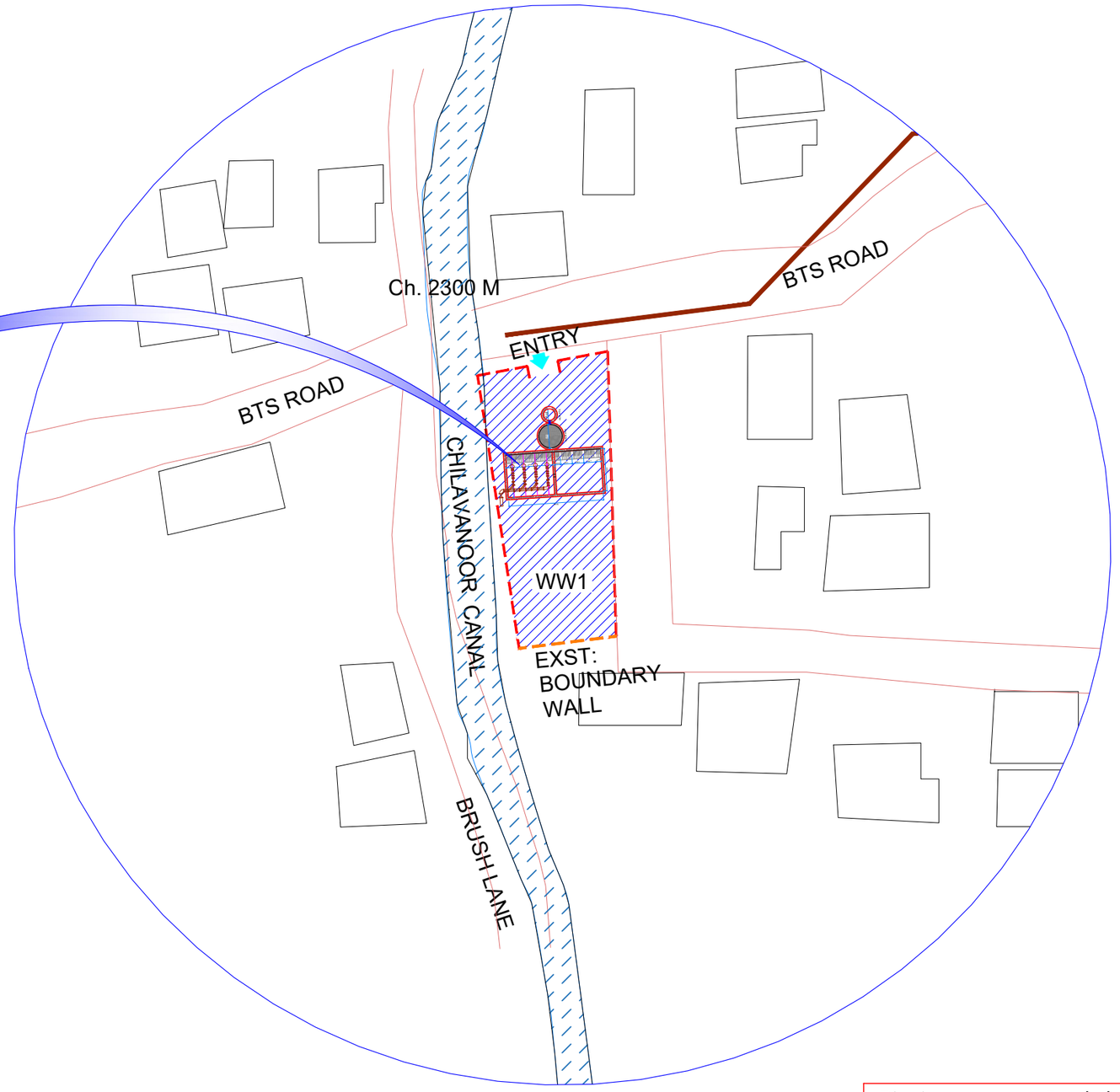
Hence Combination II consisting of 300 DI K9 20 m x 15 HP is found to be economical

ANNEXURE 6

DRAWINGS : STP



ILLUSTRATIVE WET WELL DESIGN FOR SUBMERSIBLE PUMP SET



District	:	Ernakulam
Village	:	Ernakulam
Hectare	:	0.0689 Ha

KOCHI METRO RAIL LIMITED
4th Floor, JLN Stadium Metro Station,
Baneji Road, Kaloor,Kochi,
Kerala - 682017
Ph: 0484-2846700 , 2846770
Fax: 0484-2970810

GENERAL CONSULTANT:
anteagroup
40/157, Kudiyirickal Building, First Floor
Palarivattam, Kochi - 682025,Kerala

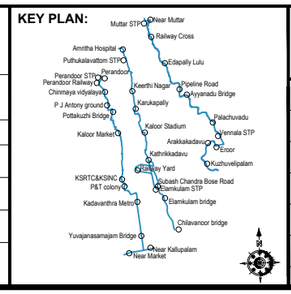
PROJECT:
GENERAL COUNSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM, KOCHI

anteagroup

Antea Nederland B.V and Antea India(JV)

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	19-10-2022
DESIGNED	RENUKA M	RM	19-10-2022
CHECKED	RENUKA M	RM	19-10-2022
APPROVED	RENUKA M	RM	19-10-2022

KEY PLAN:



NO OBJECTION BY KMRL

CIVIL		MEP	

REVISIONS

NO.	DESCRIPTION	DATE	BY
R0			

PROJECT:INTEGRATED URBAN REGENARATION & WATER TRANSPORT SYSTEM

LOCATION: BTS ROAD , MUTTAR

SCALE

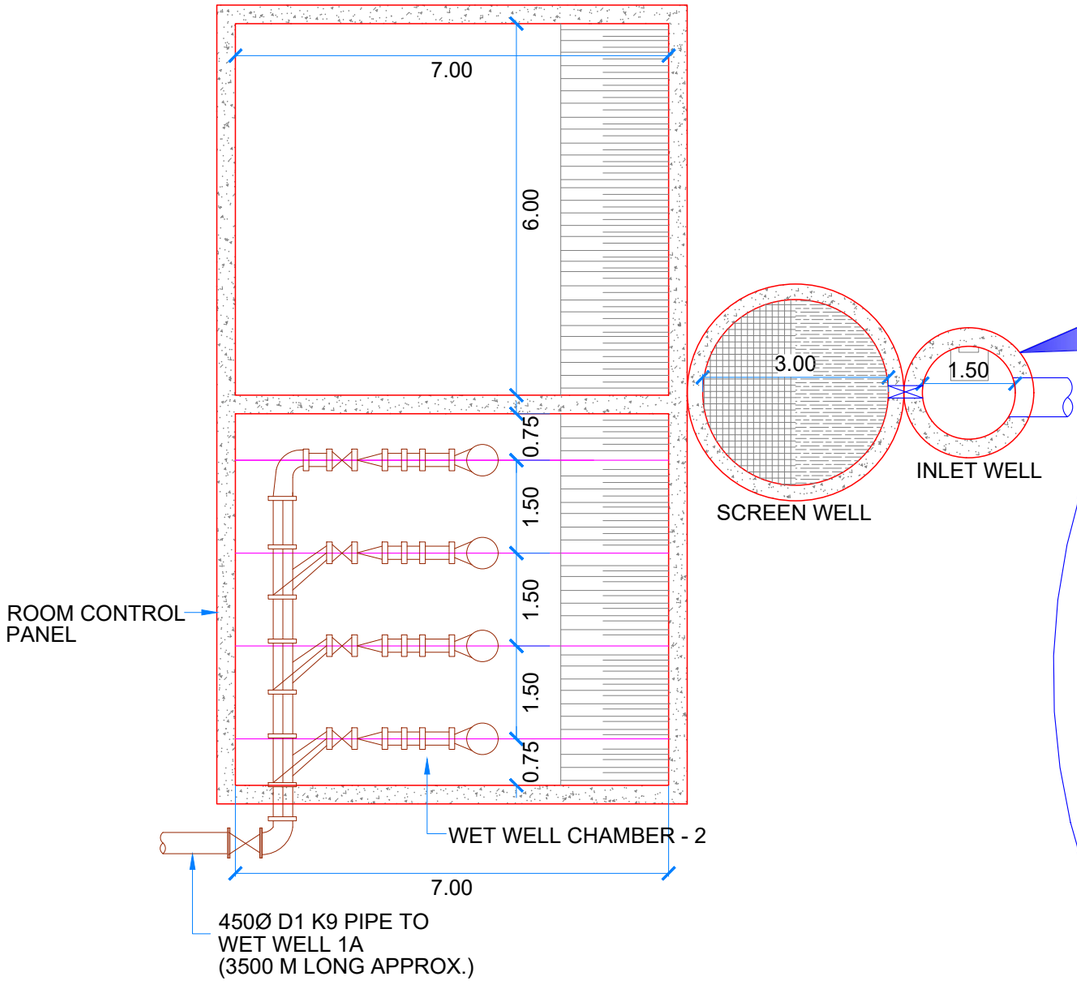
TITLE: SITE PLAN OF PUMPING STATION AT MUTTAR (WW1)

DATE 19/10/2022

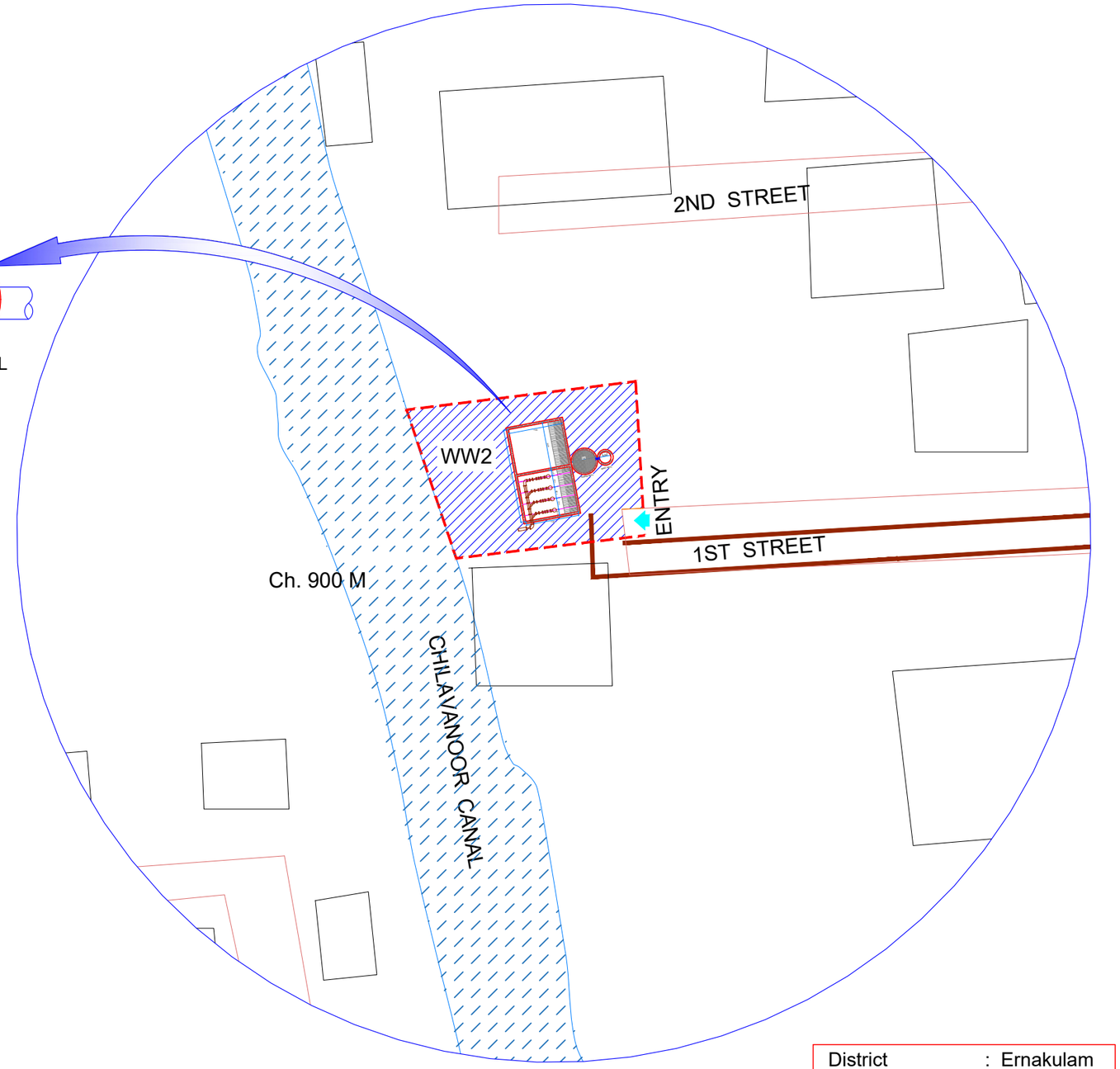
REV. R0

DRG. NO : IURWTS-WT2024-CH-CIVIL-1816

SHEET 1 OF 1



ILLUSTRATIVE WET WELL DESIGN FOR SUBMERSIBLE PUMP SET



District	: Ernakulam
Village	: Ernakulam
Hectare	: 0.0526 Ha

KOCHI METRO RAIL LIMITED
4th Floor, JLN Stadium Metro Station,
Baneji Road, Kaloor,Kochi,
Kerala - 682017
Ph: 0484-2846700 , 2846770
Fax: 0484-2970810

GENERAL CONSULTANT:
anteagroup
40/157, Kudiyirickal Building, First Floor
Palarivattam, Kochi - 682025,Kerala

PROJECT:

GENERAL COUNSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM, KOCHI

anteagroup

Antea Nederland B.V and Antea India(JV)

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	19-10-2022
DESIGNED	RENUKA M	RM	19-10-2022
CHECKED	RENUKA M	RM	19-10-2022
APPROVED	RENUKA M	RM	19-10-2022

KEY PLAN:

KOCHI METRO RAIL LIMITED — NO OBJECTION BY KMRL — IURWTS

CIVIL		MEP	

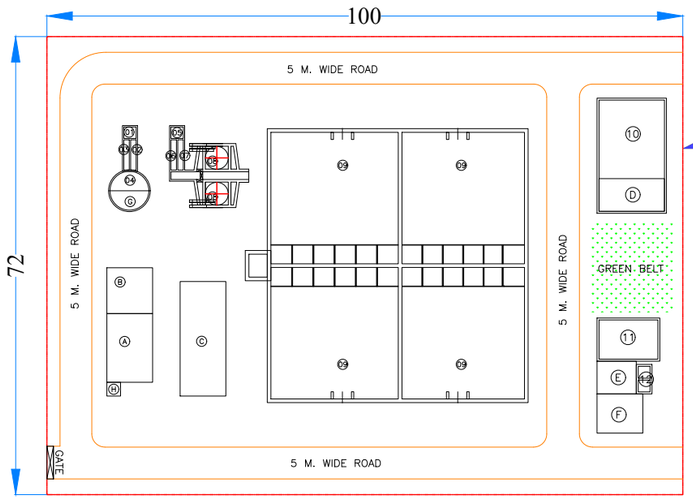
REVISIONS

NO.	DESCRIPTION	DATE	BY
R0			

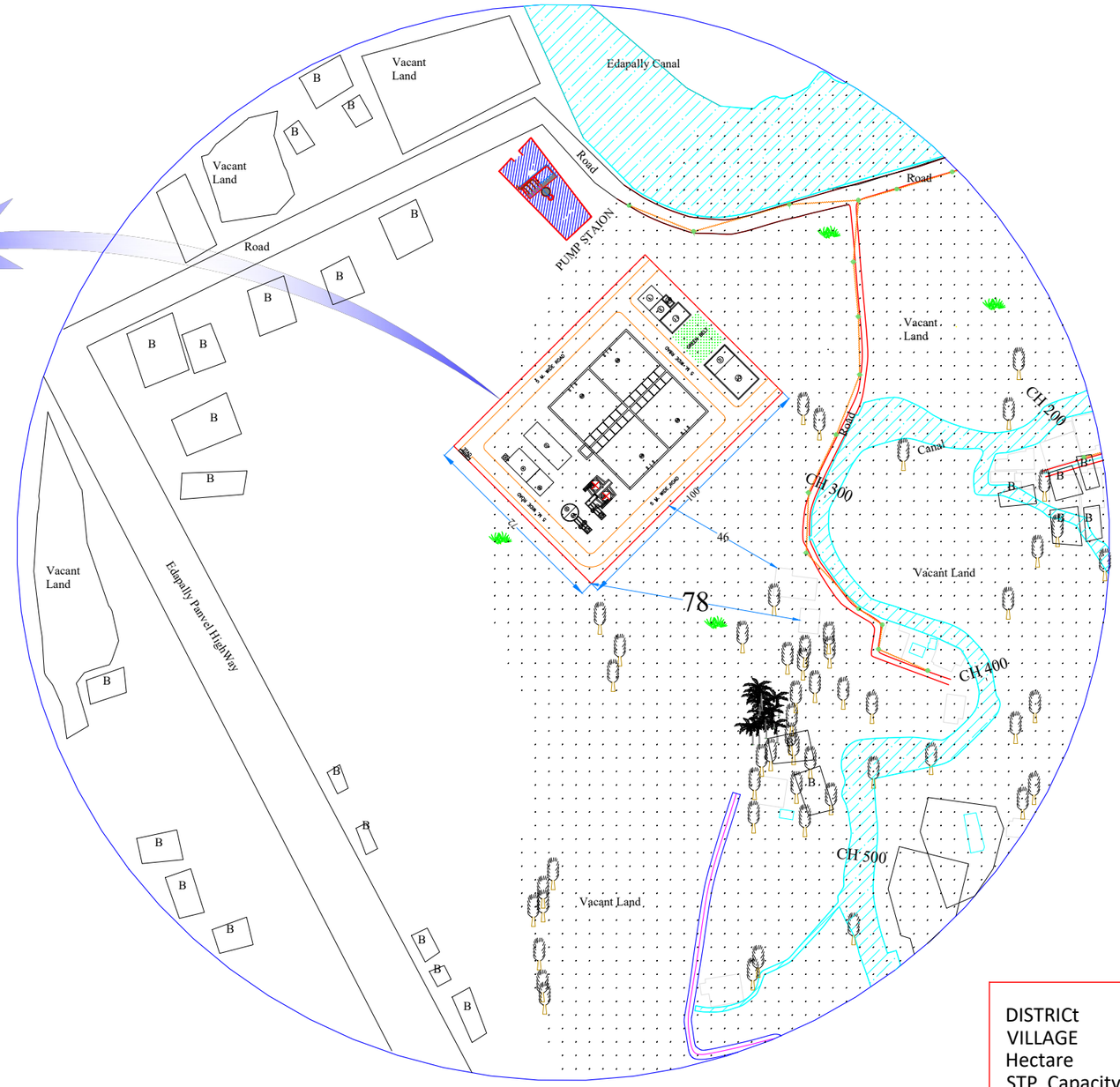
IURWTS

PROJECT:INTEGRATED URBAN REGENARATION & WATER TRANSPORT SYSTEM

LOCATION: DR. AMBEDHKAR ROAD , MUTTAR	SCALE
TITLE: SITE PLAN OF PUMPING STATION AT MUTTAR (WW2)	DATE 19/10/2022
	REV. R0
DRG. NO : IURWTS-WT2024-CH-CIVIL-1817	SHEET 1 OF 1



AREA REQUIRED = 0.72 Ha



PROCESS UNITS				
SL.NO.	PROCESS UNITS	SIZE/CAPACITY	QTY.	REMARK
01	RECEIVING CHAMBER	2700 x 2500 x 2100 SWD.	01	
02	COARSE SCREEN CHANNEL–MECHANICAL	6000 x 1200 x 700 SWD.	01	
03	COARSE SCREEN CHANNEL–MANUAL	6000 x 1200 x 700 SWD.	01	
04	RAW SEWAGE SUMP	8500 DIA x 2500 SWD.	01	
05	STILLING CHAMBER	2700 x 2500 x 2100 SWD.	01	
06	FINE SCREEN CHANNEL–MECHANICAL	6000 x 1200 x 700 SWD.	01	
07	FINE SCREEN CHANNEL–MANUAL	6000 x 1200 x 700 SWD.	01	
08	GRIT CHAMBERS	5000 x 5000 x 900 SWD.	02	
09	SBR BASINS	24000 x 24000 x 5500 SWD.	04	
10	CHLORINATION TANK	17000 x 10000 x 2500 SWD.	01	
11	SLUDGE SUMP	9000 x 6000 x 2200 SWD.	01	
12	POLYELECTROLYTE DOSING TANKS	1800 x 1800 x 1000 SWD.	01	

BUILDING LIST				
A	HT SUBSTATION	15000 x 10000 x 4500 HT.	01	
B	DG SET HOUSE	10000 x 10000 x 4500 HT.	01	
C	SBR AIR BLOWER CUM MCC & CONTROL BUILDING	25000 x 10000 x 10000 HT.	01	G+1
D	CHLORINATION CUM CHLORINE TOONER HOUSE	10000 x 5000 x 4500 HT.	01	
E	CENTRIFUGE FEED PUMP HOUSE	6000 x 5000 x 4500 HT.	01	
F	CENTRIFUGE HOUSE	7000 x 6000 x 9500 HT.	01	G(STILT)+1
G	RAW SEWAGE SUMP PUMP HOUSE	8500 DIA x 5500 HT.	01	
H	SECURITY CABIN	3000 x 3000 x 3000 HT.	01	
I	TRANSFORMER YARD	1500 x 1000 HT.	01	

DISTRICt : Ernakulam
VILLAGE : Muttar
Hectare : 0.72
STP Capacity : 16.5 MLD

CLIENT:

KOCHI METRO RAIL LIMITED
4th Floor, JLN Stadium Metro Station,
Baneji Road, Kaloor,Kochi,
Kerala - 682017
Ph: 0484-2846700 , 2846770
Fax: 0484-2970810

GENERAL CONSULTANT:

anteagroup
Antea Nederland B.V and Antea India(JV)
40/157, Kudiyirickal Building, First Floor
Palarivattam, Kochi - 682025,Kerala

PROJECT:

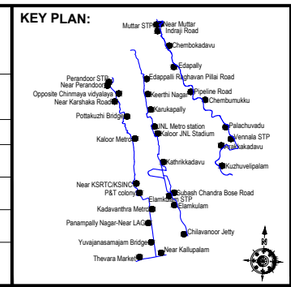
GENERAL COUNSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM, KOCHI

anteagroup

Antea Nederland B.V and Antea India(JV)

	NAME	SIGN	DATE
DRAWN	THAJUDEEN	TS	03/09/2022
DESIGNED	RENUKA M	RM	03/09/2022
CHECKED	RENUKA M	RM	13/09/2022
APPROVED	RENUKA M	RM	13/09/2022

KEY PLAN:



NO OBJECTION BY KMRL

CIVIL		MEP	

REVISIONS

NO.	DESCRIPTION	DATE	BY
R0			

PROJECT:INTEGRATED URBAN REGENARATION & WATER TRANSPORT SYSTEM

LOCATION: MUTTAR

SCALE-1:1

TITLE: SITE PLAN OF 16.5 MLD SEWER TREATMENT PLANT AT MUTTAR

DATE 03/09/2022

REV. R0

DRG. NO : IURWTS-WT2024-ED-CIVIL-1794

SHEET 1 OF 1

ANNEXURE 7

EIA CLEARANCES

FILE NO. :PCB/HO/EKM-1/ICE/04/2018
Date of issue :27/08/2020

KERALA STATE POLLUTION CONTROL BOARD

CONSENT TO ESTABLISH

ISSUED UNDER

Section 25 of Water (Prevention & Control of Pollution) Act, 1974
Section 21 of the Air (Prevention & Control of Pollution) Act, 1981

and

Environment (Protection) Act, 1986

As per Application No. :12919394
Dated:18-03-2020

TO

M/s KOCHI METRO RAIL LIMITED
Corporate Office,
JLN Metro Station,
4th Floor, Kaloor,
Ernakulam
Kochi - 682017.

Consent No. :PCB/HO/EKM-1/ICE/ 08 /2020

Valid Upto :26/08/2025

1. GENERAL

1.1. This integrated consent is granted subject to the power of the Board to withdraw consent, review and make variation in or revoke all or any of the conditions as the Board deems fit.

1	**VALIDITY**	26/08/2025
2	Name and Address of the establishment	KOCHI METRO RAIL LIMITED CORPORATE OFFICE, JLN METRO STATION, 4TH FLOOR, KALOOR, ERNAKULAM KOCHI. 682017
3	Communication	Telephone :0484-2826700 Fax :- E-mail:ajith.nair@kmrl.co.in
4	Occupier Details	Ajith A Nair, Additional General Manager, Kochi Metro Rail Ltd, Corporate Office, JLN Metro Station, 4th Floor, Kaloor, Ernakulam
5	Local Body	Kochi
6	Survey Number	As per annexure attached.
7	Village	Kochi
8	Taluk	KOCHI
9	District	Ernakulam i
10	Capital Investment(Rs in Lakhs)	16800.00 Rs in Lakhs
11	Scale	Large
12	Category	RED
13	Annual fee(Rs) Total Fee remitted(Rs)	Rs. 3, 77, 000/- Rs. 18, 85, 000/-
14	Activity	Rejuvenation of 5 major canals running through the heart and suburbs of the city ie 1)Edappally canal (11.23 kms), 2) Perandoor -Thevara Canal (11.15km), 3)Chilavannoor Canal(9.88 kms), 4) Thevara Canal (1.405 km), 5) Market Canal(0.006 kms) Installation of the STP 1)10MLD Capacity STP at the existing site of STP at Elamkulam 2) 10MLD STP at Vennala 3)7MLD Capacity STP at Muttar 4)4 MLD Capacity STP at Perandoor.

2. CONDITIONS AS PER
The Water(Prevention and Control of Pollution)Act, 1974

2.1 Sewage Treatment Plant (STP) consisting of treatment units having adequate capacity shall be made functional/ arrangement for sewage treatment shall be provided, as per the proposal submitted along with the application, before commissioning of the establishment. Additional facilities required, if any, to achieve the standards laid down by the Board u/s 17(1)(g) of the Water Act shall also be made along with.

2.2 Water Consumption : 515 kLD

2.3 Effluent Generation : 34.45 MLD

2.4 The characteristics of effluent after treatment shall confirm to the following tolerance limits:

SI.NO.	Characteristics	Unit	Tolerance Limit	
			Sewage	Trade Effluent
1	pH	-	6.5-9.0	-
2	BOD	mg/l	10	-
3	COD	mg/l	50	-
4	TSS	mg/l	10	-
5	NH4-N	mg/l	5	-
6	N-TOTAL	mg/l	10	-
7	FECAL COLIFORM	MPN/100 ml	<230	-

2.5 Mode of disposal of treated effluent :
Drain after treatment

3. CONDITIONS AS PER
The Air(Prevention and Control of Pollution)Act, 1981

3.1 Adequate air pollution control measures shall be provided before commissioning of the industry. Additional facilities required, if any, to achieve the standards laid down by the Board shall also be made along with.

Stack No.	Sources of Emission	Emission Rate(Nm3/Hr)	Stack Height above		Control Equipment
			Ground Level	Roof Level	

3.2 Emission characteristics shall not exceed the following:

SI.No.	Parameter	Limiting Standards (mg/Nm3)

4. CONDITIONS AS PER
The Environment (Protection) Act, 1986.

4.1 The construction activities shall be carried out strictly in compliance with the provisions of the Noise Pollution (Regulation and Control) Rules 2000.

4.2 Used lead acid batteries shall be disposed of as per the Batteries (Management and Handling) Rules, 2001

4.3 e-waste shall be disposed off safely as per E-Waste (Management) Rules, 2016.

5. ADDITIONAL CONDITIONS

CONDITIONS DURING CONSTRUCTION PHASE

5.1. All operations likely to produce dust or noise shall be carried out with appropriate enclosure.

5.2. Water sprinklers shall be provided to suppress spreading of dust outside the premises during the construction phase.

5.3. Ambient air quality shall not exceed the National Ambient Air quality Standards.

5.4. Proper precautionary measures shall be provided during construction phase to minimize disturbance to neighbours and neighbouring properties due to excavation, piling, transportation of materials etc.

5.5. The construction debris and mud discharges etc from the construction site shall be disposed safely as per Construction and Demolition Waste Management Rules, 2016.

5.6. Sanitary facilities shall be provided to the construction workers.

5.7. A minimum set back as per Municipality Building Rule shall be provided between the boundary and the building and the set back can be utilised for the development of green belt.

5.8. Adequate sanitary facility shall be provided in all proposed jetties.

5.9. STP's shall be constructed above flood mark with reference to the nearby water body/river.

5.10. STP shall be housed with suitable material/acoustic enclosure to control noise pollution.

5.11. Adequate odour control measures shall be provided with STP's

6. GENERAL CONDITIONS

6.1. At the end of the validity period if the construction is in progress, the same shall be got renewed. If the construction is not started in the consent period, the applicant shall apply afresh for consent to establish.

6.2. The applicant shall comply with the instructions that the Board may issue from time to time regarding prevention and control of air, water, land and sound pollution.

6.3. The date of commissioning of the project shall be intimated at least one month in advance to the District Office of the Board.

6.4. Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 shall be obtained by the builder before commissioning the project.

6.5. Water & energy conservation measures shall be adopted. Renewable source of energy namely solar energy shall be utilized.

6.6. Adequate safety measures shall be provided in accordance with fire safety regulation.

6.7. No excavation of soil shall be carried out without adequate dust mitigation measures in place.

6.8. No loose soil or sand or Construction & Demolition Waste or any other construction material that causes dust shall be left uncovered.

6.9. Dust mitigation measures shall be displayed prominently at the construction site for easy public viewing.

6.10. Grinding and cutting of building materials in open area shall be prohibited.

6.11. Construction material and waste should be stored only within earmarked area and road side storage of construction material and waste shall be prohibited.

6.12. No uncovered vehicles carrying construction material and waste shall be permitted.

6.13. Construction and Demolition Waste processing and disposal site shall be identified and required dust mitigation measures be notified at the site.

6.14. Environment clearance and necessary clearances as per Coastal Zone Regulations shall be obtained.

6.15. The construction camp shall have a well maintained waste management system and sewage and effluent shall be treated to meet the standards. The solid waste and debris from the construction shall be disposed without causing environmental problems. The dredging shall be carried out without causing significant disturbance to the back water system.

6.16. Measures to counter the escape of oil spilled from the oil storage tank, if any, at the time of an accident shall be provided.

6.17. Arrangement shall be provided for preventing oil pollution in water due to the transportation.

6.18. Treatment facility shall be provided at the boat yard fro treating waste water generated due to the washing of boats.

6.19. Arrangements shall be provided for the disposal of used lead acid batteries as per Batteries (Management and Handling) Rules, 2001.

6.20. Arrangement shall be provided for the disposal of e-waste generated as per E-waste Management Rules, 2016.

DATE :27/08/2020

SIGNATURE & SEAL OF ISSUING AUTHORITY
CHAIRMAN

To

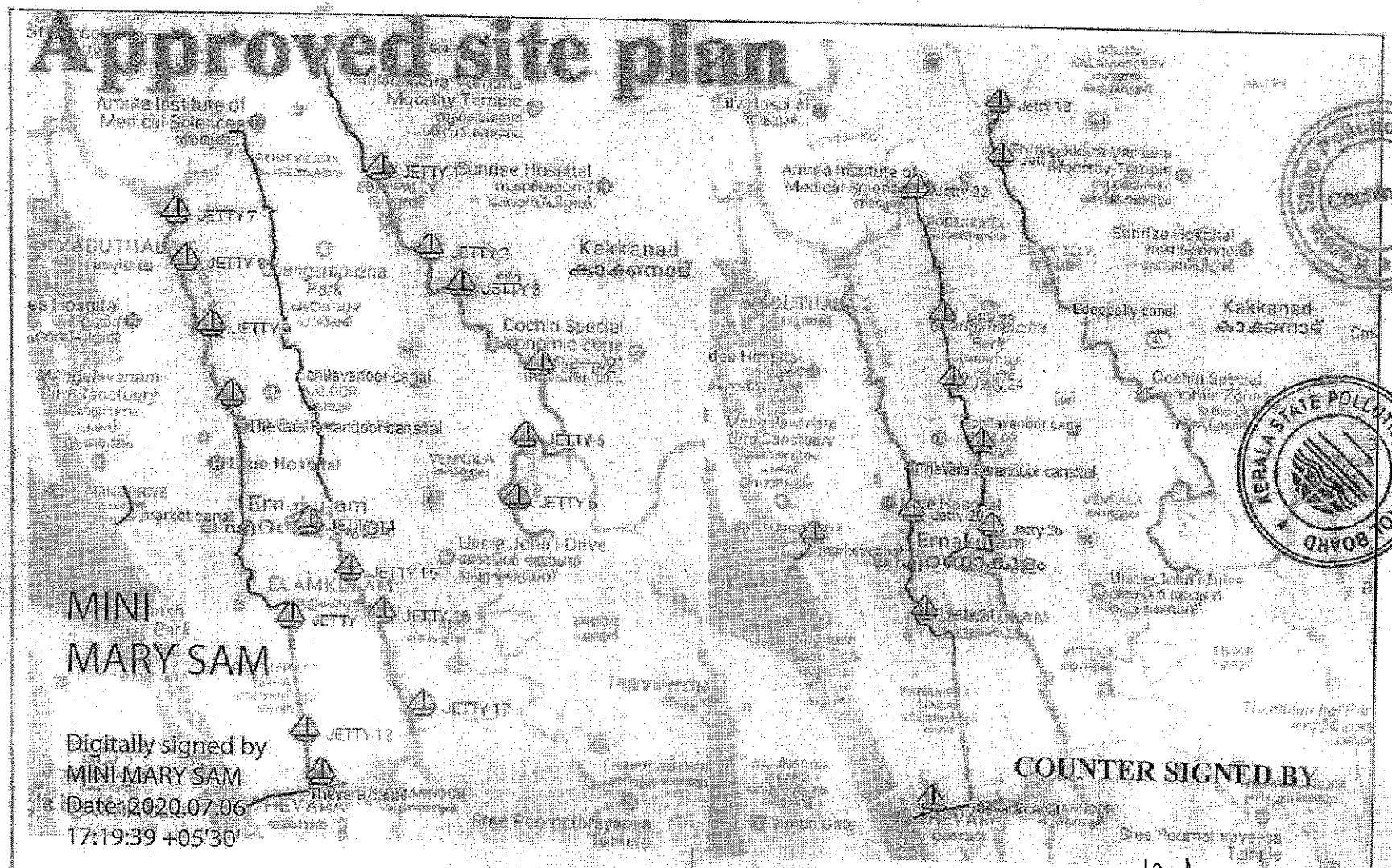
M/s. Kochi Metro Rail Limited,
Corporate Office,
JLN Metro Station,
4th Floor, Kaloor,
Ernakulam
Kochi - 682017.

1. This digitally signed document is legally valid as per the Information Technology Act 2000

2. For verifying this document please go to krocmms.nic.in and search using date of issue/name of the unit/Application Number in "Consent Granted Applications" link in the home page of the Board's Online Consent Management and Monitoring System.

Survey Numbers of Area Allotted to STP

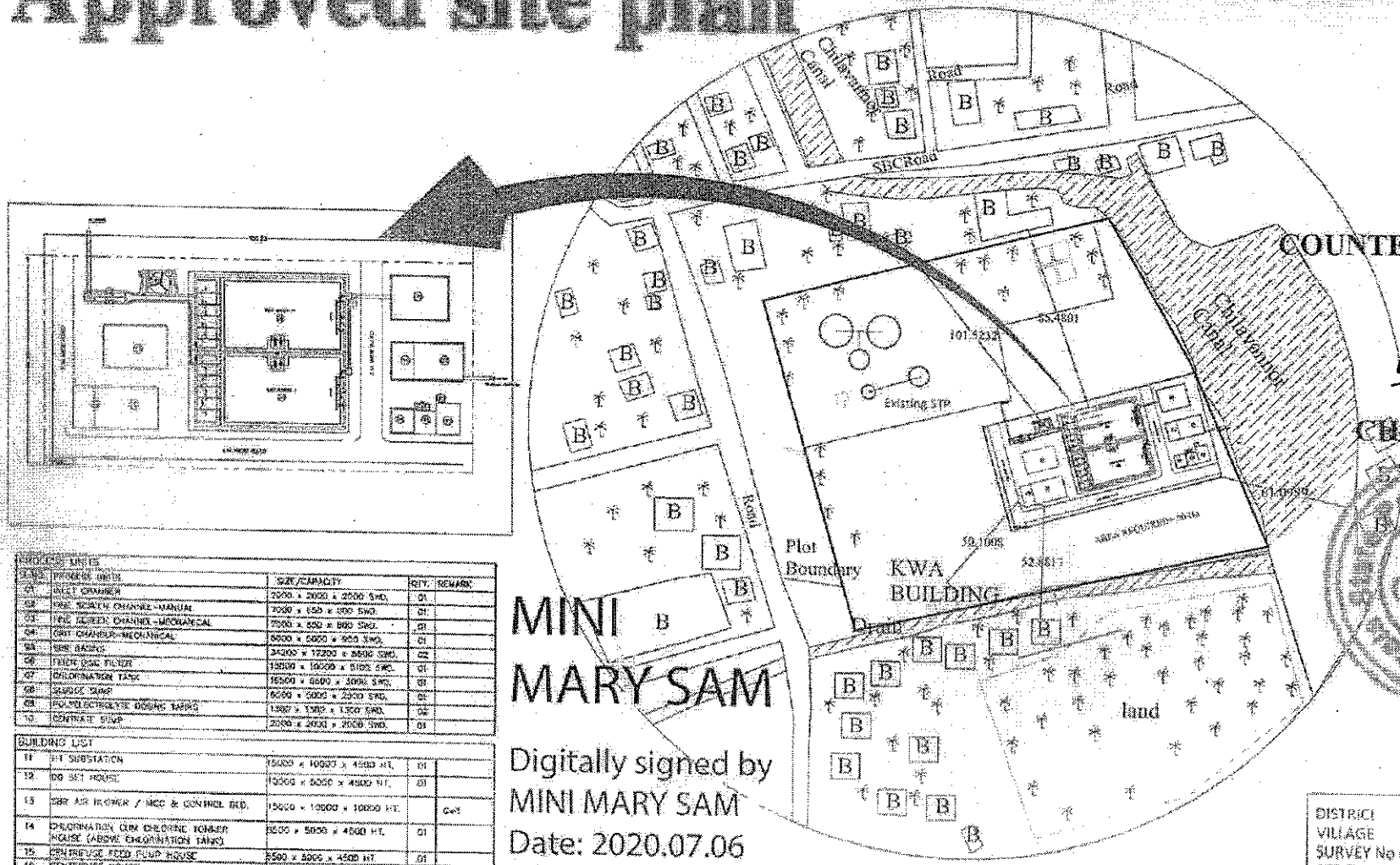
Sl. No	STP location	Proposed STP (MLD)	Block survey #	Village
1	Vennala STP - Edappally south	10	23,106	Edappally South
2	Elamkulam STP - Chilavanoor & TP south	10	514, 515	Elamkulam
3	Muttar STP-Edappally north and Chilavannur North	7	53,55	Edappally North
4	Perandoor STP - TP north	4	1088, 1090	Ernakulam



Location of Jetties in Phase I | Location of Jetties in Phase II

Figure-2: Location of Jetties

Approved site plan



	UNITS		
SL NO	PROJECT UNITS	SIZE/CAPACITY	QTY.	REMARK
01	INLET CHAMBER	2200 x 2000 x 2000 SWD.	01	
02	FINE SCREEN CHANNEL-MANUAL	2000 x 650 x 950 SWD.	01	
03	FINE SCREEN CHANNEL-MECHANICAL	2000 x 650 x 950 SWD.	01	
04	GRIT CHAMBER-MECHANICAL	6000 x 5000 x 950 SWD.	01	
05	SBR BASINS	34200 x 17200 x 6500 SWD.	02	
06	TERTIARY FILTER	18000 x 10000 x 5100 SWD.	01	
07	CHLORINATION TANK	16500 x 6600 x 3000 SWD.	01	
08	SURGE TANK	6000 x 3000 x 2000 SWD.	01	
09	POLYELECTROLYTE DOSING TANKS	1350 x 1350 x 1350 SWD.	02	
10	CONTACT TANK	2000 x 2000 x 2000 SWD.	01	

BUILDING LIST				
11	HT SUBSTATION	15000 x 10000 x 4500 HT.	01	
12	DG SET HOUSE	10000 x 5000 x 4500 HT.	01	
13	SBR AIR BLOWER / MCC & CONTROL BLD.	15000 x 10000 x 10000 HT.		G+1
14	CHLORINATION, GAS CHLORINE, BLOWER HOUSE (ABOVE CHLORINATION TANK)	5500 x 5000 x 4500 HT.	01	
15	CENTRIFUGE FEED PUMP HOUSE	5500 x 5000 x 4500 HT.	01	
16	CENTRIFUGE HOUSE	7000 x 5500 x 5500 HT.	01	G(STILT)+1

MINI MARY SAM

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Environmental Engineer

COUNTER SIGNED BY

CHAIRMAN

KERALA STATE POLLUTION CONTROL BOARD

DISTRICT	: Ernakulam
VILLAGE	: Elamkulam
SURVEY No of STP Site	: 514,515
Hectare	: 0.50
STP Capacity	: 10 MLD

CLIENT: KWA
KERALA WATER AUTHORITY

GENERAL CONSULTANT: Amec Nederland B.V. and Amec India (Pvt.)

PROJECT: GENERAL CONSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM, KOCHI

Amec Nederland B.V. and Amec India (Pvt.)

	NAME	SIGN	DATE
DRAWN			
DESIGNED			
CHECKED			
APPROVED			

KEY PLAN:

KWA NO OBJECTION BY KWA

CIVIL	MEP

REVISION

NO	TENDER DRAWING DESCRIPTION	DATE	SIGN

PROJECT: INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM

LOCATION: ELAMKULAM

TITLE: SITE PLAN

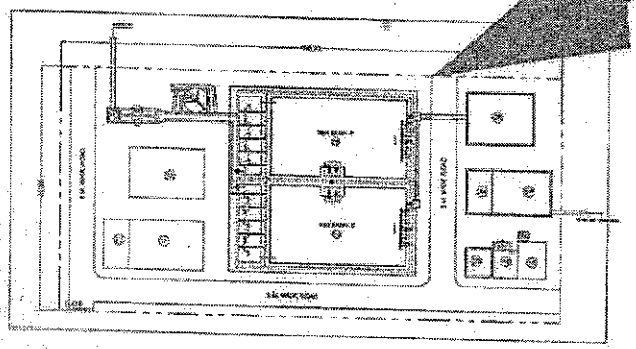
DATE: 1/06/2020

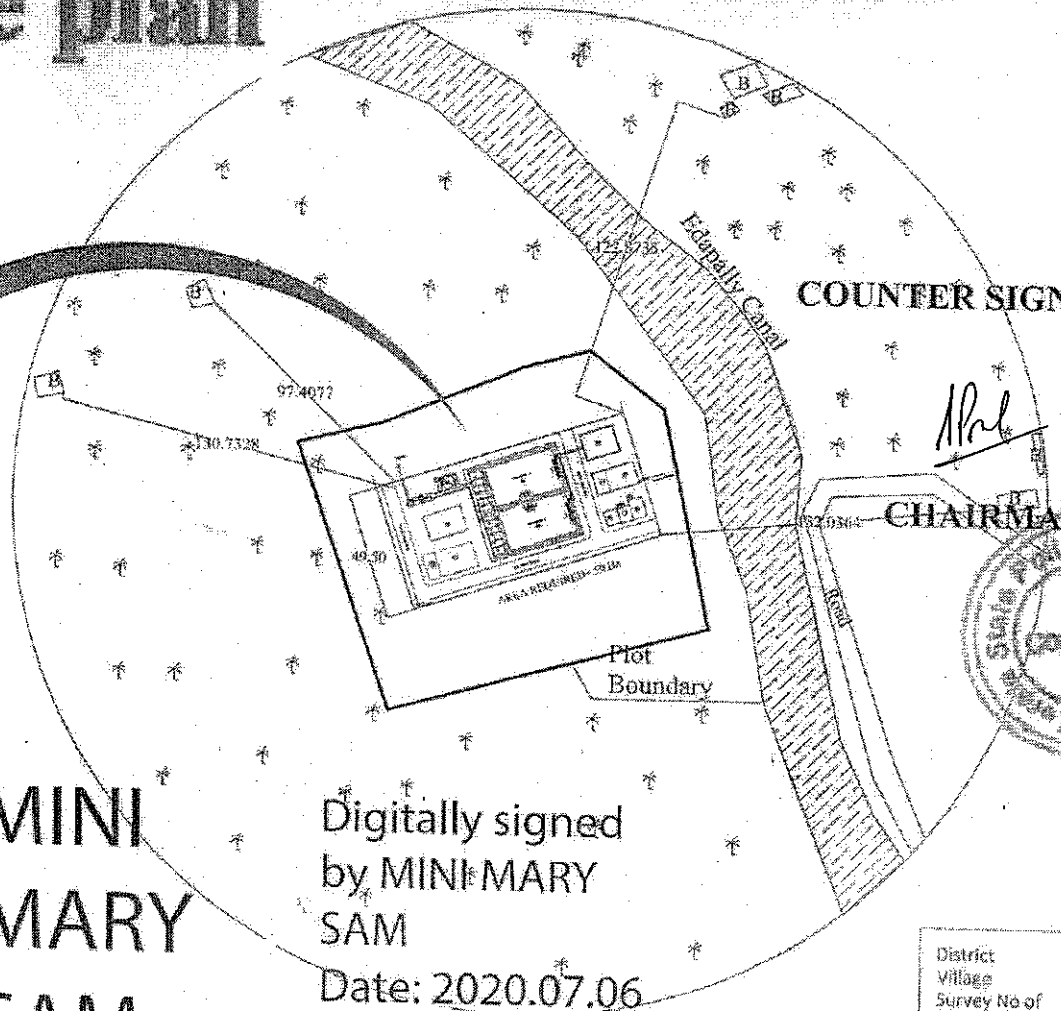
REV. 01

DRG. NO.:

SHEET

Approved site plan





COUNTER SIGNED BY

CHAIRMAN

KERALA STATE POLLUTION CONTROL BOARD

Kerala State Pollution Control Board Cochin-26

PROCESS UNITS

SL.NO.	PROCESS UNITS	SIZE/CAPACITY	QTY.	REMARK
01	INLET CHAMBER	2000 x 2000 x 2000 SWD.	01	
02	FINE SCREEN CHANNEL-MANUAL	7000 x 850 x 800 SWD.	01	
03	FINE SCREEN CHANNEL-MECHANICAL	7000 x 550 x 600 SWD.	01	
04	GRIT CHAMBER-MECHANICAL	6000 x 5000 x 900 SWD.	01	
05	SBR BASINS	34200 x 17200 x 5500 SWD.	02	
06	FIBER DISC FILTER	11000 x 10000 x 5100 SWD.	01	
07	CHLORINATION TANK	16500 x 6500 x 3000 SWD.	01	
08	SLUDGE SUMP	5500 x 5000 x 2500 SWD.	01	
09	POLYELECTROLYTE DOSING TANKS	1300 x 1300 x 1300 SWD.	02	
10	CONTRATE SUMP	2000 x 2000 x 2000 SWD.	01	

BUILDING LIST

11	HT SUBSTATION	55000 x 10000 x 4500 HT.	01	
12	DG SET HOUSE	10000 x 5000 x 4500 HT.	01	
13	SBR AIR BLOWER / MCC & CONTROL BLD.	15000 x 10000 x 10000 HT.		G+1
14	CHLORINATION CUM CHLORINE TONNER HOUSE (ABOVE CHLORINATION TANK)	8500 x 6000 x 4500 HT.	01	
15	CENTRIFUGE FEED PUMP HOUSE	5500 x 5000 x 4500 HT.	01	
16	CENTRIFUGE HOUSE	2500 x 5500 x 5500 HT.	01	G(SRLT)+1

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Environmental Engineer

District	: Ernakulam
Village	: Edappally South
Survey No of STP Site	:23,106
Hectare	: .50
STP Capacity	: 10 MLD

CLIENT: KOCHI

GENERAL CONSULTANT: Antea Nederland B.V. and Antea India(JV)

PROJECT: GENERAL CONSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM, KOCHI

Antea Nederland B.V. and Antea India(JV)

	NAME	SIGN	DATE
DRAWN			
DESIGNED			
CHECKED			
APPROVED			

KEY PLAN:

NO OBJECTION BY KMRL

CIVIL | MEP

REVISIONS

NO | TENDER DRAWING
NO | DESCRIPTION | DATE | BY

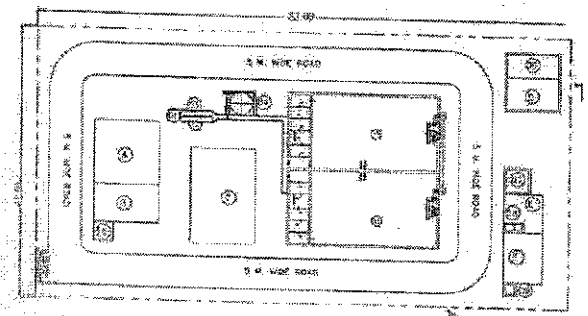
PROJECT: INTEGRATED URBAN REGENARATION & WATER TRANSPORT SYSTEM

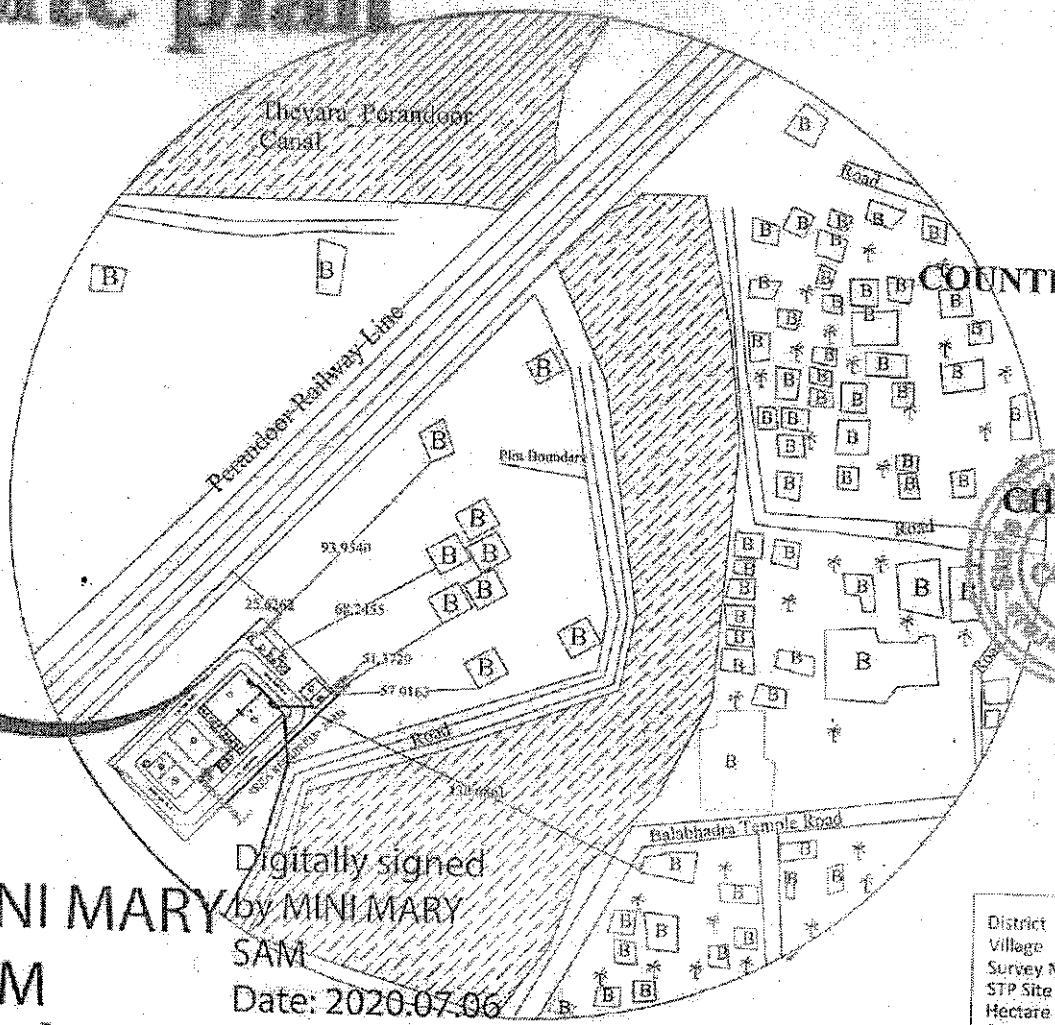
LOCATION: VENNALA | SCALE: 1

TITLE: SITE PLAN | DATE: 11/06/2020 | REV. R1

DRG NO | SHEET

Approved site plan





COUNTER SIGNED BY

CHAIRMAN

KERALA STATE POLLUTION CONTROL BOARD

UNIT LIST				
SL NO	DESCRIPTION	SIZE/CAPACITY	QTY	REMARKS
01	STILLING CHAMBER	1500 x 1500 x 1500 SWD	01	
02	MANUAL BAR SCREEN (FINE)	5000 x 800 x 700 SWD	01	
03	MECHANICAL BAR SCREEN (FINE)	3000 x 500 x 700 SWD	01	
04	UNIT CHAMBERS	2500 x 2500 x 900 SWD	02	
05	SBR BASINS	23000 x 11500 x 5400 SWD	02	
06	CHLORINATION CONTACT TANK	8000 x 8000 x 2500 SWD	01	
07	SLUDGE SUMP	3500 x 3500 x 2500 SWD	01	
08	DRIFT BOARD TANKS	1000 x 1000 x 900 SWD	02	
09	CENTRATE SUMP	1500 x 1500 x 1500 SWD	01	
BUILDING LIST				
A	HT SUBSTATION	10000 x 10000 x 4500 HT	01	
B	CG SET HOUSE	10000 x 5000 x 4500 HT	01	
C	SBR AIR BLOWER/MCC/ CONTROL ROOM	15000 x 10000 x 10000 HT	01	G+1
D	CHLORINATION CUM CHLORINE TUNNEL STORAGE HOUSE	8000 x 5000 x 4500 HT	01	
E	CENTRIFUGE FEED PUMP HOUSE	6000 x 6000 x 4500 HT	01	
F	CENTRIFUGE HOUSE	5000 x 6000 x 9500 HT	01	B(ST)+1
G	SECURITY CABIN	3000 x 3000 x 3000 HT	01	

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Environmental Engineer

District	: Ernakulam
Village	: Ernakulam
Survey No.of STP Site	: 1088,1090,
Hectare	: 0.35 Ha
STP Capacity	: 4 MLD

CLIENT:

GENERAL CONSULTANT:

Antea Nederland B.V and Antea India (P)

PROJECT: GENERAL CONSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM KOCHI

Antea Nederland B.V and Antea India (P)

	NAME	SIGN	DATE
DRAWN			
DESIGNED			
CHECKED			
APPROVED			

KEY PLAN

NO DIRECTION BY PARTS

CIVIL | MEP

REVISIONS

NO.	DESCRIPTION	DATE	BY
RD.	TENDER DRAWING		

PROJECT: INTEGRATED URBAN REGENARATION & WATER TRANSPORT SYSTEM

LOCATION: PERANDOOR

SCALE: 1:1

TITLE: SITE PLAN

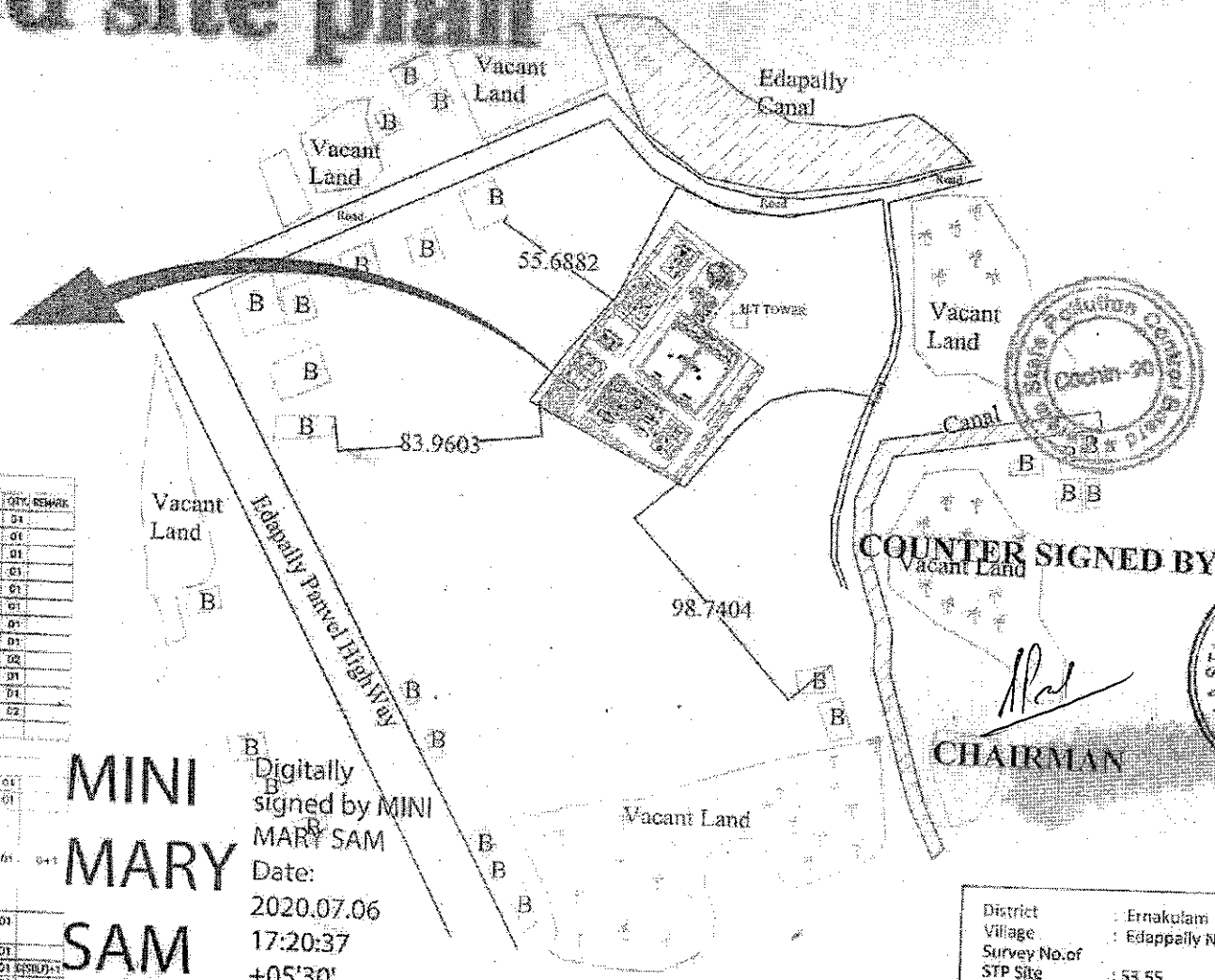
DATE: 11/08/2020

REV. R1

DWG NO

SHEET

Approved site plan



PROPOSED LAYOUT FOR 7MLD STP AT MUTTAR

COUNTER SIGNED BY

CHAIRMAN

Kerala State Pollution Control Board Cochin-30

KERALA STATE POLLUTION CONTROL BOARD

SL.NO.	PROCESS UNITS	SIZE/CAPACITY	QTY.	REMARK
01	RECEIVING CHAMBER	3 m2. x 2000 SWD.	01	
02	COARSE SCREEN CHANNEL-MANUAL	5000 x 900 x 600 SWD.	01	
03	COARSE SCREEN CHANNEL-MECHANICAL	5000 x 900 x 600 SWD.	01	
04	RAW SEWAGE SUMP	9000 DIA x 1200 SWD.	01	
05	INLET CHAMBER	2500 x 2500 x 2000 SWD.	01	
06	FINE SCREEN CHANNEL-MANUAL	6500 x 900 x 500 SWD.	01	
07	FINE SCREEN CHANNEL-MECHANICAL	6500 x 900 x 500 SWD.	01	
08	GRIT CHAMBERS	4500 x 4500 x 900 SWD.	01	
09	SBR BASINS	28400 x 14500 x 6500 SWD.	02	
10	CHLORINATION TANK	12500 x 6500 x 3000 SWD.	01	
11	SLUDGE SUMP	8500 x 3000 x 3000 SWD.	01	
12	POLYELECTROLYTE DOSING TANKS	1200 x 1200 x 1200 SWD.	02	

A	HT SUBSTATION & PMCC ROOM	15000 x 12500 x 5000 HT.	01	
B	BLOWER ROOM	12500 x 7700 x 5000 HT.	01	
C	ADMIN. CUM PLC ROOM BUILDING-GROUND FLOOR: WORK SHOP, TOOL ROOM, OFFICE & TOILET BLOCK			
	ADMIN. CUM PLC ROOM BUILDING-1ST FLOOR: LABORATORY, SCADA, TOILET BLOCK OPERATOR ROOM, CONFERENCE	14000 x 10000 x 9500 HT.	01	G+1
D	CHLORINATION CUM CHLORINE TONNER HOUSE (ABOVE CHLORINATION TANK)	5000 x 5000 x 3500 HT.	01	
E	CENTRIFUGE FEED PUMP HOUSE	6500 x 5000 x 4500 HT.	01	
F	CENTRIFUGE HOUSE	6500 x 5500 x 9500 HT.	01	G(SILT)+1
G	DC ROOM	10000 x 5000 x 5000 HT.	01	
H	METERING ROOM	4500 x 4500 x 3000 HT.	01	
I	SECURITY CABIN	4500 x 3000 x 3000 HT.	01	
J	STAFF QUARTERS	12500 x 8000 x 3500 HT.	01	

MINI MARY SAM

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Environmental Engineer

District	: Ernakulam
Village	: Edappally North
Survey No.of STP Site	: 53,55
Hectare	: 0.52
STP Caopacity	: 7 MLD

CLIENT:

GENERAL CONSULTANT:

PROJECT: GENERAL CONSULTANCY SERVICES INTEGRATED URBAN REGENERATION AND WATER TRANSPORT SYSTEM KOCHI

	NAME	SIGN	DATE
DRAWN			
DESIGNED			
CHECKED			
APPROVED			

KEY PLAN

NO DIRECTION BY KMAL

REVISIONS

NO.	DESCRIPTION	DATE	BY
NO.	TENDER DRAWING		

PROJECT INTEGRATED URBAN REGENARATION & WATER TRANSPORT SYSTEM

LOCATION: MUTTAR

TITLE: SITE PLAN

SCALE

DATE 17/06/2020

REV. RE

SHEET

കൊച്ചി മുനിസിപ്പൽ കോർപ്പറേഷൻ

ഫോൺ 2369007, 2369196
2369143, 2369149
2369197, 2369069
ഫാക്സ് 91484-2369023

കോർപ്പറേഷൻ ഓഫീസ്
പി.ബി നമ്പർ 1016
എറണാകുളം, കൊച്ചി 682 011

"ഭരണഭാഷ- മാതൃഭാഷ"

No.ISO/MOE6/25201/2020

തീയതി: 11.11.2020

സെക്രട്ടറി,
കൊച്ചി മുനിസിപ്പൽ കോർപ്പറേഷൻ.

മെമ്പർ സെക്രട്ടറി,
കേരള സ്റ്റേറ്റ് വെറ്റ്ലാന്റ് അതോറിറ്റി കേരള (SWAK)
4th Floor, കെ.എസ്.ആർ.ടി.സി. ബസ് ടെർമിനൽ കോംപ്ലക്സ്,
തമ്പാനൂർ, തിരുവനന്തപുരം 695001

സർ,

വിഷയം: കൊച്ചി മുനിസിപ്പൽ കോർപ്പറേഷൻ - IURWTS പദ്ധതി നടപ്പിലാക്കുന്നതിന് കേരള സംസ്ഥാന തണ്ണീർതട അതോറിറ്റിയിൽ നിന്നും നിരാക്ഷേപ സാക്ഷ്യപത്രം ലഭിക്കുന്നതിന് നഗരസഭ കൗൺസിൽ ശുപാർശ ചെയ്യുന്നത്- സംബന്ധിച്ച്.

സൂചന : (1) AGM, Kochi Metro Rail Limited ന്റെ 22.09.2020-ലെ KMRL/IURWTS /Corrs stakeholders /143/2020-ാം നമ്പർ കത്ത്.

(2) ബഹു. കൊച്ചി നഗരസഭ കൗൺസിലിന്റെ 03.11.2020-ലെ 02-ാം നമ്പർ തീരുമാനം.

മേൽ സൂചന (1) പ്രകാരം കൊച്ചി നഗരസഭയിലെ വിവിധ കനാലുകളിൽ സംയോജിത നഗര ജലഗതാഗത സംവിധാനം പുനരുജ്ജീവിപ്പിക്കൽ (IURWTS) എന്ന പദ്ധതി നടപ്പിലാക്കുന്നതിന് കേരള സംസ്ഥാന തണ്ണീർത്തട അതോറിറ്റിയിൽ നിന്നും നിരാക്ഷേപ സാക്ഷ്യപത്രം ലഭിക്കുന്നതിന് നഗരസഭ കൗൺസിൽ ശുപാർശ ചെയ്യുന്നതിനായി കത്ത് നൽകിയതിന്റെ അടിസ്ഥാനത്തിൽ മേൽ സൂചന (2) പ്രകാരം NOC ലഭിക്കുന്നതിന് ശുപാർശ ചെയ്യുവാൻ ബഹു. കൗൺസിൽ തീരുമാനിച്ചിട്ടുണ്ട്. NOC നൽകുന്നതിനാവശ്യമായ നടപടി സ്വീകരിക്കുവാൻ താത്പര്യപ്പെടുന്നു.

വിശ്വസ്തതയോടെ,

OFFICE OF THE CORPORATION OF COCHIN
ERNAKULAM, COCHIN-11

13/11/2020

സെക്രട്ടറി (i/c)
കൊച്ചി മുനിസിപ്പൽ കോർപ്പറേഷൻ

ഉള്ളടക്കം: കൗൺസിൽ തീരുമാനത്തിന്റെ ശരിപകർപ്പ്

MOE6

NES

കൊച്ചി മുനിസിപ്പൽ കോർപ്പറേഷൻ

03.11.2020 തീയതിയിലെ കൗൺസിലിലെ 2-ാം നമ്പർ തീരുമാനം

ISO/MOE6/25201/20. കൊച്ചി നഗരസഭയിൽ താഴെ പറയുന്ന വിവിധ കനാലുകളിൽ സംയോജിത നഗര ജലഗതാഗത സംവിധാനം പുനരുജ്ജീവിപ്പിക്കൽ IURWTS (Integrated Urban Regeneration and Water Transport Systems) എന്ന പദ്ധതി (ആകെ 34.33 Km ദൂരം) നടപ്പിലാക്കുന്നതിന് കേരള സംസ്ഥാന തണ്ണീർത്തട അതോറിറ്റി (SWAK) ൽ നിന്നും നിരാക്ഷേപക സാക്ഷ്യപത്രം (എൻ.ഒ.സി.) ലഭിക്കുന്നതിന് നഗരസഭ കൗൺസിലിന്റെ ശുപാർശയ്ക്കായി അപേക്ഷിച്ചുകൊണ്ട് AGM, Kochi Metro Rail Limited ന്റെ 22.09.2020ലെ KMRL/IURWES/Corrs stake holders/143-2020-ാം നമ്പർ കത്ത് ബഹു. കൗൺസിൽ പരിഗണനയ്ക്ക്.

പദ്ധതി നടപ്പിലാക്കുന്ന കനാലുകൾ

1) ഇടപ്പള്ളി കനാൽ (11.23 കി.മീ.)
2) തേവര പേരണ്ടൂർ കനാൽ (9.88 കി.മീ.)
3) ചിലവന്നൂർ കനാൽ (11.15 കി.മീ.)
4) തേവര കനാൽ (1.41 കി.മീ.)
5) മാർക്കറ്റ് കനാൽ (0.66 കി.മീ.)

കുറിപ്പ്: 1) കേരള സംസ്ഥാന പൊല്യൂഷൻ കൺട്രോൾ ബോർഡിന്റെ അനുമതി (consent to establish),ജെട്ടികളുടെ/അടിസ്ഥാന സൗകര്യങ്ങളുടെ രൂപരേഖ, എലവേഷൻ പ്ലാൻ, സർവ്വെ സ്കെച്ച് എന്നിവയും കത്തിനോടൊപ്പം സമർപ്പിച്ചിട്ടുണ്ട്.
2)കനാലുകളുടെ ശുചീകരണം, ആഴവും വീതിയും കൂട്ടി പൂർവ്വസ്ഥിതിയാക്കൽ, തീരസംരക്ഷണം, ഫുട്ട്ഓവർ ബ്രിഡ്ജ് പുനർനിർമ്മാണം, മലിനജല ശുദ്ധീകരണ പ്ലാന്റ്, സാനിറ്റേഷൻ സംവിധാനങ്ങൾ, തീരസൗന്ദര്യവൽക്കരണം തുടങ്ങിയ പ്രവർത്തികളാണ് ടി പദ്ധതിയിൽ ഉൾപ്പെടുത്തിയിട്ടുള്ളത്.

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തീരുമാനം:

"അംഗീകരിച്ചു."

63-ാം ഡിവിഷൻ കൗൺസിലർ ശ്രീമതി. പൂർണ്ണിമ നാരായൺ വിയോജിപ്പ് രേഖപ്പെടുത്തി.

(ഒപ്പ്)

മേയർ

//ശരിപ്പകർപ്പ്//

കൗൺസിൽ സെക്രട്ടറി

OFFICE OF THE CORPORATION OF COCHIN ERNAKULAM, COCHIN-11

State Wetland Authority Kerala (SWAK)

4th Floor, KSRTC Bus Terminal Complex,
Thampanoor, Thiruvananthapuram-695001
Ph: +91471-2326264(Off); (Dir, Envt &Climate Change)
E-mail: swak.kerala@gmail.com , swak.envt@kerala.gov.in

15 YEARS OF CELEBRATING THE MAHATMA

SWAK/A1/163/2020 20.01.2021

From
The Member Secretary

To
The AGM (Civil-WT)
Kochi Metro Rail Limited
JLN Metro Station, 4th Floor, Kaloor
Ernakulam-682017

Kochi Metro Rail Limited
Kochi - 682 017
No. 9732
Date 25.1.21
Sign.

Sir,

Sub:- SWAK-Wetland Clearance for Integrated Urban Regeneration and Water transport System -NOC - Reg

Ref: -1) Your office letter No. KMRL/IURWTS/Corrs Stakeholders/187-2020 dated 25.11.2020.

AGM (Civil) (IURWTS)

Vide reference cited above; AGM (Civil-WT) had submitted an application to State Wetland Authority Kerala for obtaining an NOC from the Authority for proceeding with clearance for the work for Integrated Urban Regeneration and Water transport System in five canals namely (1) Edappally Canal (11.23 km), (2) Thevara- Perandoor Canal (9.88 km) (3) Chilavanoor Canal (11.15 km) (4) Thevara Canal (1.41 km) (5) Market Canal (0.66 km) with a total stretch of 34.33 km. The activities proposed include Cleaning of canals, Deepening & Widening the canal to its original state, Bank protection, Reconstruction of cross structures and foot over bridges which have encroached into the canal water way, Sanitary Sewer line to household level and STPs, Sanitation Facilities, Jetties and Beautification of canal banks.

All the Jetties, Sewage Treatment Plants and Lock Gates suggested in the project along the Edappally Canal, Thevara- Perandoor Canal, Chilavanoor Canal, Thevara Canal are away from the 50 m boundary of Vembanad-Kol wetland and hence Wetlands (Conservation and Management) Rules, 2017 are not applicable to the said project. State Wetland Authority has

Kochi Metro Rail Ltd.
(Water Transport Dept.)
No. IURWTS - 22 - 2021
Date 28/01/2021
Sign.

no objection for the work for proceeding with the Integrated Urban Regeneration and Water Transport System in the above said five canals.

Vembanad Lake comes under the purview of both CRZ notification and Wetlands (Conservation and Management) Rules, 2017. As per the Wetlands (Conservation and Management) Rules, 2017, section (3) "*Provides that Wetlands (Conservation and Management) Rules, 2017 shall not apply to the wetlands falling in areas covered under the Indian Forest Act, 1927, the Wild Life (Protection) Act, 1972, the Forest (Conservation) Act, 1980, the State Forest Acts, and the Coastal Regulation Zone Notification, 2011 as amended from time to time*", so necessary statutory clearance / permissions from Kerala Coastal Zone Management Authority (KCZMA) to be obtained for the said project.

After obtaining the necessary clearances below mentioned key considerations has to be taken care

- Dredging to be used only selectively and based on assessment of bathymetric profile and species interactions. For inflowing channels, dredging can be used to improve water inflow. Dredged out materials should be disposed properly without causing any harm/pollution to the wetland ecosystem.
- No solid or liquid waste to be disposed into Vembanad-Kol wetland, as these canals are connected to the wetland downstream.

Yours Faithfully

Environment Programme Manager
For Member Secretary

ANNEXURE 8

KIIFB TECHNICAL APPRIASAL FORM

KIIFB TECHNICAL APPRAISAL REPORT COMMENT SHEET				
SL No	**Reference: Page No**	**KIIFB Queries as per TAR**	**KMRL Clarifications/Replies dated 08.01.2021**	**Remarks by KIIFB**
1	**Salient Features**:12(e) Pg no 4	Development of Konthuruthy Canal (Additional work) : Not included in the Administrative Sanction	Please find the details in **Annexure-28** regarding inclusion of Konthuruthy canal in IURWTS.	
2		The estimate submitted is not as per KIIFB guidelines, hence shall be furnished in PRICE software.	KIIFB Guidelines were followed for DPR. As IURWTS Project components involve various activities not exclusive available in PRICE other Schedules such as DSR 2019, Horticulture DSR and observed data had to be used.	Presently KIIFB is following the DSR2016 with corresponding cost index in PRICE(including Horticulture). In case a non DSR item is needed for proper completion, then the observed data with proper justification for rates and its necessity shall be furnished and shall be in PRICE as OD item.
3	**General Observations:** PG no 6	It is understood that some of the components are proposed to be executed on EPC/DBO basis and some of the components on item rate basis. A list of detailed component wise mode of execution may be furnished. While preparing estimate for each component, applicable guideline of KIIFB shall be followed. The aforesaid list shall also indicate compliance to KIIFB guidelines.	The tentative tender mode to be followed has been given in Table 14.1 chapter 14 of the DPR submitted. Further changes made if any, will be concurred with KIIFB, and the same is extracted and given as **Annexure:1** of this comment sheet. Further based on the availability of land from the Govt. of Kerala, clubbing of the components shall be done and accordingly mode of procurement shall be decided in concurrence with KIIFB.	1.Preparatory Works- Item Rate tender.2.Canal widening works. Item rate Tender.3.Bathymetric surveys and Canal Dredging works. Item rate Tender.4.Shore protection Works Item rate Tender.5.Sanitation and solid waste management works, Eco Toilets, installation of tracking systems- Item rate tender.6.Sewer lines and Sewage treatment plants-Turnkey /EPC 7.Landscaping and promenade development-Item rate Tender.8.Jetties, Operation Control room, Innovation Lab, Corporate office of SPV Regulation lock arrangements and associated works- Item rate Tender.9.Foot over bridges and highway bridges- EPC/ Item Rate.10.Road network. Item rate Tender.11.Rolling stock in the form of Hybrid or electric ferries for passenger and tourism-EPC tender/Lowest life cycle.12. Customer Experience, Signage's and Way finding -Item Rate tender .....

4		It is seen that lot of items are considered in estimate as non DSR items, as far as possible the non DSR item may be avoided and in case a non DSR item is needed for proper completion, then the observed data with proper justification for rates and its necessity shall be furnished	Only items not available in DSR are included as non DSR items. The non DSR items are mainly related to Canal beautification for which the rates were collected on local enquiry from market. At present detailed rates are being obtained for all the items and a typical rate analysis taken from stakeholders and nurseries for canal beautification Landscape palette works is attached as **Annexure:2(a)** of this comment sheet. The rate analysis for signage works is attached as **Annexure:2(b)** of this comment sheet.	
5		Present status of statutory approvals like environmental clearance, CRZ, Approval from Kochi Municipal Corporation, Fire & Pollution Control Board etc. shall be updated.	EIA clearance 1.KSPCB: Consent to establish-- Received 2.Kochi Corporation: NOC received for undertaking infrastructure works and recommended to SWAK 3.SWAK: clearance in progress, expected date 10th Jan 2021. 4.Forest dept: SBWL GoK submitted clearance to MoEF&CC on 22-12-2020 5.CRZ clearance: HTL and LTL mapping completed by Institute of Remote Sensing, Anna university, Application to KCZMA tube submitted by 12-01-2021 6.Final MoEF&CC Clearance: Expected date Feb 2021.The details attached as **Annexure:3** of comment sheet	shall be updated further
6		The Structural drawings and its analysis shall be furnished for all the works and the detailed estimate shall be prepared based on the structural drawings.	Only concept design drawings are was given in the DPR. The detailed design of the structures is being finalised based on geotechnical investigation bore log taken subsequently at 53 location along the IURWTS canals banks. It is given as **Annexure:4** of this comment sheet and is used for design of foundation for the structures to be taken up under IURWTS activities.	At least ready to tender drawings shall be furnished, working drawings can issue based on actual site condition and design. Annexures are not seen furnished. -Missing Annexure resubmitted

			The detailed structural design drawings for FOB (3types- 7nos) and ROB (1 types 5nos) undertaken after submission of DPR for Edappally canal is given as **Annexure:5** of this comment sheet. The other structures of FOB//ROB are typical except for change in foundation design which is in progress. Further detailed design	
7		Lump sum provisions in the estimate may be detailed.	Lumpsum amount has been given based on local enquiry and similar works executed and are essential items for which site specific detailing is in progress. Rate analysis for ls items are included in the related subsequent items as annexures. Kindly see the DPR annexures for the rate analysis	Not seen furnished -Missing Annexure resubmitted
8		The items related to safety measures for the construction (for eg: temporary fencing/barricading by using casuarina poles etc.) shall be considered in the scope of the contractor and contractor shall make quote inclusive of such safety measures.	HSE management plan will form part of the contract and is given as **Annexure:6** of the comment sheet.	
9		There are certain items in the estimate without either Quantities or Rates which may be reviewed.	Not found	
10		The rate of same item in different heads seen different, this may be rectified.	Noted.	Corrections are not seen done in estimate.

11		For utility shifting, the specific estimate from the concerned government departments/Agencies like KWA, KSEB, BSNL, PWD etc. shall be furnished.	Estimate preparation is under progress by the utility stake holders and detailed estimate from each stakeholder will be submitted separately as and when submitted by stake holders. Modification proposal prepared for consideration to Railway authorities for Edappally bottleneck is given as **Annexure 6(a)** of this comment sheet. 30cr proposed is based on a rough estimation and for obtaining AS in advance from CSIN dept. The guidelines contemplated of G.O MS No. 444/2018/Fin dated 26-11-2018 of KIIFB will be followed in submitting separate proposals for each major utility shifting works. Hence the LS provision may be considered as and when the estimates are finalised from the stakeholder dept the same shall be forwarded to KIIFB for concurrence and shall be operated under this LS budget head.	The Estimate from each stake holder is required, actuals may vary depends on site situation and the same shall be forwarded to KIIFB for concurrence
12	**Canal Oriented Development (COD),** a) Cleaning and water hyacinth removal during preparatory and final phase: PG no 6	1. A provision of 2.10 Cr is considered for this work and rate provided is Rs25.96/sqm. Actual estimate comes only 1.05Cr, but the process of cleaning is taken twice, shall be clarified. Detailed area calculation and rate analysis shall be furnished	The need for cleaning the canals pre-implementation and after completion has been clearly detailed in Chapter:6 Sec 6.1 (1). This is a provision to meet the exigencies and the amount will be further assessed before the execution of the project and after completion and only the actual required quantity will be executed on concurrence with KIIFB. Hence may be accepted. Rate analysis was undertaken as per DSR 2019 and the rate of Rs.25.96/sqm. for cleaning was provided as Annexure 6.1.1 of the DPR submitted and is attached as **Annexure:7** of this comment sheet. After submission of DPR, G.O (P) no 86/2020 fin dated 26-06-2020 was issued by	OK. But the estimate shall be updated based on DSR 2016

			Finance Dept. GoK .The detailed estimates will be prepared based on DSR 2016 only.	
13		2. It came to understand that the District Disaster Management Authority already taken up the cleaning activities of the TP canal may be reviewed.	DDMA has taken up cleaning of canal at selected stretches only. The water hyacinth grown is a periodic phenomenon, the actual quantity available at site was assessed. The varying percentages depending on the width of the canal and concentration has only been included as Annexure 6.1.1 of the DPR. Before the work is executed by the contractor to be realistic, exact quantity will be assessed. As regard to the quantity deepened by DDMA at various stretches in the canal, it may be informed that the bathymetry survey was undertaken KMRL after the DDMA work was executed and the exact quantity is reflectance in the quantity estimated for deepening in the canals. The bathymetry survey estimation **Annexure: 8(a)** along with the present condition of the canal after DDMA completed the work is given as **Annexure: 8(b)** for KIIFB review along with this comment sheet**.** **Further, the pre bathymetry and post bathymetry surveys shall be carried out as discussed during meeting on 07.01.2021.**	Annexures are not available -Missing Annexure resubmitted
14	**Canal Oriented Development (COD),** b) Canal widening & deepening. Pg No 6-7	1. The estimate provided for Canal widening & deepening amounts to INR 33.73 Cr consists of Earth work in or under water along with back filling on banks, Earth work excavation on the side of the banks with backfilling, on banks, Earth work in or under water excavation and transporting out of site.(a) Development permit from KMC is needed for the above activities, detailed drawing and calculations with details of surplus	a) NOC has been received for undertaking all the infrastructure works in the canal from KMC council. This requirement is a part of SWAK clearance, and action is being initiated by KMRL for taking over these canals before the execution of the works and handed back after completion. The NOC issued is given as **Annexure:9** of this comment sheet.	

		earth to be transported shall be furnished.		
15		The existing canal width in some of the place are seen less than the proposed width of 16.50 meter, SPV shall verify and ensure any encroachment/squatters with revenue records/FMB sketch shall be detailed.	Detailed Land acquisition proposal has been undertaken by KMRL and in places where width is less than 16.5m the land acquisition proposal has been prepared for widening the canal to 16.5m based on village records (FMB). The govt land and private land has been detailed separately and submitted by KMRL to Govt. for notification. The copy of the details furnished as part of LA process for Edappally canal is given as **Annexure: 10** of this comment sheet. The same was already submitted vide **PFMS File CIN001-01-REVISION-01 Note#9 dated 12.08.2020**	Ok.. but the details of other than Edappally canal are also need to be furnished. -Missing Annexure resubmitted
16	**Canal Oriented Development (COD),** c) Shore Protection: Pg No 7	DSR rates provided in estimate is not matching with actual relevant DSR. For eg: rate of steel reinforcement Rs.117/Kg, RCC M30 Rs 13248 per cum & Centering & Shuttering Rs.1026/sqm etc. shall be reviewed	The rates are given as per DSR 2019. After submission of DPR, G.O (P) no 86/2020 fin dated 26-06-2020 was issued by Finance Dept. GoK and the same shall be updated at the time of tendering.	shall be updated for approval.
17		1. The overall rate of shore protection comes to Rs.57059 per running meter seems to be much expensive, alternative options to optimize the cost shall be explored.	As per the concept design, four different shore protection measures is being envisaged. For estimation under DPR purpose, the average rate of the 4 options was used. Based on geotechnical investigation undertaken the type of shore protection required based on site specific requirement has been detailed. The split up of Shore protection measures envisaged for Edappally canal at different stretches is given as a typical case for review as **Annexure: 11** of this comment sheet.	Annexure 11 not available -Missing Annexure resubmitted

18		2. Also the running meter rate provided for Rs.57059/- will not be same for all the canals throughout the length; it may vary as per the site condition. Hence the rate per running meter shall be worked out for each canal separately in segment wise for more clarity.	The actual running meter rate worked out for different types of shore protection works as per DSR 2019 is given as **Annexure: 12** of this comment sheet. The most optimal choice has been made while selection of the type of shore protection taking into consideration the land value, land extent constraints and width of the shore protection in a site specific manner.	Estimate shall be updated based on DSR 2016, Annexure 12 not available -Missing Annexure resubmitted
19		3. The ring bund in the estimate considered as 15m instead of 10m length maybe clarified. Also the rate provided for Rs.22227 per running meter shall be justified.	The additional length of ring bund for a 10m length of shore protection has been given considering the working space and the dewatering measures to be undertaken at each end of the stretch under construction. The rate analysis has been reworked based on Irrigation OD of PRICE, which works out to only Rs.1085. and is given as **Annexure 13** of this comment sheet.	OK
20		4. Item 2.1 mentioned in DPR not matching with the item 2.1 as per DSR for the sheet piling work in estimate may be clarified.	It may be noted that this is a correction and may be read as Observed Data and not DSR data item 2.1. Rate Analysis for the same was provided as Annexure 6.1.3 item 2.1 of the DPR	OK
21		5. The estimate is worked out based on 10m length shoring. The necessity of the rubble masonry retaining wall where the sheet piles are provided shall be clarified	Comments addressed in SL.No.18 and in no stretches the 2 types are used together.	Ok
22	**Canal Oriented Development (COD),** d) Regulatory arrangements with automatic operations and pumping arrangements: Pg No 7	1. It is seen that only 3 canals are provided with regulatory shutters, shall be clarified	Shutter arrangements are required only for Edappally, Chilavanoor, and Thevara-Perandoor as the other two canals are very small and the site condition does not necessitate a requirement for shutter arrangements.	OK
23		2. Lumpsum provision for Rs.30 Cr shall be detailed.	The construction of shutter arrangement is envisaged as an EPC contract and the manufacturing of shutters is a specialised work and is vendor based. The detailed drawing and rough cost arrived for giving	

			the LS provision is given as **Annexure 14** of this comment sheet for review.	
24	**Canal Oriented Development (COD)** e) Canal beautification in canal banks with landscaping & promenade development: Pg No 7-8	1. LS provision for Rs 5 Cr shall be detailed.	Development of landscaping and beautification of parks and adjacent to the canals owned by Govt stakeholders is also proposed. Detailing is in progress based on the availability of open spaces and parks and is the actual need for this project and hence may be accepted.	may be considered in contingency provision
25		2. DSR items & rates provided are not matching with items in the estimate.	Horticulture DSR has been used for canal beautification items. Hence may be accepted.	OK ,shall be updated based on DSR 2016
26		3. It is seen that 520 nos of lights per Kilometre provided, the requirement shall be justified with proper drawing.	As per the lighting standards, Pedestrian lights are provided every 3-3.5 metres centre to centre. Hence on either side it will be coming around 572 nos per kilometre. As per site conditions, only 520 nos have been provided, hence may be accepted.	OK
27		4. It is noted that a quantity 15820 cum of sand considered in the estimate as supply and filling from outside. The possibility to use the surplus sand obtained from dredging maybe explored.	For canal beautification works, after the dredged earth is used for filling the low lying area and land grading, the next layer is proposed to be filled with 20cm thick layer of sand for soil stabilisation purpose. Also sand is required for soil preparation for planting. This is the actual requirement for undertaking the activity. Further as discussed, it is confirmed that in case of any availability of sand during dredging, the same shall be accounted for strictly following govt guidelines as client supply.	This has to be reflected in estimate also..

28		5. As far as possible the soil/sand obtained by excavation and dredging shall be used for the formation of mount and other horticulture related works.	Maximum usage of soil obtained from excavation is proposed for usage with is varying from 20-50% along the Edappally, Chilavanoor, Thevara-Perandoor and Thevara canals .The canal wise utilisation is given as **Annexure: 15** of the comment sheet. The disposal management plan for the remaining earth has been framed and KEIL has agreed to take the soil for covering the hardous water pits with this soil for which an agreement has been executed with KMRL . The copy of MOU is attached as **Annexure: 16** of this comment sheet.	
29		6. Usage of GSB & PCC shall be reviewed for footpath	Requirement for Usage of GSB & PCC has been included for facilitating cycling and N.M.V movement and other service activities in the canal beautification stretch of Edappally canal. The detailed drawing for a particular zone along Edappally canal beautification stretch is attached a**s** **Annexure: 17** of this comment sheet.	OK
30		7. The rate of coconut pole for supply and erection comes to Rs.18879/- per running meter is too high, shall be reviewed.	This coconut pole estimate has been prepared for board walk purposes and specialized skilled labour is required for fixation purposes. Hence the rates may be accepted. The rates will be reviewed further in the detailed estimate stage. The details are already provided in Annexure of DPR	Ok after rate review, shall be updated
31		8. The rate provided for board walk is Rs.38612/- per sqm shall also be reviewed also the width of the board walk shall be furnished with proper drawings.	Rate analysis provided under DPR is also a realistic one as per observed data. As the wood which is being used under water the best option available was using Thembakam wood and copy of the same justifying the same is attached as **Annexure:18** of this comment sheet. Further as discussed during the meeting on	Reiterate the Sqm rate provided shall be reviewed

			07.01.2021, alternatives for the same shall also be explored and during finalization of tender, the details shall be shared with KIIFB for concurrence.	
32		9. The supply of grass required for the landscape work is not seen considered in the estimate.	It is considered in Annexure 6.1.9 Sl.No.24. Rate taken as per Horticulture DSR 2.10 (2018).	ok shall be based on 2016
33		10. Item no 37–46, detailed specification with base drawings shall be furnished.	These items are related to canal beautification and detailed design based on different zones are in progress and competed details are given in **Annexure 2(a) and 2(b)** of this comment sheet.	
34	**Canal Oriented Development (COD)**f) Construction of Jetties & Construction of Terminal buildings : Pg no 8	1. It is observed that total 30 Nos. of jetties are provided for 4 canals and the market canal is exempted. Maybe clarified	In market canal, no navigation is proposed. Only movement of small boats are envisaged for which existing docking yard will be used. Hence not included.	Ok
35		2. The DSR rates furnished in the estimate are not matching with actual DSR 2016. Shall be reviewed.	The rates are given as per DSR 2019. After submission of DPR, G.O (P) no 86/2020 fin dated 26-06-2020 was issued by Finance Dept. GoK	shall be updated for approval.
36		3. The structural details and reinforcement calculations shall be detailed.	Based on the geotechnical investigation through bore logs taken after submission of DPR structural detailed drawings of jetties is given as **Annexure:19** of this comment sheet.	Annexure not seen furnished -Missing Annexure resubmitted
37		4. LS provisions provided in the estimate for water tank, septic tank, bathroom fittings and plumbing etc. shall be detailed.	All jetties have not been provided with these facilities and completed detailed estimate works is given in **Annexure:20** of this comment sheet.	No annexure -Missing Annexure resubmitted
38	**Canal Oriented Development (COD)** g) Construction of Corporate office of SPV with operation control room and testing lab : Pg no 8	1. Architectural, Structural and finishes drawing with c/s and elevation etc. shall be furnished and detailed estimate shall be furnished in PRICE based on the actual requirements.	Architectural drawing of proposed SPV building given as **Annexure:21** of this comment sheet the plinth area rate has been followed in the DPR and detailed estimate under PRICE is in progress. This shall be detailed further before tendering and taking concurrence from KIIFB.	Ok

39	**Canal Oriented Development (COD)** h) Construction of access road to jetties and terminals : Pg no 8	1. Separate observations attached (Please refer sl no 3, Quick appraisal on Roads, Bridges and foot bridges)	Comments given under Item 71-76	
40	**Canal Oriented Development (COD)** i) Purchase of vessels/Boats for navigation of passengers and tourism : Pg no 8	1. Lump sum provision for the boat/vessels shall be detailed.	Please find the details of LAR for 100 pax Boats (Water Metro Project and estimate for 50 pax Boats (Water Metro Project) in the **Annexure 28** given. Based on these annexures , the costing for individual boats for 20 pax is worked out on a pro rata basis'. The same shall be detailed and before tendering concurrence from KIIFB shall be obtained	
41	**Canal Oriented Development (COD)** j) Navigational aids (5 canals) & Signages, Markers and way finding – Civil packages : Pg no 8	1. Lump sum provision shall be detailed	The rates have been taken from the market and has been included as ls provision. This would be a separate tender wherein only specifications will be given and competitive rates obtained.	Ok
42	**Canal Oriented Development (COD)** k) Solar Installations & EV chargers and electrical systems : Pg no 8	1. Lump sum provision shall be detailed.	The rates have been taken from the market and has been included as ls provision. This would be a separate tender wherein only specifications will be given and competitive rates obtained.	Ok

43	**Urban Regeneration** a) Construction of Sewer network including interceptor, pumping stations, manholes : Pg no 8	1.Detailed estimate shall be furnished in PRICE	Tentative estimate has been prepared for DPR submission. Based on the road network, and elevation details the detailed design and estimation is under progress. This is proposed under EPC contract and further detailing will be part of the EPC contract. Separate DPR preparation with detailed design and drawings attending to comments 1 to 9 is in progress. The road net work with elevation for laying the sewer lines as a typical case for Vennala STP is attached as **Annexure: 22** along with the comment sheet.	shall be updated for approval.
44	**Urban Regeneration** b. Sewer networks for households : Pg no 8-9	1.The total estimated cost as per DPR comes to Rs.98.86 Cr		
45		2.The rates provided in the estimate are based on the local market rates, necessary documents shall be attached to substantiate the reasonability of the rates provided.		
46		3.The alternative options instead of DWC HDPE/CI SPUN pipes shall be explored.		
47		4.The usage of surplus excavated earth after backfilling shall be detailed and the removal of surplus earth if any shall be carried out by observing all the govt formalities.		
48		5.Proper network drawings shall be provided		
49		6.Construction of manholes, Item no 16, the specification for earthwork is for 0-1.5m but the item 1-1.5m for a quantity of 27152.19 cum has been considered again. This may be clarified		
50		7.Construction of manholes item no 31-35 for RCC manholes, the inside dimensions and the details of the manhole cover etc. have to be furnished.		

51		8.The earthwork rate provided for Construction of manholes and house service connections, the rate without dewatering is more than that of with dewatering.		
52		9.The rate provided for earthwork in restoration of roads, Item no 1, shall be justified		
53	**Urban Regeneration** c. Sanitation facilities in Catchment Area **: Pg no 9**	1.In the abstract, 5 canals are included with a project cost of Rs. 26.65 Cr. But in the detailed estimate, only 3 canals are included with a project cost of Rs. 22.86 Cr. Clarification in this regard may be furnished.	Market canal is being addressed under CSML and the sanitation facilities have been provided as per the actual requirements at site when the construction work of sewer network is in progress as transitional facilities and the provision provided is as per actuals and hence may be accepted.	ok
54		2.The calculation for arriving the number of Bio toilets for Chilavanoor stretch (1903 nos) are shown as 0.5% of the canal stretch. The calculation may be detailed.	After the final Household survey is completed the exact number can be finalized. This figures have been finalized based on the similar works undertaken in the nearby locality. As discussed during the meeting the reasons stand deliberated.	Ok
55		3.The sewage transportation cost is shown as 30% of the cost of the bio toilet. Detailed estimate is needed.	After the final Household survey is completed the exact number can be finalized. This figures have been finalized based on the similar works undertaken in the nearby locality. As discussed during the meeting the reasons stand deliberated.	Ok
56		4.The unit cost per person of Rs. 807/- is arrived based on the population of Chilavanoor stretch. This shall be worked out independently for each canal.	Final detailed estimate will address the comments after the final Household survey is completed.	Ok
57	**Urban Regeneration** d. Sewage Treatment Plants (5nos. of	1.The Technology selected for STP is SBR (Sequential batch reactors) based on the study conducted by seven IITs in India. This study is titled "Sewage Treatment from Class I	A detailed technical report justifying the selection of SBR technology is attached as **Annexure: 23** of this comment sheet. The criteria followed based on population is only one of the parameters for the multi criteria	

	total 31 MLD) and its pumping systems : Pg no 9-10	towns: Recommendations and guidelines”	parametric analysis. The most important point to be addressed as per National green tribunal judgement is the efficiency of the STP in reduction of output effluent parameters and in specific the nutrient load removal and output effluent parameters.. The list of SBR STP of various capacities across India is included along with the technical note.	
58		2.Class I town means with population higher than 1,00,000 people, which means the STP serving community is more than 1,00,000 (that is the precondition to select the study as the reference). It does not mean that for all the STPs in a Class I city SBR is the best technology (even for 10,000 L per day wastewater treatment plant). Here other than one STP, all others serve few people, even less than 50% of the margin. The selection of technology shall be analysed individually. The criteria to select SBR technology for all ST Plants may be justified.		OK
59		3.The possibility to provide one Central plant instead of 5 de-centralized units shall be explored to optimize the cost of plant, land cost and its recurring expenditure and to minimize the local issues	Based on the stake holder meeting conducted by SPV, the general request from the public is to have decentralised scheme away from the urban fabric. All the earlier STP schemes (under KSUDP, JNuRM etc) in kochi corporation have failed, since the location of STPs were in the middle of the urban fabric. Hence GC has identified STP locations complying with KSPCB siting criteria at 4 locations. • In the DPR stage 5 locations were identified. Two on the southern side of the catchment considering topographic constraints. Elamkulam STP of 10MLD serving the south catchment of T-P and Chilavanoor and Vennala STP serving southern catchment of Edappally canal. On the northern side 3 STPs were initially proposed with a 4 MLD plant at Perandoor	Ok

			serving northern side of T-P canal, 5 MLD plant at Puthukkalavattom serving northern catchment of Chilavanoor canal and 2MLD plant at Muttar serving northern side of Edappally catchment. • The STP plant has been decentralised considering the topography of IURWTS catchment . There is a ridge running in the East west direction of the catchment and any measures to make it to centralise will involve high amount of capital cost due to high energy pumping stations and also the land cost. The average slope of the catchment is also very less **limiting the scope of the centralised unit.**	
60		4.As per the details given in the table 3B.18,	Detailed Note given in the Technical note given as **Annexure:23 above**	
61		5.As per DPR the max area required for SBR technology is 400 m2/MLD. So, for 31 MLD an area of 12,400 m2 area is needed or 3.06 acres. But the area provided for each plant is much higher, this may be clarified.	The area of 400sqm refers to the plant area for various components per MLD only. For adhering to the EIA norms additional areas has been included. As explained under section 3 above, the possibility of centralised STP is not feasible in the IURWTS catchment due to its topography and the slope being very flat. Green belt development is mandatory as per the EIA norms for getting MoEFCC compliance and effective odour control. Hence the are required is the bare minimum and Consent to establish has been issued by KSPCB.	OK
62		6.The area ear marked for Elamkulam is 1.94 acres with an additional vacant area of 2.21 acres (page 209/3B-26). Area marked at Vennala is 4.54 acres (page 209/3B-26) and looks like there are additional area available in both the locations. So, this area can accommodate the full size	As explained in the earlier paras a centralised unit is not feasible. The Elamkulam STP site area is under the control of KWA. Here a 5 MLD plant under AMRUT is under progress in a vacant space., After the completion of existing Sewer load to the old plant will be connected to teh new plant. The10 MLD plant proposed under IURWTS at Elamkulam is the space	Ok

		(centralized plant of capacity 31MLD) for the possibility shall be explored.	occupied by the existing 4.45MLD plant .The area mentioned for the proposed upgradation plant of 10MLD is the existing plant area and additional area available at the site.	
63		7.The locations at Muttar and Puthukkalavattom seems right in the middle of residential area, may be reviewed.	The 5 MLD plant proposed in the DPR at Puthukkalavattom did not adhere to the EIA siting criteria as per KSPCB, of having no inhabitants of 50m from the boundary of the STP units. In the detailed DPR for STP being prepared, the sewage load of Puthukkalavattom STP has been routed to Muttar STP by increasing the capacity from 2 to 7 MLD. The Muttar site adheres to the siting criteria of EIA and the consent to establish has been received from KSPCB.	OK
64		8.As per DPR Page 211 (3b-27) Sewer mains are proposed all along both the banks of the 5 canals to collect the sewage generated and transport the same to the sewage treatment plant for treatment. There is a possibility that after the laying of the sewer networks, a few low-income group colonies/ individual houses which due the location issues cannot be connected to the sewer systems. So, provisions for providing sanitation facilities for these individual houses are provided by means of community toilets.	Provision for sanitisation facilities for the left out households from the sewer network has been included in DPR.	OK
65		9.Laying the sewer mains along the banks of the canal would increase the risk of high-water infiltration to the sewer network, at least upon ageing of network. As per DPR an infiltration rate of 5% of the per capita sewage flow as suggested by CPHEEO has been adopted in the design. But the wastewater quantity	In the DPR submitted, wa based on estimates for tender under EPC mode. The total sewer load has been calculated based on the arithmetic mean projection up to 2051 population. The factual situation of the population projection is that Kochi corporation has a negative decadal growth by 2051. In the final estimate for sewer network being designed under EPC mode	OK

		calculated to 31MLD does not seems to have included the infiltration water, may be reviewed	all the criteria of CPHEEO manual, such as infiltration rate, households water usage, roof water harvesting, etc. will form part of the EPC tender requirement and the design and drawings will be requested accordingly.	
66		10. Design criteria for sewage pumping station: The pumping station is usually having high odour generation potential, leading to odour nuisance in the area attracts public protest. The DPR mentioned about ventilation for pumping stations, but the toxic gas elimination/odour control measures are not described.	Pumping stations are proposed with suitable odour control measures and will also form part of the conditions being prepared under EPC mode.	OK
67		11. The detailed estimate for the civil structure, Electro-mechanical works etc. for STP shall be furnished.	The detailed estimate for the civil structure, Electro-mechanical works etc. for a typical 10MLD STP is attached as **Annexure: 24** of this comment sheet. The detailing of other STPs is in progress.	shall be updated for approval.
68	**Urban Regeneration** e. Operation & Maintenance 15 Years – sewage treatment plants 5 nos. **:** PG no 11	1. It is shown in DPR 3 years O&M will be under the scope of the Principal Contractor and 12 years by Maintenance Contractor. The estimate has to be worked out in detail.	The detailed estimate given in **Annexure: 24** in the DPR has considered 3 years O&M under the scope of the principal contractor and 12 years under maintenance contract. As the tender mode proposed is EPC the 15 year period of O&M will be under the scope of the principal contractor.	
69		2. The O&M cost comes to almost 50% of the principal cost of the estimate of STP. This shall be justified.	The detailed estimate given as **Annexure: 24** in the DPR has considered the O&M cost as only 11.9% of the total estimate.	Annexure 24 not seen attached -Missing Annexure resubmitted
70	**Urban Regeneration** f. Solid waste management (To be handed over by Kochi corporation) :PG no 11	1. Necessary documents shall be furnished to substantiate the market rates provided for the items.	DPR has been prepared as per Observed data from local firms, detailing is in progress.	shall be updated

71		1. Proposal comprises abstract estimates for access road along Canals, road to Bridges, road to Jetty terminals, Bridge structures and Foot Over Bridges.		Without getting the detailed estimates, appraisal cannot be completed.
72	**Roads, Bridges and Footbridges.** 1. Construction of Access Roads along Canal 2. Construction of Cross Structures Like Road Bridges 3. Construction of Foot Over Bridges 4. Construction of Access Road to Road Bridges 5. Construction of Access road to Jetty Terminals	2. On a general scrutiny, it is found that approximate estimates are framed based on unit costs (running meter cost for roads and unit cost for bridges). For Thevara_Perandoor Canal road and Thevara canal road, same unit rate is considered. For 4.00 m wide bituminous road, pavement of which comprises GSB, WMM and MSS (as finishing layer) Rs 172.0856 lakh is the Kilometre cost. This is inclusive of provision for masonry retaining wall amounting to Rs 29.03 lakhs and embankment filling for Rs 30.82 Lakhs. As the provision for masonry wall and embankment filling vary section to section, estimate based on unit cost arrived at cannot be treated as a realistic one. As such detailed estimate based on the actual necessity at each site to be provided . In the case of access road to bridges, instead of running meter cost, estimate is based on number of roads. It is a fact that typical estimate cannot be considered for the whole works as the requirements at each site will vary considerably. Hence detailed estimate with detailed design shall be provided for verification.	Geotechnical investigation was completed after DPR submission. Based on the soil conditions detailing is being carried out and the pavement design is being decided as per site suitability which is under progress. Paver blocks are not proposed as the access roads for Road bridges are only for gradient correction. Hence the existing condition of BM&BC is followed. Access roads along canal for cycling and walkways have been provided with paver blocks. Sample given as **Annexure 25.** Inclusion of GST will be removed in the Tender stage.	As regards to the existing pavement, the causes of distress and remedial measures can only be suggested after inspecting the site and conducting the structural and functional evaluation of pavements. Mere rectification with MSS cannot be acceptable as far as this project is concerned. Stretches severely damaged requires full depth rectification by using GSB, WMM and surface course. But no MSS layer shall be laid as surface coarse here. Either resort to BM&BC or provide concrete interlock.

73		3. Moreover, the provision of MSS layer as surface coarse disintegrate more easily than the BM & BC. But BM & BC will be costlier. Hence alternative options including concrete precast paver blocks may be explored instead of MSS layer which is intact and will last for several years than BM & BC. Thickness of GSB and WMM can also be reduced when providing paver blocks.		Some of the advantages of concrete block pavements are : -since the blocks are prepared in the factory, they are of a very high quality, are skid- resistant, restrict the speed of vehicles to about 60 km/hr, unaffected by the spillage of oil from vehicles, simple maintenance and repair, low cost, ideal or intersections, preferred in heavily loaded areas and the limitations are - this cannot be used for high speed facilities and riding quality is reasonably good. As such for a durable, long lasting, and improved performance this is found appropriate for this project.
74		4. Also, the provisions of RR masonry including levelling up with cement concrete 1:6:12 need justification as the unit rate comes to Rs 10477.69/m3. Rate for ordinary cement concrete M20 is only around 6500/m3. Hence this item may be separated as RR masonry in cement mortar 1:6 with cement concrete belt over the masonry surface or replace the item with cement concrete alone with reduced thickness which are economical than the proposal.		
75		5. On scrutiny of all the other proposals like cross structures, other access road etc., it is seen that all of them are based on unit cost, which shall be as per the actual site condition. For the road bridges, provisions seem over engineered hence shall be optimized. Provision for ring bund costing to Rs 11.11 lakh, Hire & labour for sheet piles costing to Rs 10.00 lakh, 600 mm dia RCC piles costing to Rs 24.14 lakh. 8 mm thick corrugated steel sheet		Proper detailed estimate is inevitable for the appraisal of the project. Most of the rough estimates are inflated one and not as per PRICE and KIIFB guide lines

		costing to Rs 47.25 lakh etc. are more than the required. Detailed structural design shall be submitted for all these bridges along with detailed estimate. For the steel foot bridge also provision given are in excess. . Also 18% GST is seen accounted, which shall be reviewed. Detailed structural design shall also be submitted along with corrected estimate and LS provisions shall be detailed		
76		6. Access road to bridges, the same item- RR with levelling coarse CC 1:6:12 with a rate of Rs 10477.69/m3 is given. MSS layer may be replaced with CC paver blocks and the estimate got optimized as per site conditions. Access road to jetty terminals also, the same specifications as noted above is followed. This shall also be corrected as observed above.		Proper detailed estimate is inevitable for the appraisal of the project. Most of the rough estimates are inflated one and not as per PRICE and KIIFB guide lines
77	Major Hurdles of the proposed project Page no.06	Major Hurdles of the proposed project	1. Land Acquisition process, identification of Squatters and Encroachers and Rehabilitation and Resettlement has been addressed in the DPR. 2. Once the parallel primary sewer lines are laid along the canal, the illegal drainage arrangements opening into the canal will automatically be cut off to the canals. 3. Govt. of Kerala has already issued G.O.(Rt) No.823/2020/LSGD dated 04.05.2020 and G.O(Rt) No.2466/2019/LSGD dated 06.11.2019 preventing the dumping of households, housing complexes, commercial buildings, hospitals etc. and other waste in to the canal and the District Collector has already initiated proceedings in this regard. Also,	

			wire mesh fencing has been envisaged in the possible locations for tackling the issue. Solid Waste management strategies are being framed separately as part of this project and signage boards for the113nos. of littering points identified has been designed and given as **Annexure 26.** 4. Around 23,000 trees are proposed to be planted as part of the Greenbelt Development and Afforestation plan given as **Annexure 27.**	

ANNEXURE 9

SELECTION OF APPROPRIATE TECHNOLOGY FOR SEWAGE TREATMENT PLANTS

Integrated Urban Regeneration and Water Transport System (IURWTS) in Kochi

Selection of appropriate technology for Sewage Treatment Plants for IURWTS catchment

Project # : WT/2024
Revision #: R0
Date : 25.11.2020

IURWTS
Integrated Urban Regeneration & Water Transport System

Antea Group

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Understanding today.
Improving tomorrow.

Integrated Urban Regeneration and Water Transport System (IURWTS) in Kochi

Selection of appropriate technology for Sewage Treatment Plant for IURWTS catchment

Project number : WT/2024

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Kochi Metro Rail Limited, (A Joint Venture of Govt. of Kerala and Govt. of India)

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anteagroup

Selection of appropriate technology for Sewage Treatment Plants for IURWTS Catchment

1 Introduction

The purpose of a Sewage Treatment Plant (STP) is to treat the raw sewage waste water and remove the contaminants to approved standards, so that the treated water can be discharged to the existing water bodies with minimal impact on the ecosystem (Yawar Hayat Wani (2016)[1]).

One of the most challenging aspects of a sustainable sewage treatment system (either centralized or decentralized) design is the analysis and selection of the treatment processes and technologies capable of meeting the requirements (IIT report 2010)2. Suitability of any technology largely depends upon the location of the plant, land availability and objectives of the treatment etc. or in other words it depends on the scenario for which plant need to be constructed (Adesh kumar (2016)[3].

[2]Effluent quality, process complexity, process reliability, environmental issues are other important issues which also needs to be considered while deciding on an appropriate technology.

Due to the population increase in every decade, conventional treatment technologies have become outdated due to the high establishment, lesser output effluent standards and O&M cost. Innovative technologies are in vogue to treat the increased population load, requiring lesser space requirement, and increase effluent standards before discharging the same to the water bodies. Two major technologies which are commonly adopted in India are Moving Bed Bio-film Reactor (MBBR) and Sequential Batch Reactor (SBR) technologies. The selection of the STP technology has been based on parametric analysis as regard to the output effluent standards, CAPEX, OPEX and Life Cycle cost.

The comparative study for SBR and MBBR STP technologies reported by STP suppliers, User stake holders, consultants, and researchers have been reviewed both as case studies and research publication with their findings before the choice of STP technology has been recommended by the General Consultant for IURTWS catchment.

2 Technology description of SBR and MBBR

2.1 Sequential Batch Reactor (SBR)

Sequencing Batch Reactor (SBR) as compared to traditional or conventional treatments is an easily obtainable, highly operational, flexible technology for newer and varied pollutants (Franklin 2019).

SBR is a different configuration of the conventional activated sludge process used for the treatment of wastewater. The treatment process is undertaken in batches in the same reactor and each batch is sequenced through a series of treatment stages. The sedimentation, biodegradation and biosolid separation are achieved in the same reactor, but at different times. When the inflow of raw wastewater is intermittent SBR technology is very useful has the treatment is undertaken in batches. [Manoj Tiwari (2018) [5]].

Steps involved in SBR treatment process

In SBR all the treatment steps are undertaken in a single tank. The process diagram is a given in **Figure 1** (Meenu Jain (2018)[6].

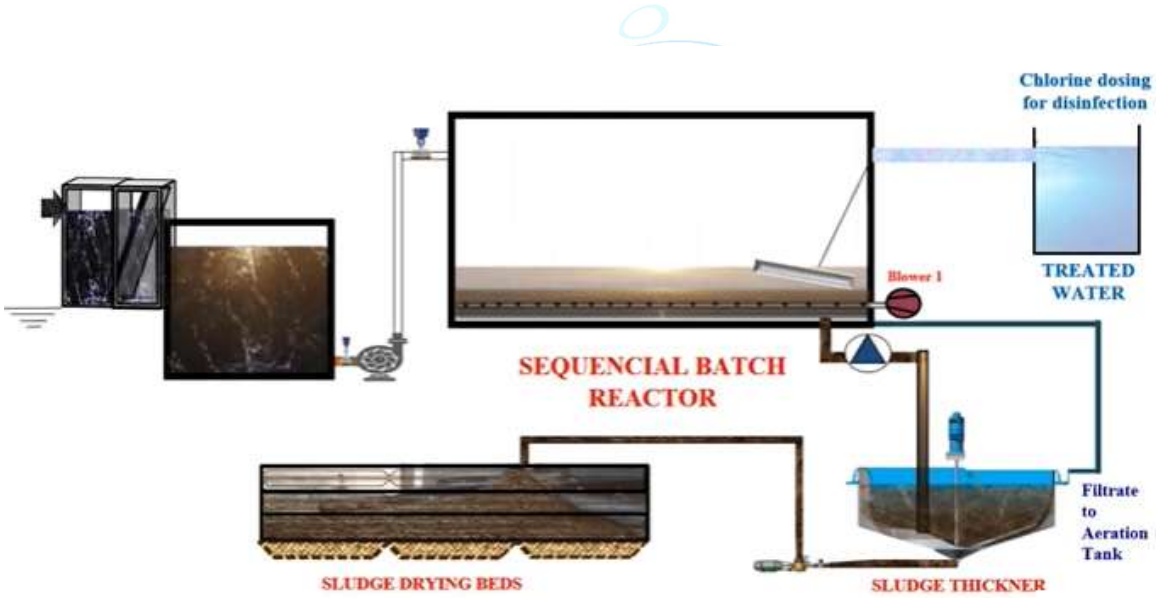

Figure 1: Treatment process flow diagram of SBR technology[6]

Step:1 Filling process[6] : The raw sewage wastewater is introduced into the reactor and mixed with the biomass for bioreaction. Here aeration stops and mixers are turned on to provide anoxic conditions for denitrification. Time of filling is 25% of full cycle time.

Step:2 Aeration[6] : Aeration is used for BOD removal and nitrification. Time taken is 50% of the total time cycle (typically around 35%).

Step:3 Reaction[6] : Time of filling is 20-25% of the total cycle time. For nitrification, Aerobic reaction time is 1 to 3 hrs.

Step 4 Settling[6] : Time taken is 15-20%of the total cycle time.

Step:5 Decanting[6] : The clear, treated water is decanted as final effluent. A swing or telescope type decanter is used to remove the clarified supernatant from the tank.

In SBR technology there is no need for a Return Activated Sludge (RAS) System[6]. A 100MLD SBR technology plan functioning in Navi Mumbai is given in **Figure 2**[5].

Figure 2: 100 MLD SBR plant in Navi Mumbai[5]

2.2 Moving Bed Biofilm Reactor (MBBR) (Meenu Jain 2020)[7]

MBBR is compact, simple to operate and very efficient for the removal of BOD, Ammonia and nitrogen from both municipal and industrial sector's wastewater. There is no recycle activated sludge sent back into the process like SBR. An adequate microorganism population is maintained in the treatment process.

Inlet Raw sewage water comes to screen chamber for preliminary treatment of waste material like plastic solid materials etc. Raw sewage water is then pumped to the Equalization tank, maintaining a desired

constant or uniform flow rate. In this tank the raw sewage is made homogeneous. The aeration process through the blower in the equalization vessel will help to reduce BOD of wastewater by 10 to 20%.

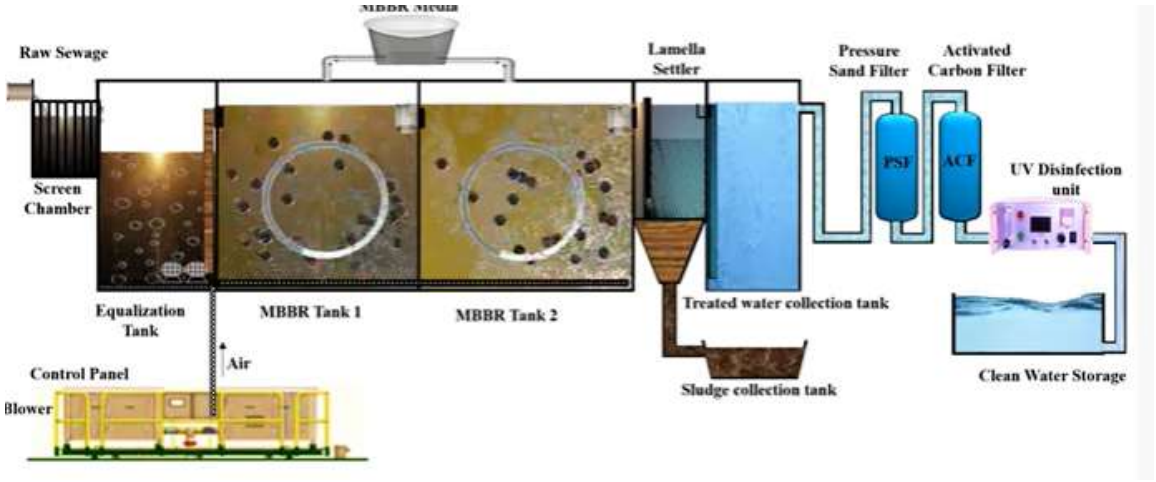

Figure 3: Sewage process diagram for MBBR technology[7]

After the equalization tank homogeneous raw sewage is sent to the MBBR tank. Moving bed biofilm reactor (MBBR) is part of the secondary or biological treatment process consists of an aeration tank, like activated sludge tank and special plastic media that provides a surface where microorganism as a film can grow. These carrier media is dumped into an aeration tank and mixed with effluent liquid by aeration system. Aeration is provided to continuously circulate the plastic media and to maintain the dissolved oxygen level in the MBBR tank. Proper aeration gives good contact between BOD and organic material and biomass and microorganism on carrier media. Sieve is provided on the outlet of the tank to prevent the carrier media from escaping the MBBR tank.

The water is let to MBBR tank 2 and the process undertaken is the same as MBBR tank 1. The digested sludge and treated water is send to the clarifier unit where the sludge is collected in the sludge collection tank through the bottom hopper of the clarifier and clear water is collected in the treated water collection tank through launder at the top of the clarifier unit. To avoid the pathogens, the treated water it is passed to a chlorinator or passed through a Pressure Sand Filter (PSF) for reduction of total suspended solids and BOD and then through an Activated Carbon sand Filter (ACF) media for removal of smell odour and colour. This water is passed through a UV disinfection unit for killing of all types of pathogens present in the water.

3 Selection of Appropriate technology for IURWTS Catchment

Selection of STP technology relying on data from suppliers can be biased, hence 3 **institutional findings based on parametric analysis** are discussed as case studies in this report and the research findings of various researchers are also tabulated with their findings for better exposure in selecting an appropriate innovative technology.

The parameters considered for estimating the **efficiency and performance of technology** by the technical institutes of repute, Government organization, private national and international organization and researchers are as given below.

Parameters

1) As function of total treatment capacity.
2) Function of Sludge output.
3) Function of Energy and land requirements.
4) Function of Capital costs (CAPEX).
5) Function of Operations cost (OPEX).
6) Performance of the systems after Secondary and tertiary treatment.
7) Life cycle cost considering 15 years.

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Other General considerations like 1) Regulatory determinants 2) Financial sustainability 3) Size of community that can be served by technology 4) Institutional manageability 5) reliability and future opportunities for minimizing pollution load 6) Availability of skills in handling the technology is also brought out.

3.1 Parametric Analysis

The works reported and findings by 3 major institutes are brought as case studies in the following sections.

3.1.1 Case Study 1 : Sanitation Technology Platform (STeP 2017)[8]

The aim of the study by **Sanitation Technology Platform (STeP) along with Gates foundation** was targeted to obtain detailed information on decentralized, small-scale sewage treatment systems in India, with a focus on configuration, performance, and capital/operations costs of specific systems.

The following three innovative STP technologies have been compared (1) Moving Bed Biofilm Reactor (MBBR), (2) Sequencing Batch Reactor (SBR) and (3) Membrane Bioreactor (MBR).

The majority of data used were collected from STP vendors, consultants who help builders in selecting STPs, Developers, stake holders, contractors who have installed and who operate/maintain the system as well as end users. Data was also collected based on primary research—phone interviews, meetings, and email communications— with key players in the value chain.

Key data/information collected for each STP included,

1) Description of specific system components/equipment.
2) Location.
3) Type of end user served.
4) Installation year.
5) System lifetime.
6) System capacity.
7) Reported effluent treatment levels.
8) Sludge output - Footprint of system.
9) Energy requirements.
10) Cost data including capital and operations costs.

The Sanitation Technology Platform (STeP), with the support of the Gates Foundation (STeP, May 2017)[8] collected data for 81 small-scale STP installations serving various end-use types. Data on operating STPs were collected from 16 different Indian states and was tabulated as shown in **Figure 4**[8].

STP Type	Total Installations Identified	Installations by End-Use Type	
MBBR	46	Residential	16
		Commercial	11
		Industrial	13
		Other	6
SBR	25	Residential	12
		Commercial	9
		Industrial	1
		Other	3
MBR	10	Residential	0
		Commercial	0
		Industrial	10
		Other	0

Figure 4: Number of installations in data set by STP type and end user type[8]

Features and treatment specifications for STPs installations was tabulated as shown in **Figure 5**.

	Reported Values					
	MBBR		SBR		MBR	
	Median	Range	Median	Range	Median	Range
Features						
Treatment Capacity (KLD)	62.5	10 - 120	35	10 - 135	50	10 - 90
Installation Year	2015	2008 - 2016	2015	2004 - 2016	2012	2007 - 2016
Anticipated System Lifetime (Years)	15	10 - 20	15	.	15 (3 for membrane)	.
*Treatment Specifications**						
BOD (mg/L)	30	10 - 30	10	10 - 30	10	5 - 20
COD (mg/L)	100	20 - 250	50	20 -150	50	50 - 100
TSS (mg/L)	20	0 - 100	10	3 - 50	20	2 - 50

** These values represent design specifications and have not necessarily been verified via sampling.*

Figure 5: Features and treatment specifications for STPs installations

Findings of the study[8]

Features

Treatment capacity: overall system capacities in data set are lowest for SBR (median of 35 KLD), even though ranges are similar for all three system types.

Installation year: as a group, MBBR or SBR installations (median of 2015).

Anticipated system lifetime: at 15 years, the projected lifetime is the same for both systems

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Treatment Specifications

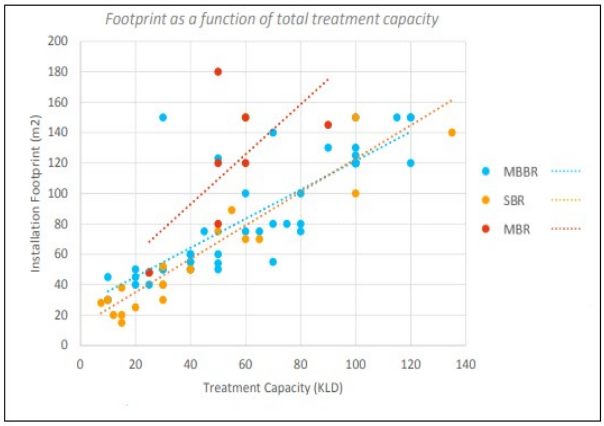
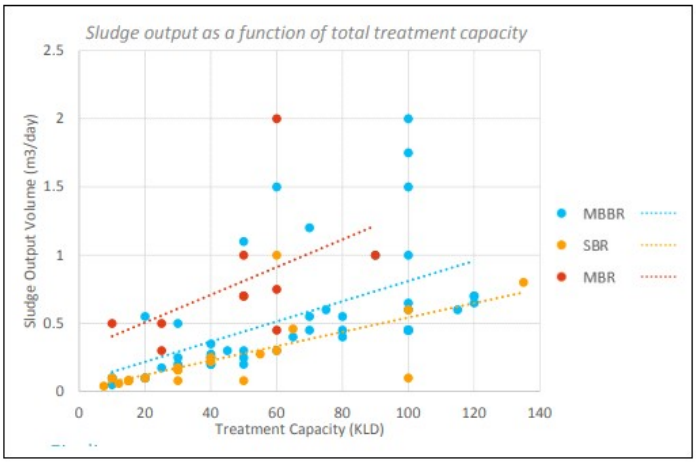
BOD Treatment: SBR has the best reported performance than MBBR since the median value for SBR is 10 against MBBR value of 20.

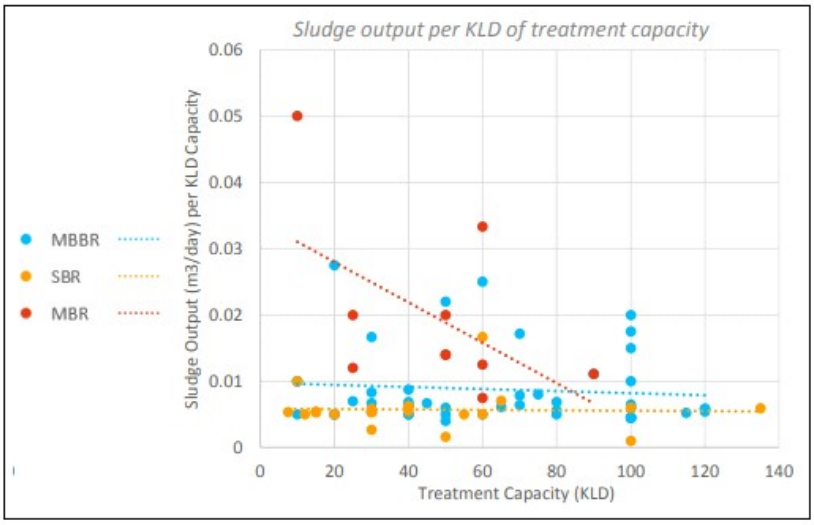
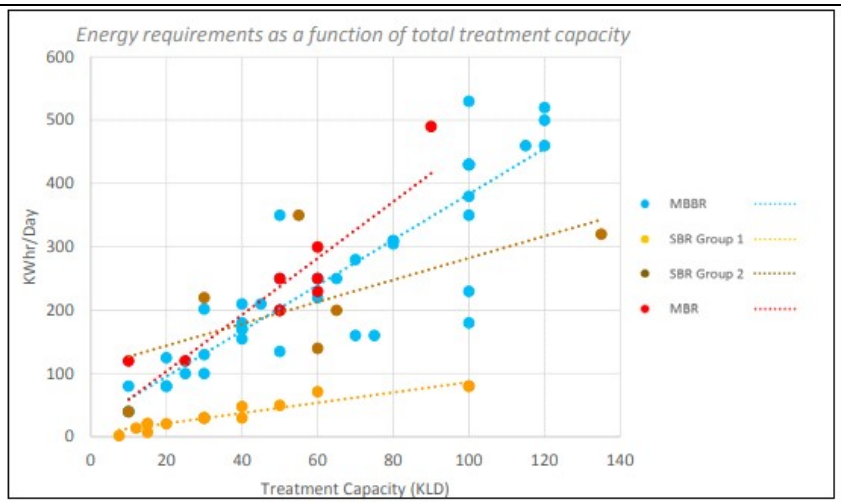
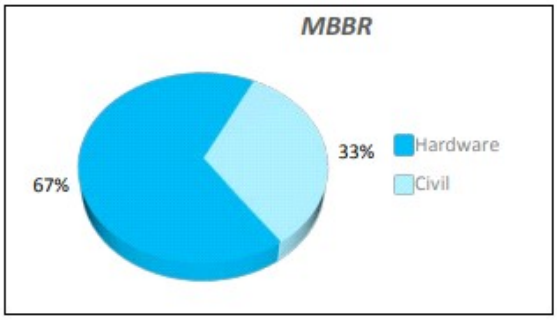
COD Treatment: SBR has the best reported performances, based on median values of 50 against MBBR value of 100.

TSS Removal: SBR has a better reported performance median values value of 10, against MBBR value of 20.

The findings[8] based on Footprint of STP installation is given in **Table 1**.

Table 1: Footprint of STP installations: Finding[8]

Parameter	Findings
Function of **total treatment capacity**	 MBBR and SBR system footprints were similar, **SBR (on average) having slightly smaller footprints** than MBBRs as capacity decreases[8]
Sludge output as a function of total treatment capacity	 On an average **SBR has the lowest reported sludge generation**

Sludge output per KLD of treatment capacity	 **SBR and MBBR each have sludge outputs per unit of capacity that are relatively flat** i.e., these values did not change significantly across varying treatment capacities[8]
Energy requirements as a function of total treatment capacity	 SBR Group 1 has the **lowest reported energy requirements** of installations in the data set[8]
Capital costs (CAPEX) defined, and average breakouts for STP installations.***	

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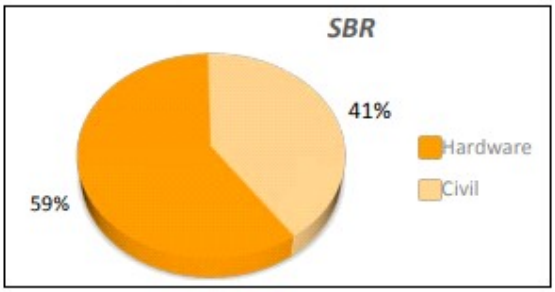

The percentage of hardware versus civil costs, on average, is similar for MBBR and SBR, **with MBBR having a slightly higher percentage than SBR** for hardware. – The largest proportion of civil costs seems to be associated with construction of concrete tanks for these systems[8].
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<td>CAPEX comparison for STP installations with cost curves</td>
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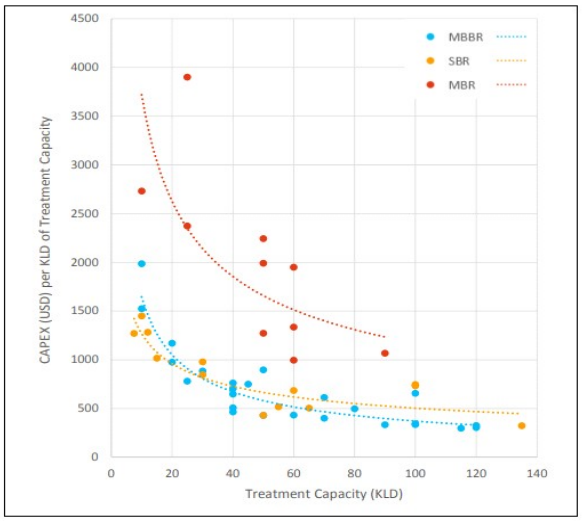

CAPEX cost-curve formulas based on data set.

STP Type	CAPEX (USD/KLD Capacity)
MBBR	$y = 7309.1x^{-0.648}$ ($R^2 = 0.8137$)
SBR	$y = 3189.2x^{-0.401}$ ($R^2 = 0.6995$)
MBR	$y = 11826x^{-0.502}$ ($R^2 = 0.5279$)

CAPEX examples for each STP type using costs curves.

STP Type	Capacity (KLD)**	CAPEX (USD) per KLD	CAPEX (USD) Total
MBBR	20	$1,049	$20,981
SBR	20	$959	$19,187
MBR	20	$2,629	$52,572

***20KLD, or 20 m3/day, corresponds to a population equivalent of 100.*

MBBR and SBR have similar CAPEX across treatment capacities.[8]
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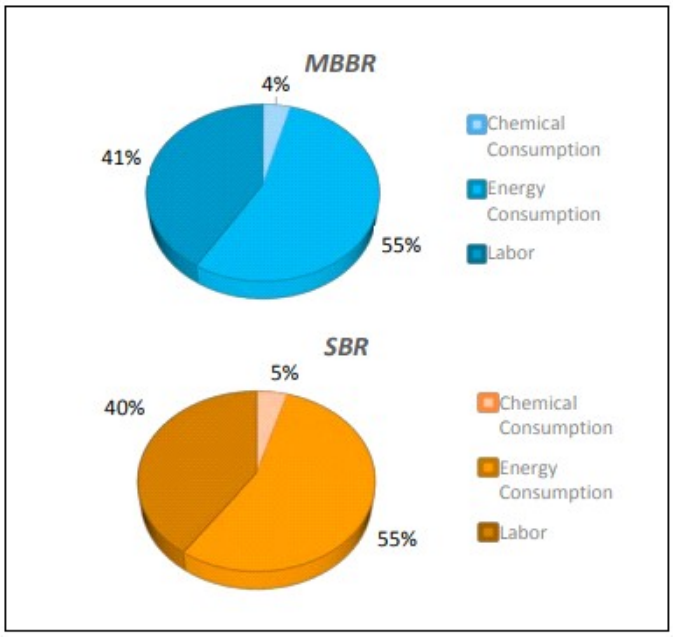
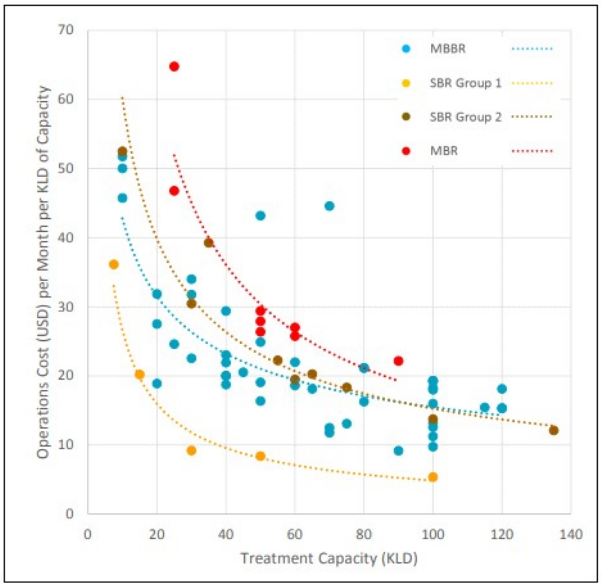
Operations cost (OPEX) defined **** **Average breakouts for STP installations** Chemical vs. Energy vs. Labor Costs	 As seen above OPEX is almost same for MBBR and SBR, **with OPEX labor cost lesser for SBR**[8]
Operations cost comparisons for STP installations	 **Operations costs lowest for energy-efficient SBRs** [8]

Notes on CAPEX cost-curve calculations[8]

- CAPEX includes both hardware costs and civil costs (when applicable).
- Data excludes MBBR and SBR installations that were reported to include treated-sewage storage tanks— these tanks do not appear to be standard in the configuration of MBBR and SBR systems and seem to add significantly to CAPEX.

- CAPEX values for each installation were adjusted to 2016 Rupees (to take into account for inflation). Adjustments were made using the Indian Producer Price Index for Chemical Plant Equipment.
- The exchange rate used was 0.015 Rupees to 1 USD.
- "Noise" in CAPEX (and operations cost) data may be related several factors, including the following: – Variations in system configurations for the same STP type (i.e., different components and/or subsystems are sometimes used for the same system type) – Variations in supplier pricing – Incomplete/inaccurate reporting of costs.

****Operations Costs Defined**

- Operations Cost = Chemical Cost + Energy Cost + Labor Cost.
- Chemical Cost = Cost associated with the sodium-hypochlorite (chlorine bleach) treatment stage.
- Energy Cost = Cost associated with operation of electromechanical components including pumps, blowers, and instrumentation.
- Labour Cost = Cost associated with operating the STP, including starting/stopping pumps and lab analysis. Twenty-four-hour monitoring is required for fully manual systems.
- Operations costs do not include maintenance costs (Operations Costs + Maintenance Cost = OPEX). Maintenance costs may include in-house maintenance of pumps, blowers, microprocessor controllers, and/or compressors, as well as replacement costs for filters (when applicable) or membranes (in the case of MBRs).

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Comparison with Typical example for MBBR and SBR[8]

A 50KLD capacity MBBR plant at Madurai, Tamil Nadu has been compared with a 55MLD SBR plant installed at Bengaluru, Karnataka and is given tabulated in **Figure 6** & **Figure 7**.

Feature	Description	Feature	Description
Type of End User Served	Commercial	System Hardware Components	Bar screen, Equalization tank, Denitrification tank, MBBR reactor, Clarifier, Sodium hypochlorite dosing, Dual media filter (DMF--sand + anthracite), Activated carbon filter (ACF), Ultrafiltration, Basket centrifuge
System Location	Madurai, Tamil Nadu	CAPEX (design, supply, installation, commissioning)	$44,850 (Rs. 2450000)
Installation Year	2015	CAPEX Breakdown	$37,375 (Rs. 2450000) for Hardware + $7,475 (Rs. 490000) for Civil Primary treatment (screen/equalization tank, pumps): $5,797 (Rs. 380000), Secondary treatment (MBBR, blowers): $25,323 (Rs. 1660000), Tertiary treatment (DMF, ACF): $3,814 (Rs. 250000) + $9,916 (Rs. 650000) for UF
Anticipated System Lifetime	10 years		
Treatment Capacity	50 KLD		
Treatment Levels	BOD: 10 mg/L, COD: 20 mg/L, TSS: Nil, MPN: E-Coli log 6 removal	Operations Cost (Monthly)	Total:$2,161 (Rs. 144000) Chemical consumption: $113 (Rs. 7500), Energy consumption: $698 (Rs. 46500), Labor cost: $1,350 (Rs. 90000)
System Output: Effluent Volume	30 KLD		
System Output: Sludge Volume	1.1 m^3/day	Energy Requirements	250 KWh per day
Footprint of System (Area)	123 m^2	Additional Information	All tanks including MBBR are civil structures.

Figure 6: Details of 50 KLD-capacity MBBR system in Madurai, Tamil Nadu[8]

Feature	Description	Feature	Description
Type of End User Served	Educational Institute	System Hardware Components	Bar screen, Equalization tank, SBR reactor (with decanting valve), Sodium Hypochlorite dosing, Pressure sand filter, Activated carbon filter, Filter press
System Location	Bengaluru, Karnataka	CAPEX (design, supply, installation, commissioning)	$28,500 (Rs. 1900000)
Installation Year	2016	CAPEX Breakdown	$19,500 (Rs. 1300000) for Hardware + $9,000 (Rs. 600000) for Civil
Anticipated System Lifetime	15 years		
Treatment Capacity	55 KLD	Operations Cost (Monthly)	Total: $1,225 (Rs. 81650) Chemical consumption: $25 (Rs. 1650), Energy consumption: $900 (Rs. 60000), Labor: $300 (Rs. 20000)
Treatment Levels	BOD: <10 mg/L, COD: <100 mg/L, TSS: <10 mg/L, MPN: < 100/ml		
System Output: Effluent Volume	54 KLD	Energy Requirements	350 KWh per day
System Output: Sludge Volume	0.25-0.3 m^3 with 1% consistency		
Footprint of System (Area)	89 m^2	Additional Information	.

Figure 7: 55 KLD-capacity SBR system in Bengaluru, Karnataka[8]

Based on the findings, advantages, and disadvantages of MBBR and SBR plant reported by STeP[8] is given in **Table 2** and **Table 3**.

Table 2: Advantage and Disadvantages of MBBR technology reported by STeP[8]

Advantage of MBBR	Disadvantage of MBBR
• Can operate at high organic loads • Is less prone to hydraulic overloading than other STP types • Is relatively easy to operate—does not require advanced skills for operation/maintenance • Requires a relatively small footprint • Eliminates issues with media becoming clogged (compared to fixed film systems)	• Is a manually operated process • Generally, offers a lower level of wastewater treatment

Table 3: Advantage and Disadvantages of SBR technology reported by STeP[8]

Advantage of SBR	Disadvantage of SBR
• Allows for react, settle, and decant phases to occur within the same tank • Does not require secondary clarifiers or return-activated sludge (RAS) lines • Generally, has lower capital costs • Is an automated process • Requires a relatively small footprint	• Can face issues with high peak flows—unless already factored into design • Requires higher skill level for maintenance, due to more complex system setup (automation/instrumentation)

Conclusion of GC based on STeP findings

Based on the findings of the parametric analysis undertaken as related to function of total treatment capacity, Sludge output as a function of total treatment capacity, Sludge output per KLD of treatment capacity, Energy requirements as a function of total treatment, Capital costs (CAPEX),Operational cost (OPEX), SBR technology is found to be a better option for STPs .

3.1.2 Case study 2 : Consortium of 7 Indian Institute of Technology (IIT)[2] report

A Consortium of 7 Indian Institute of Technology (IIT)[2] was given the responsibility of preparing Ganga River Basin: Environment Management Plan (GRB EMP) by the Ministry of Environment and Forests (MoEF&CC), GOI, New Delhi. Selection of Appropriate sewage treatment Technology, Cost of treatment and land requirement for ganga basin were also the deliverables assigned to the consortium.

Important considerations for selection of sewage treatment processes was tabulated as given in Figure 8.

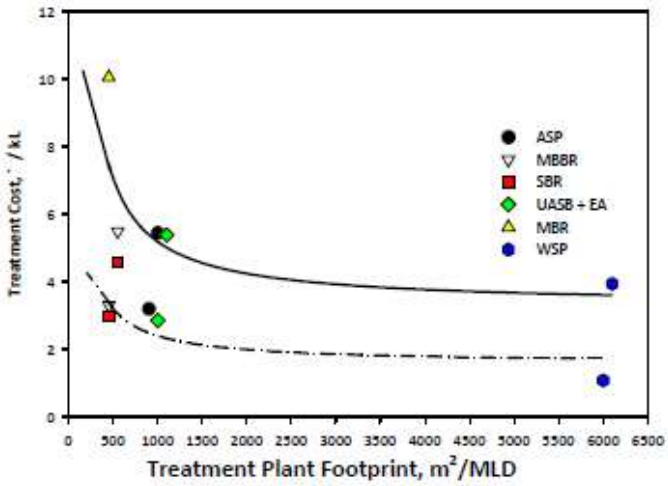
Consideration	Goal
Quality of Treated Sewage	Production of treated water of stipulated quality without interruption
Power requirement	Reduce energy consumption
Land required	Minimize land requirement
Capital Cost of Plant	Optimum utilization of capital
Operation & Maintenance costs	Lower recurring expenditure
Maintenance requirement	Simple and reliable
Operator attention	Easy to understand procedures
Reliability	Consistent delivery of treated sewage
Resource Recovery	Production of quality water and manure
Load Fluctuations	Withstand variations in organic and hydraulic loads

Figure 8: Parameters considered for selection of STP technology[2]

Cost of Treatment and Land Requirement

Comprehensive analysis of capital cost, operation and maintenance costs, reinvestment, cost, energy cost and land requirement based on data obtained from various STPs in the Ganga river basin and elsewhere in India was used for the study. This analysis has been summarized in **Table 4** as linkage between the treatment cost (`/KL as in 2010) and the required footprint of the treatment plant in m^2/MLD.

Table 4: Treatment Cost (2010) and Corresponding Plant Footprint for various Secondary Treatment Options[2]

Parameter	Findings
Comprehensive analysis of capital cost, operation and maintenance costs, reinvestment cost, energy cost and land requirement based on data obtained from various STPs in the Ganga river basin and elsewhere in India. IIT Consortium study (2010)[2]	

The findings reported was that for a particular effluent quality, the technological option with higher treatment cost will generally require a lower treatment plan footprint and vice versa.

Comparison of treatment cost[2]

A comparison of treatment costs which includes tertiary treatment for various technologies of sewage treatment plants in India, was undertaken by IIT consortium and is presented in **Table 5 (a-g)**.

Table 5: Comparison of Treatment Costs of Various Technologies

(a) Performance after Secondary and tertiary treatment effluent standards[2]

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+EA[*,b]	MBR[*,a]	WSP[**,b]
Performance after Secondary Treatment						
Effluent BOD, *mg/L*	<20	<30	<10	<20	<5	<40
Effluent SS, *mg/L*	<30	<30	<10	<30	<5	<100
Faecal coliform removal, *log unit*	upto 2<3	upto 2<3	upto 3<4	upto 2<3	upto 5<6	upto 2<3
T-N Removal Efficiency, *%*	10-20	10-20	70-80	10-20	70-80	10-20
Performance After Tertiary Treatment						
Effluent BOD, *mg/L*	<10	<10	<10	<10	<10	<10
Effluent SS, *mg/L*	<5	<5	<5	<5	<5	<5
Effluent NH_3N, *mg/L*	<1	<1	<1	<1	<1	<1
Effluent TP, *mg/L*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Effluent Total Coliforms, *MPN/100 mL*	10	10	10	10	10	10

(b) Comparison of capital cost and land area requirement for different STPs[2]

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+EA[*,b]	MBR[*,a]	WSP[**,b]
Capital cost						
Average Capital Cost (Secondary Treatment), ` *Lacs/MLD*	68.00	68.00	75.00	68.00	300.00	23.00
Average Capital Cost (Tertiary Treatment), ` *Lacs/MLD*	40.00	40.00	40.00	40.00		40.00
Total Capital Cost (Secondary + Tertiary) ` *Lacs/MLD*	**108.00**	**108.00**	**115.00**	**108.00**	**300.00**	**63.00**
Civil Works, *% of total capital costs*	60.00	40.00	30.00	65.00	20.00	90.00
E & M Works, *% of total capital costs*	40.00	60.00	70.00	35.00	80.00	10.00
Area Requirements						
Average Area, m^2 *per MLD* *Secondary Treatment + Secondary Sludge Handling*	900.00	450.00	450.00	1000.00	450.00	6000.00
Average Area, m^2 *per MLD* *Tertiary Treatment + Tertiary Sludge Handling*	100.00	100.00	100.00	100.00	0.00	100.00
Total Area, m^2 *per MLD* *Secondary + Tertiary Treatment*	**1000.00**	**550.00**	**550.00**	**1100.00**	**450.00**	**6100.00**

(c) Comparison of operation and maintenance cost(Energy Cost) for different STPs[2]

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+ASP[*,b]	MBR[*,a]	WSP[**,b]
Operation & Maintenance Costs						
Energy Costs (Per MLD)						
Avg. Technology Power Requirement, *kWh/d/MLD* *Secondary Treatment + Secondary Sludge Handling*	180.00	220.00	150.00	120.00	300.00	2.00
Avg. Technology Power Requirement, *kWh/d/MLD* *Tertiary Treatment + Tertiary Sludge Handling*	1.00	1.00	1.00	1.00	1.00	1.00
Avg. Non-Technology Power Req., *kWh/d/MLD* *Secondary Treatment*	4.50	2.50	2.50	4.50	2.50	2.50
Avg. Non-Technology Power Req., *kWh/d /MLD* *Tertiary Treatment*	0.20	0.20	0.20	0.20		0.20
Total Daily Power Requirement (avg.), *kWh/d /MLD*	185.70	223.70	153.70	125.70	302.50	5.70
Daily Power Cost (@` 6.0 per KWh), ` */MLD/h* *(including Standby power cost)*	46.43	55.93	38.43	31.43	75.93	1.43
Yearly Power Cost, ` *lacs pa/MLD*	**4.07**	**4.90**	**3.37**	**2.75**	**6.65**	**0.49**

(d) Comparison of operation and maintenance cost (Repair cost) for different STPs[2]

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+ASP[*,b]	MBR[*,a]	WSP[**,b]
Operation & Maintenance Costs						
Repairs cost (Per MLD)						
Civil Works per Annum, *as % of Civil Works Cost*	3.00	3.00	3.00	3.00		3.00
E&M Works, *as % of E&M Works Cost*	1.00	1.00	1.00	1.00		1.00
Civil Works Maintenance, ` *Lacs pa /MLD*	1.94	1.30	1.04	2.11		1.70
E & M Works Maintenance, ` *Lacs pa/MLD*	0.43	0.65	0.81	0.38		0.06
Annual repairs costs, ` *Lacs pa/MLD*	2.38	1.94	1.84	2.48		1.76

(e) Comparison of operation and maintenance cost (Chemical cost) for different STPs[2]

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+ASP[*,b]	MBR[*,a]	WSP[**,b]
Operation & Maintenance Costs						
Chemical Cost (Per MLD)						
Recurring Chemical/Polymer Costs, ` *Lacs pa/MLD* *Secondary Treatment*	0.40	0.40	0.40	0.40		0.00
Recurring Chemical, ` *Lacs pa/MLD* *(Alum, Chlorine, Polymer) Costs, Tertiary Treatment*	4.00	4.00	2.00	5.00		6.00
Other Chemical Cost, ` *Lacs pa/MLD*	0.90	0.90	0.90	0.90		1.20
Total Chemical Cost, ` *Lacs pa/MLD*	5.30	5.30	3.30	6.30		7.20

(f) Comparison of operation and maintenance cost (Manpower cost) for different STPs[2]

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+ASP[*,b]	MBR[*,a]	WSP[**,b]
Operation & Maintenance Costs Manpower Cost (Assuming 50 MLD Plant)						
Manager, ` pa (1 No.)	3.60	3.60	3.60	3.60		3.60
Chemist/Engineer, ` *pa (1 No.)*	3.60	3.60	3.60	3.60		3.60
Operators, ` *Pa (@ ` 12000 pm)*	8.64	5.76	4.32	8.64		4.32
Skilled technicians, ` *pa (@ ` 10000 pm)*	7.20	4.80	3.60	7.20		1.20
Unskilled personnel, ` *pa (@ ` 7000 pm)*	5.04	2.88	2.16	5.04		8.64
Total Salary Costs, ` *Lacs pa*	28.08	20.64	17.28	28.08		21.36
Benefits (50% of total salary), ` *Lacs pa*	14.04	10.32	8.64	14.04		10.68
Salary + Benefits, ` *Lacs pa*	42.12	30.96	25.92	42.12		32.04
Total annual O&M costs, ` *Lacs pa*	629.26	638.11	451.22	618.96	832.55	504.86

(g) : Comparison of treatment cost till tertiary and Secondary treatment level[2].

Assessment Parameter/Technology	ASP[*,a]	MBBR[*,c]	SBR[*,a]	UASB+EA[*,b]	MBR[*,a]	WSP[**,b]
NPV (2010) of Capital + O&M Cost for 15 years, ` *Lacs*	14838.92	14971.67	12518.32	14684.42	27488.27	10722.96
Present (2010) Treatment Cost, paisa/L	0.54	0.55	0.46	0.54	1.00	0.39
Average Capital Cost, `. Lacs/MLD *upto Secondary Treatment*	68.00	68.00	75.00	68.00		23.00
Yearly Power Cost, ` *lacs pa/MLD* *upto Secondary Treatment*	4.04	4.87	3.34	2.73		0.10
Annual Repairs Cost, ` *Lacs pa/MLD* *upto Secondary Treatment*	1.50	1.22	1.16	1.56		1.11
Annual Chemical Cost, `*Lacs pa/MLD* *upto Secondary Treatment*	0.85	0.85	0.85	0.85		0.60
Manpower Cost, ` *Lacs pa* *for 50 mld plant upto secondary treatment*	33.70	24.77	20.74	33.70		25.63
Total Annual O&M Costs, ` *Lacs pa* *upto Secondary Treatment*	353.02	372.11	288.15	290.72		116.09
NPV (2010) of Capital + O&M Cost for 15 years, ` *Lacs* *upto Secondary Treatment*	8695.35	8981.58	8072.24	7760.85		2891.39
Present (2010) Treatment Cost, *paisa / L* *upto Secondary Treatment*	0.32	0.33	0.29	0.28		0.11

Based on the findings, the advantages and disadvantages of MBBR and SBR plant reported by IIT consortium[2] is given in **Table 6** and **Table 7**.

Table 6: Merits of MBBR and SBR technology as reported by IIT report[2]

Merits MBBR[2]	Merits SBR[2]
1. Needs less space since there is no primary clarifier 2. Detention period in reactor is generally 4-5 h.	1. Excellent effluent quality 2. Smaller footprint because of absence of primary, secondary clarifiers and digester 3. Recent track record available in large applications in India also Biological nutrient (N&P) removal 4. High degree of coliform removal Less chlorine dosing required for post disinfection 5. Ability to withstand hydraulic and organic shock loads

Table 7: Demerits of MBBR and SBR technology as reported by IIT report[2]

Demerits MBBR[2]	Demerits SBR[2]
1. High operating cost due to large power requirements 2. The plastic media is patented item and is not available in the open market, leading to single supplier conditions which limit or deny price competition. 3. In large plant, media quantity is very high, and it requires long shut down period for plant maintenance 4. Not much experience available and reported with larger capacity plants (>1.5 MLD) 5. Due to very less detention time and other engineering factors, functional MBBR in India do not produce acceptable quality effluent. 6. Skilled operators needed. 7. No energy production. 8. Effluent quality not up to the mark in India. 9. Much less nutrient removal. 10. Designed criteria not well established.	1. Comparatively high energy consumption 2. To achieve high efficiency, complete automation is required 3. Highly skilled operators needed 4. No energy production 5. Uninterrupted power supply required

Conclusion of GC based on findings

Based on the parametric analysis related to Secondary and tertiary treatment effluent standards, capital cost and land area requirement, operation, and maintenance cost (Energy, Repair, Chemical, Manpower cost) given in **Table 5 (a-g)** undertaken till the tertiary level by the consortium of 7 IITs **it is seen that SBR technology is better option than MBBR**.

The treatment cost brought down to the net present worth (2010) the year the study was undertaken till the secondary and tertiary level clearly indicate that SBR is worth the choice.

3.1.3 Case Study 3: Yamuna Pollution control board (YPCB)(2013)[9]

Central Pollution Control Board (CPCB) undertook the monitoring of sewage treatment plants installed in different parts of India which were funded by Ministry of Environment and Forest (MoEF&CC), Govt of India. The performance evaluation of different technologies was brought out in the report titled "Performance evaluation of Sewage treatment plants in India funded under NRCD" (2013). This was undertaken pursuant to the follow up action of parliamentary standing committee note[9].

Various parameters have been analyzed for different STP technology options and is given in **Table 8(a-f)**[9].

Table 8: Analysis of various parameters of STP technologies[9]

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(a) Overall effluent standards for different STP technology options[9]

Assessment Parameter/Technology	ASP	MBBR	SBR	UASB+ASP	MBR	WSP
Overall HRT. (Through the entire plant)	**16-20 h**	**8-10 h**	**16-18 h**	**16-18 h**	**8-12 h**	**8-15 h**
Performance parameters						
Effluent BOD, mg/L	<20	<30	<10	<20	<5	<40
Effluent SS mg/L	<30	<30	<20	<30	<5	<100
Faecal Coliform, log unit	upto 3<4	upto 2<3	upto 3<4	upto 2<3	upto 5<6	upto 2<3
T-N Removal Efficiency %	10-20	10-20	70-80	10-20	70-80	10-20

(b) Average capital cost for different STP technology options[9]

Assessment Parameter/Technology	ASP	MBBR	SBR	UASB+ASP	MBR	WSP
Average Capital Cost, Rs. Lacs/MLD	**80**	**80**	**80**	**80**	**400**	**30**
Civil Works, % of capital costs	60	40	30	65	20	90
E & M works, % of capital costs	40	60	70	35	80	10
Average Aera, Required m^2 / MLD	800	400	400	800	200	6000

(c) Operation and maintenance cost (Energy Cost) for different STP technology[9]

Assessment Parameter/Technology	ASP	MBBR	SBR	UASB+ASP	MBR	WSP
Operation & Maintenance Costs						
Energy Costs						
Avg. Technology Power requirement, kWh/d/MLD	180	200	170	120	300	2
Avg. Non-Technology Power requirement, kWh/d/MLD	4	2.5	2.5	4.5	2.5	2.5
Total Daily Power Requirement, kWh/d/MLD(avg)	184	202.5	172.5	124.5	302.5	4.5
Daily Power Cost (@ Rs. 4.0/kWhr), Rs./MLD/hr	31	34	29	21	50	0.75
Yearly Power Cost, Rs. Lacs PA/MLD	2.65	2.92	2.48	1.79	4.36	0.06

(d) Operation and maintenance (repair cost) for different STP technology[9]

Assessment Parameter/Technology	ASP	MBBR	SBR	UASB+ASP	MBR	WSP
Operation & Maintenance Costs						
Repair cost						
Civil works per annum, as % of civil works cost	1	1	1	2		1
E&M works, as % of E & M works cost	3	3	2.5	3.5		3
Civil works maintenance, Rs. Lacs PA/MLD	0.8	0.8	0.34	1.6		0.3
E & M works Maintenance, Rs. Lacs	2.4	2.4	2	2.8		0.9
Annual repairs costs, Rs. Lacs	3.2	3.2	2.34	4.4		1.2

(e) Operation and maintenance (Chemical and manpower cost) for different STP technology[9]

Assessment Parameter/Technology	ASP	MBBR	SBR	UASB+ASP	MBR	WSP
Operation & Maintenance Costs						
Recurring Cost, (Chemicals etc), Rs. Lacs PA/MLD	**0.3**	**0.4**	**0.2**	**0.5**		**0.2**
Manpower O & M cost						
Manager, Rs. Lacs PA	4.8	4.8	4.8	4.8		4.8
Chemist/Engineer, Rs. Lacs PA	2.4	2.4	2.4	2.4		2.4
Operators, Rs. lac PA	1.44	1.44	1.44	1.44		1.44
Skilled Technicians, Rs. lacs PA	1.08	1.08	1.08	1.08		1.08
Unskilled personal, Rs. PA	0.96	0.96	0.96	0.96		0.96
Manpower Reqd. & their costs, Rs. lacs PA/MLD	9.96	8.12	8.03	9.96	50.00	5.88
Total annual O & M costs, Rs. lacs PA/MLD	16.11	14.64	13.05	16.65	50.00	7.67

(f) Life Cycle cost for different STP technology options[9]

Assessment Parameter/Technology	ASP	MBBR	SBR	UASB+ASP	MBR	WSP
Avg. Land Cost Assumed, Rs. lacs/m^2	0.01	0.01	0.01	0.01	0.01	0.01
Unit Land Cost, Rs. Lacs/MLD	8.00	4.00	4.00	8.00	2.00	60.00
Unit Capital Cost including land cost, Rs. lacs/MLD	88.00	84.00	84.00	88.00	402.00	90.00
Rate of compound interest, (adopted),% per year	10.00	10.00	10.00	10.00	10.00	10.00
Treatment cost, Rs. /KL	7.30	6.89	6.46	7.44	28.10	3.18
Unit life cycle cost for 15 years, Rs. lacs/MLD	210.53	195.35	183.27	214.66	214.66	148.3295

Decision Matrix[9]

A decision matrix has been formulated with matrix attributes ranked as Low, Medium, High, and Very High recognizing that differences between processes are relative, and often, the result of commonly accepted observations is extracted and given as **Table 9**.

Table 9: Decision matrix as per the findings of CPCB (2013)[9]

Criteria	ASP	UASB+ASP	SBR	MBBR	MBR	WSP
Performance in Terms of Quality of Treated Sewage						
Potential of Meeting the RAPs TSS, BOD, and COD Discharge Standards	+++	+++	++++	++++	++++	++
Potential of Total / Faecal Coliform Removal	+++	+++	++++	++++	++++	++++
Potential of DO in Effluent	+++	+++	+++	+++	+++	+++
Potential for Low Initial/Immediate Oxygen Demand	++++	++++	++++	++++	++++	++++
Potential for Nitrogen Removal (Nitrification-Denitrification)	+	+	++++	++	++	+
Potential for Phosphorous Removal	+	+	++++	++	++	+
Performance Reliability	++++	++	++	+++	++++	++
Impact of Effluent Discharge						
Potential of No Adverse Impact on Land	++	++	+++	+++	++++	+++
Potential of No Adverse Impact on Surface Waters	+++	+++	+++	+++	++++	+++
Criteria	ASP	UASB+ASP	SBR	MBBR	MBR	WSP
Potential of No Adverse Impact on Ground Waters	+++	+++	+++	+++	++++	++
Potential for Economically Viable Resource Generation						
Manure / Soil Conditioner	++	++	++	++	+	+
Fuel	+++	++	+	+	+	+
Economically Viable Electricity Generation/Energy Recovery	++++	+++	+	+	+	+
Food	++	+	+	+	+	+
Impact of STP						
Potential of No Adverse Impacts on Health of STP Staff/Locals	++	+	+++	+++	+++	++
Potential of No Adverse Impacts on Surrounding Building/Properties	+++	++	+++	+++	+++	++++
Potential of Low Energy Requirement	++	++	++	++	+	++++
Potential of Low Land Requirement	+++	++	+++	+++	++++	+
Potential of Low Capital Cost	++	++	++	++	+	++++
Potential of Low Recurring Cost	++	++	++	++	+	+++
Potential of Low Reinvestment Cost	++	++	++	++	+	+++
Potential of Low Level of Skill in Operation	+++	++	+++	+	+	++++
Potential of Low Level of Skill in Maintenance	+++	++++	+++	++	+	++++
Track Record	++++	+++	+++	+	+	++
Typical Capacity Range, MLD	All flows	All flows	All flows	Smaller	Smaller	All flows

+ : Low; ++ : Medium; +++ : High; ++++ : Very High

ASP: Activated Sludge Process **UASB: Upflow Anaerobic Sludge Blanket**
WSP: Waste Stablization Pond **MBBR: Moving Bed Biological Reactor** **EA: Extended Aeration**
SBR: Sequential Batch Reactor **MBR: Membrane Bio Reactor**

Conclusion of GC based on findings

The findings of YPCB authority[9] based on the parametric analysis undertaken related to output effluent standards, Capex and Opex cost indicate that SBR technology as a better option to MBBR.

The life cycle studied for SBR and MBBR indicate that the LCC is lower for SBR as compared to MBBR.

The findings indicate that SBR technology has advantage over MBBR.

4 Comparison of SBR and MBBR: Literature review

The literature review on comparison of SBR and MBBR STP technology have been undertaken by many researchers and the findings are given in **Table 10**.

Table 10: Comparison of SBR and MBBR STP technology: Researchers and findings

Year	Reference	Findings
Feb 2003 reliability	[10]Isabel Comette. "Comparison of the performance of MBBR and SBR systems for the treatment of anaerobic reactor biowaste effluent" Water Science and technology, 47(12),155-161.	1. Both MBBR and SBR systems presented a good carbon removal for this specific wastewater. 2. The Chemical Oxygen Demand (COD) total removal was 53% for MBBR and 55% for SBR. 3. MBBR offered a higher dissolved COD removal (40%) than SBR (30%). In both systems a complete nitrification was obtained.
2012 Industrial waste treatment efficiency	[11]SunilS.Mane., "Sequential batch reactor-Application to waste water-A review "Proceeding of International conference SWRDM 2012, Dept of Civil Engineering,Walchand college of Engineering	The SBR is one of the potential options for treatment of industrial wastewater. As per review taken in this paper of various authors removal efficiency of SBR for COD, BOD, Total nitrogen(TN), Total Phosphorous(TP) ,total Suspended solids (TSS) etc. is more satisfactory compared to conventional methods.

Year	Reference	Findings
2012	[12]Malakahmed.A.,etal,"Application of Sequential batch reactor (SBR) for treatment of frefinery waster water containing nickel" Malaysia, Water pollution XI 403,WIT transactions on ecology and The Environment Vol164, 2012 WIT press ISSN1743-3541	1. SBR system requires small space since no clarifiers are required 2. SBR has shown successful performance of COD removal efficiency ranging from 70% - 90% and nickel removal efficiency are found to 79.2% in refinery wastewater. SBR is a suitable system for heavy metals removal i.e. nickel.
Nov 2014 Efficiency	[13]Devendra Dohare., etal "Biological Treatment of Wastewater Using Activated Sludge Process and Sequential Batch Reactor Process - A Review", International Journal of Engineering Sciences & research Technology (IJESRT), 3 (11) (2014).	1. SBR system has higher oxygen dissolving capacity higher 2. Higher Fecal coliform removal efficiencies with less cost and space. 3. SBR system provides flexibility for future expansion. 4. The effluent quality is better in case of SBR system and hence helps in maintaining satisfactory quality of water body in which effluent is being discharged. **5. Higher overall efficiencies with lesser cost and space requirement of SBR process provides itself the maximum probability in selection of technology for biological treatment of wastewater treatment.**
Nov 2016	[14]Yawar Hayat wani., etal., A comparison of two different technologies of sewage treatment plants working in Srinagar, Kashmir, International Journal of Engineering Research, and science & technology, Vol5, no4 (2016)	The SBR technology gave the highest values of percentage removal of COD, total phosphate, ammonia nitrogen and ortho-phosphate proving to be a better technology.
April 2017 LCC, efficiency	[15]Gautam.S.etal., Cost effective treatment technology for small size treatment plants in India., Journal of scientific & industrial research, Vol76 (2017)	1. In terms of the overall investment including initial investment and O&M for effective life of STP, SBR is found to be the most economical.

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Year	Reference	Findings
		2. Treatment quality of effluent SBR is superior to the rest of the variants. 3. SBR is recommended as the most cost-effective technology for the biological treatment of sewage in India.
Sept 2018 Efficiency LCC	[16]Saurabh Singh etal., "Life cycle cost assessment of different sewage treatment technologies: A case study," Journal of Indian water works association, Vol1, No3 (2018)	1. Life cycle cost over a 20 yr. period studied brought out that LCC for SBR plants are lesser than MBBR 2. Treated effluent quality with respect to BOD removal is better in SBR plants than MBBR. 3. Land requirement for SBR and MBBR is comparable Electricity requirement for MBBR is high compared to SBR.
Sept 2018 Financial	[17]Ayusha mondlo., etal., "Comparative study of different technologies involved in small sewage treatment plants" International Journal of research in Engineering, Science and management, Vol.1,issue 9 Sept 2018	In terms of overall investment, area and removal efficiency it has been concluded that SBR is the most economical and efficient technologies for small sewage treatment plant followed by MBBR.
2019	[18]Uzma Showkat., etal., Study on the efficiency of Sequential batch reactor (SBR) based sewage treatment plant., Applied water services (2019) 9.2	Study revealed that SBR based treatment significantly removed the objectionable physiochemical properties of waste water prior to discharge into water bodies**.**
Mar 2019	[19] Swati Agnihotri., "Performance evaluation of Sewage treatment plant based on SBR and MBBR technology" International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES), Volume 5, Issue 03	Overall view it can be seen from the removal efficiency that SBR technology has a higher efficiency to remove BOD and COD than MBBR.
May 2019	[20]Nadeem.A,Khan., (etal) Review on SBR (Sequential batch reactor) treatments technology of Industrial waste water, http//www.researchgate.net/publication	1. The availability of computer science has currently created the option of a SBR method providing better control and leads to waste matter treatment.

Year	Reference	Findings
	Water pollution and health, page 153-161	2. The flexibility of a SBR within the treatment of variable flows, minimum operator interaction needed, option for hypoxia or anaerobic conditions within the same tank, smart element contact with microorganisms and substrate and smart removal efficiencies. 3. Environmental protection Agency studied SBR operation and identified that the SBR square measure is more promising the other STP options.
Year 2020	[21]Omar Alagha., etal, "Suitability of SBR for waste water treatment and Reuse: Pilot scale reactor operated in different Axoxic conditions"International journal of Environmental research and public health, Iinternational Journal of research in Engineering, Science and management, 2020,17,1617 www.mdpi,com/journal/ijerph	1. SBR system function was better for BOD, COD,TN and PO_4^{3-}treatement efficiencies . 2. Tested and proposed SBR process is simple, efficient, flexible, cost effective and successful technology for the treatment of municipal waste waters. 3. SBR process can be employed in remote areas in arid regions and reuse of treated wastewater for sustainable water management.

5 Financial Sustainability of Sewerage and Sewage Treatment Services

Most of the urban local bodies in India are financially weak for various reasons and have not been able to discharge their obligatory functions satisfactorily. The subject of sanitation including sewerage and sewage treatment has received low priority. As per the findings of a study conducted by NIUA, the sanitation services either generate no revenue or the revenue generated is not very significant[23].

One of the major problems with wastewater treatment methods is that none of the available technologies have a direct economic return due to the high capital and O&M cost[26].

As the current sewage tariff levels are too low across ULBs in India and do not reflect the true economic cost of providing sewage collection and treatment and disposal services, increasing tariffs to a level to

ensure that the sewerage system generates sufficient revenues to meet its capital and O&M costs and becomes self-sustainable may not be possible in one stroke[23].

A long-term monitoring strategy is required to study the effectiveness of the STPs executed in depth[24].

This could be achieved by increasing tariffs gradually over a period of time. It is suggested that in the initial years, tariffs should be set to ensure that they recover at least the O&M costs of the sewerage system[23].

Once operational efficiency is demonstrated with the infusion of private sector participation, the user acceptability of a tariff increase by ULBs would also improve. The tariffs can then be increased to recover the capital costs also in addition to the O&M[23].

In cases of PPP, the concession itself should be structured to accommodate a rising tariff scenario with obligations from the private partner to increase service levels as well as undertakings by ULBs to increase tariff accordingly at a later date[23].

[22]It is important to state that decentralized WWTP for individual household prove to be uneconomical because of high power consumption with respect to lesser design capacity.

Based on personal interview, it was observed that middle or high-income group of people were aware about the environmental benefits of installing decentralized wastewater treatment system and were even ready to incur additional cost. But it is impractical to assume the same for lower income group people[22].

WWTP can never be a revenue generating model as the product is treated water and a small fraction of sludge. It is not possible to create a business out of it. But in the long run recycling and reusing wastewater can solve water issues to a great extent. Therefore, the government must encourage pilot projects on decentralized approach of wastewater treatment so that low-cost technologies are developed to treat wastewater at economical rate[22].

6 Regulatory Determinants

The degree of treatment for the out effluents is being upgraded periodically by Central pollution control Board (CPCB) along with the various State Pollution Control Boards.

It was brought to the notice of the National Green Tribunal that the effluent standards as laid down in the notification dated 13-12-2017 of the Environment (protection) Amendment rules 2017 of MoEF&CC were diluted to the earlier effluent standards[24].

It was also pleaded by the Applicant before the National Green Tribunal that the existing standards were not being properly adhered, and the untreated or partially treated sewage was becoming a major source of pollution in the country and intervention of the Green Tribunal was sought.

Considering that the relaxed standards will pollute the water bodies further, the National Green Tribunal intervened in the matter. Accordingly, the Tribunal was constituted of an expert committee comprising of nominees from IIT Roorkee, NEERI and CPCB[24].

Based on the recommendation of the expert committee the National Green Tribunal fixed the Regulatory determinants for the effluents standards to be discharged into water bodies which is extracted and given in **Figure 9**[24] and the judgement is given as **Annexure 1**.

Sl. No.	Industry	Parameters	Standards (Applicable to all mode of disposal)			
1	2	3	4			
	Sewage Treatment Plants (STPs)		Mega and Metropolitan Cities	Class I Cities	Others	Deep Marine Outfall
		pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.0
		Bio-Chemical Oxygen Demand (BOD)	10	20	30	30
		Total Suspended Solids (TSS)	20	30	50	50
		Chemical Oxygen Demand (COD)	50	100	150	150
		Nitrogen-Total	10	15	-	-
		Phosphorus-Total(For Discharge into Ponds, Lakes)	1.0	1.0	1.0	
		Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100 ml	Desireable-100 Permissible-230	Desireable-230 Permissible-1000	Desireable-1000 Permissible-10,000	Desirable-1000 Permissible-10,000

Note:

(i) Mega-Metropolitan Cities have population more than 1 crore, Metropolitan Cities-Population more than 10 Lakhs and Class-1 Population more than 1 Lakh.

(ii) All value in mg/l except for pH and Fecal Coliform.

(iii) These standards will be applicable for discharge into water bodies as well as for land disposal/applications.

(iv) These Standards shall apply to all new STPs for which construction is yet to be initiated.

(v) The existing/under construction STPs shall achieve these standards within 07 years from the date of notification.

(vi) In case where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100m away from discharge point, then norms for deep sea marine discharge shall be applied.

(vii) Reuse/Recycling of treated effluent shall be encouraged.

(viii) State Pollution Control Boards/Pollution Control Committees may make these norms more stringent taking into account the local conditions.

Figure 9: Regulatory determinants for effluents standards by National Green Tribunal[24]

7 Future opportunities to minimise pollution loads (Aparna Dutta 2015)[25]

- Sequencing Batch reactors (SBRs) have operational flexibility and excellent process control possibilities and are being extensively used for the treatment of wastewater.
- Nowadays the wastewater to be treated are becoming contaminated with newer and more complex pollutants.
- SBR technology has the advantage of including different expanding array of configurations and various operational modification to the existing plants. Hence it is possible to meet the effluents standards which are also getting continuously upgraded.
- With increasing water demand, it has become inevitable to include tertiary treatment units for nutrient removal from wastewater for other conventional STPs including MBBR[25].
- The advantage of SBR technology is that by optimizing the sequence of aerobic, anoxic, and anaerobic phases during different stages of SBR process conventional pollutants like COD, BOD, and suspended solids and pathogens can be treated in an SBR-based treatment plant and the output effluent standard requirement adhered[25].
- The operation of SBR cycle phases is related to time rather than space and also it provides greater degree of flexibility for nutrient removal through alteration of aerobic and mixing regimes to create aerobic and anoxic environment during the React phase of the treatment cycle[25].
- For removal of N and P, an advanced variant UNITANK is used. This configuration possesses additional anaerobic/anoxic compartments with internal recirculation of mixer liquor. UNITANK is more suitable for small to middle -sizes wastewater treatment plants .This has the advantage of being a simple structure, less land occupation, cost efficient and reliable operation, This is popular in many countries like China, Mexico etc., but still to be implemented in India[25].
- A further enhancement to the standard SBR process used in countries like china,US,UK etc and yet to be adopted in India is the **Intermediate Cycle Extended Aeration System** (ICEAS) process[25].
- In this system there is a continuous inflow of the waste water.Variable inflow is handled by a distributor box which distributes flow evenly among all the tanks so as to avoid overloading of a single tank.The ICEAS technology can be replaced into the old unit or a new plant if needed as it requires limted space and enhanced effluent quality[25].
- A variation of SBR is the Sequential Batch Biofilm Reactor (SBBR), which is a combination of suspended and attached Growth (CSAG) system.Due to the excessive head loss and sloughing off risk,and also if the influent has high level of TSS and when excessive microbial growth is expected,the SBBR system are unsuitable and hence not considered fro IURWTS catchment.[25]

8 Population to be served in IURWTS Catchment

A thorough estimate of the population to be served by the treatment system throughout its life period is necessary for the estimation of the quantity of sewage treatment that would require treatment. The total projected population estimated for IURWTS catchment for the year 2051 based on 2011 census is 4.40lakhs. The total sewage load estimated is 31MLD. The IURWTS Catchment has been divided in 6 zones with 4 STPS of capacity 10MLD at Vennala,7 MLD at Muttar, 10 MLD at Elamkulam and 4 MLD at Perandoor totalling to 31 MLD.

SBRs are typically used at flowrates of 5 MGD (19 MLD) or less. The more sophisticated operation required at larger SBR plants tends to discourage the use of these plants for large flowrates[27]. Hence SBR technology can cater to the needs of the catchment as the maximum capacity in IURWTS catchment is not greater than 10 MLD.

9 Environmental conditions including land availability, climate of IURWTS

CPCB standards of the treated effluent are met by SBR technology as per the findings reported and addressed above. The treated effluent is proposed to be discharged into the nearby water bodies and the conditions of the water bodies will be much better than the present condition. At present the excess flow from the soak pits and septic tanks are mostly discharged into the sub drains of the catchment which leads to the main canal and thereby flow to the water bodies in a polluted condition. The provision of an SBR technology will enhance the water quality and the environment of the area.

The STPs are proposed in vacant land without disturbing the existing environment and the location of the STP are such that there are no inhabitants within 50m radius from the STP units. Due to lesser footprint of the SBR systems more area is made available for green belt development.

The area selected for STP are not within the flood zone areas of the catchment and also EIA and CRZ clearance is being obtained before the execution of the project. The design of STP will be flood resilient based on flood plain studies being undertaken.

10 SBR plants in Kochi, Kerala, and cost comparison

From local enquiry over mobile, data was collected on the existing SBR plant with capacity 16.8MLD installed for BPCL, refinery, Kochi, Kerala. The plant was commissioned in the year 2017. Due to security reason no performance evaluation has been undertaken so far and no details are available in the public domain.

The consultants for the project was Engineers India Ltd and the contractor was Paramount constructions. The influent is treated crude water for biological parameters only. This SBR plant is working in conjunction with other sophisticated treatment plant for treating the crude impurities.

The second plant with a capacity of 5 MLD is approved for installation is in in Fort Kochi.

A comparative analysis has been undertaken as regard to the **cost of construction and the area requirement** for a 12 MLD MBBR plant for which AS and TS has been issued (2018) at Kureepuzha at Kollam, Kerala and a 10 MLD SBR plant estimated for IURWTS catchment as given in Table below

Table 11: Comparative analysis of SBR & MBBR

Type of STP	Location	Capacity / Executing Agency	Estimated Cost	Area used as footprint
MBBR	Kureepuzha, Kollam	12MLD (Kerala water Authority)	INR 29,86,90,000 / (2.98cr) (KWA, TS approved estimate 2018)	2.22 acres
SBR	Vennala, Kochi	10MLD (IURWTS Project)	INR 21,00,00,000 (2.1 crores)	1.24 acres

The table above clearly indicates that the cost and land utilised for an MBBR project is much higher than SBR plant.

11 Conclusion and Recommendation

With the increase in population and many kinds of new pollutants to be treated has necessitated the introduction of stringent standards by regulatory authorities for treatment of wastewater. Among the innovative technologies two popular technologies namely SBR and MBBR technology was chosen were considered for comparison. The comparison based on parametric analysis for different treated wastewater output effluent characteristics undertaken by different technological institutes of repute, government organisation, reputed national and international organisation and researchers were reviewed. The CAPEX and area requirement for installation of the STP were reviewed from reported literature. The estimated cost and area requirement for an MBBR plant in execution stage by KWA at Kureepuzha, Kollam and SBR proposed for IURWTS catchment were also compared before concluding on the STP technology to be adopted.

From the review findings reported and based on comparison of MBBR and SBR technology with an ongoing project in Kerala, it is proved that SBR based waste water treatment plants can achieve better treated water quality, requires lesser foot print area, lower investment cost, lower operation complexity, easily adoptability to modification in the installed infrastructure for future development and significant control performance as compared to MBBR technology. Also, SBR technology as discussed in the earlier case studies is well within the regulatory determinants fixed by the National green tribunal and hence recommended.

Several large-scale plants exist around the world with several years of continuous operation. In India also, there are large number of SBR plants are successfully operating both for sewage treatment plant and industrial effluents for nearly a decade. A major list of plants documented by GC in the industrial sector operating in India is given in as **Annexure 2**.

Based on the above findings GC recommends SBR technology for the STPs of IURWTS catchment.

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ANNEXURE 1

Item No. 04 Court No.1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 1069/2018
(M.A. No. 1792/2018, M.A. No. 1793/2018, I.A. No. 150/2019 & I.A. No. 151/2019)

Nitin Shankar Deshpande Applicant(s)

Versus

Union of India &Ors. Respondent(s)

Date of hearing: 30.04.2019

CORAM: HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

For Applicant(s): Ms. Ekta Sikri and Ms. K. Gayatri, Advocates

For Respondent (s): Mr. Rajkumar, Advocate for CPCB
Mr. Gigi C. George, Advocate for MoEF&CC
Mr. Dhruv Mehta, Sr. Advocate with Mr. Ashish Wad and Mr. Sidharth Mahajan, Advocates

ORDER

1. The issue for consideration is effluent discharge standards for STPs as laid down vide Notification dated 13.10.2017 by way of Environment (Protection) Amendment Rules, 2017 against Serial No. 105 of Schedule-I to the Environment (Protection) Rules, 1986.

2. Vide order dated 21.12.2018, this Tribunal noted that untreated or partially treated sewage is a major source of pollution in the country.

The Hon'ble Supreme Court in the case of *Paryavaran Suraksha Samiti & Anr. Vs. Union of India & Ors.*[1] directed taking of steps so that huge gap in sewage generated and treated is bridged.

3. The Tribunal also noted that the proposed standards as per Draft Notification dated 24.11.2015 issued by Ministry of Environment, Forest & Climate Change (MoEF & CC) are sought to be diluted by the impugned Notification as follows:

Sr. No.	**Parameters**	**Old Norms 1986**	**Draft Norms Nov., 15**	**MoEF& CC Notification October 2017**
1.	Biochemical Oxygen Demand (BOD) (mg/l)	<30	<10	<30 and <20 (metro cities)
2.	Chemical Oxygen Demand (COD) (mg/l)	<250	50	No limit
3.	Total Suspended Solids (TSS) (mg/l)	<100	<20	<100 and <50 (metro cities)
4.	Total Nitrogen (mg/l)	<100	<10	No limit
5.	Ammonical Nitrogen (mg/l)	<50	<5	No limit
6.	Total Phosphorus (mg/l)	No limit	No limit	No limit
7.	Fecal Coliform MPN/100 ml	No limit	<100	<1000

4. The Tribunal also noted that the relaxed standards will deteriorate the water quality and degrade the environment and be a retrograde

[1](2017) 5 SCC 326

step. The dilution will also affect the human life and the water quality of the rivers.

5. Accordingly, the Tribunal constituted an Expert Committee comprising the nominees from IIT Kanpur, IIT Roorkee, NEERI and CPCB which was to give its report after examining the best available technologies and best practices and after referring to the Experts study on the subject particularly CPCB Report on "River Stretches for Restoration of Water Quality, 2014-15" and the order of this Tribunal on the subject of polluted river stretches dated 20.09.2018 in Original Application No. 673/2018 in the matter of News item published in *"The Hindu" authored by Shri Jacob Koshy titled "More river stretches are now critically polluted : CPCB"*. The Tribunal also directed stay of operation of the impugned Notification and application of pre-revised standards till further orders.

6. Accordingly, report has been received from CPCB vide e-mail dated 30.04.2019 forwarding the Expert Committee report. The report noted the current status of water quality of rivers which flows in India and the fact that 351 river stretches out of 323 rivers were polluted. There was need for revised standards for BOD and COD with a view to protect the water quality of the rivers/streams. There was also a need for revised standards for TSS, for Nitrogen (Ammonia & Nitrates) and Phosphorus and for Fecal Coliform.

7. The Committee while discussing the need for revised the Standards for BOD and COD observed that:

"Inclusion of COD in sewage discharge certainly offers advantages in terms of early diagnosis on functioning of STPs and thus helps in resorting immediate measures/corrective actions. This is because analysis of COD is completed within 5 Hours as against 5 days at 20°c or 3 days at 27°C for BOD (Sawyer & Mccarty, V. Edition). Moreover, if Government wishes to regulate STPs across the county through online monitoring system in future, inclusion of COD in Discharge Standards will prove beneficial for the reason that COD sensors are quite reliable and readily available in Indian market, however the same is not the case with BOD sensors. Thus, from regulatory point of view also, COD is an important parameter and needs to be included in sewage Discharge Standards."

While discussing the need for revised standards for TSS the Committee has observed that:

" The Microbial quality of wastewater could be linked with the TSS concentration. The larger the Suspended solids, the larger shall be the presence of bacteria, protozoa and viruses. High TSS wastewater cannot be easily disinfected, as the suspended particles "hide" these microorganisms and also react with chemical disinfectants."

Further the committee observed:

"A well designed and operated conventional sewage treatment system such as activated sludge process can meet 20 mg/L effluent TSS discharge standards. Many STPs bases on secondary wastewater treatment all over the globe are able to achieve 10-20mg/L. TSS without any tertiary treatment."

Further with regard to the need for revised standard for Nitrogen (Ammonia & Nitrates) and Phosphorus it has been elaborated by Committee that:

"Nitrogen and phosphorus in all forms are major rate limiting elements essential for the growth of alage and other vegetation in water bodies leading to a state called eutorphication. The greenish color water with large vegetation growth is common sight for not only lakes and ponds but also slow moving rivers.

Eutrophication arises from the oversupply of nutrients (N & P), which leads to overgrowth of plants and alage. Degradation of dead alage and plants by microbes consumes dissoloved oxygen in the water, thereby creating the state of hypoxie.

Eutrophication leads to many problems related to water quality:

- *Large Dissolved oxygen variation leads to fish kills*
- *Filling the water body with dead algae and other vegetation.*
- *Decomposition of dead algae and vegetation at the bottom causing oxygen depletion and further release of nutrient.*
- *Release of algal toxins and odors causing substances make the water unsuitable for human and animal consumption."*

The Committee has also observed that:

Due to the absence of dilution and worsening of our rivers and lakes, it is necessary to move towards nutrients (nitrogen and phosphorus) regulations in water bodies.

The Committee while discussing the revised standards for Fecal Coliforms observed:

"As per "Houses and Household Amenities, Latrine Facility, Census of India - 2011, Registrar General and Commissioner, India" available at http://censusindia.gov.in/ 2011census/hlo/ Data sheet/ India / Latrine. Pdf; Out of 7.9 Crores Urban Households (UHH), nearly 1.7 Crores UHH (i.e. 20 %) lacks adequate sanitation. At the same time more than 5 lakhs villages in the country are now open defecation free (ODF) (https:// sbm.gov.in/sbmdashboard / ODF.aspx.) Although rural parts are covered through sanitary toilets, effluent from septic tanks from newly built 9.2 crores toilets across the country is unavoidable. This may pose very high health risk owing to the fact that "Sanitation" including collection, conveyance and treatment is either absent or inadequate in such areas. ***Relaxing FC pose risk to downstream cities/town/villages that rely on drinking water source on same water body in case of rivers. It appears quite reasonable to say that FC Standards be prescribed to 100 MPN/100 ml. considering its impact on human health in general and readiness of Indian wastewater sector to handle the same (Recommended value of FC in CPHEE0 Manual, 2013 is MPS230/100 mI.).*** *(emphasis added)*

Hence, CPHEE0 2013 recommended the following guidelines for treated sewage discharge into surface water which after some travel may join a ***drinking water source to be used as source of supply for drinking water as given in following Table 5.20***

Table 5.20 Recommended Guidelines for Treated Sewage if Discharged into Surface Water to be used as source of Drinking Water.

Parameter	*MoEF Standards (A)*	*Recommended Values*
BOD, mg/L	*30*	*Less than 10*
SS, mg/L	*100*	*Less than 10*
TN, mg/L	*100*	*Less than 10*
Dissolved P, mg/L	*5*	*Less than 2*
Faecal Coliforms, MPN/100 mL	*Not specified*	*Less than 230*

(A) General Standards, Environmental Protection Rule, 1986 & as authorized by PCB

• *In order to achieve the above values, the treatment process would need to be designed for nutrient removal in addition to the conventional BOD and SS removal. It has also been reported that if the nutrients were removed to the levels mentioned in Table 3.20, then the amount of chlorine required for disinfection would be less at about 5 mg/ l.*

Considering aforementioned analysis, the Chairman CPCB directed all State Pollution Control Boards to make it mandatory for local bodies to set up sewerage systems for treatment and disposal of sewage to meet the prescribed standards ie., pH 6.5-9, BOD (mg/L): Not more than 10, COD (mg/L): Not more than 50, TSS (mg/L) : Not more than 20, NH_4-N (mg/L): Not more than 5, N-total (mg/L) Not more than 10 ,Fecal Coliforms (MPN/100 ml) Less than 230. The details are provided in Annexure 1."

8. The report further mentions that the stringent standards in terms of Draft Notification dated 24.11.2015 are not only economically viable

and technically feasible, the cost will not be significantly high. In this regard, it was observed:

"7.0 ECONOMIC VIABILITY & RESOURCE POSITION

1. For Nitrification (Conversion of ammonia to nitrate), 20-30% larger aeration tanks are required with additional 40-50 % aeration demand. The Total capital and O&M cost of the system increases by 10-20 & 5-10 % respectively.

2. For further removal of nitrate from wastewater, denitrification (conversion of nitrate to Nitrogen gas) is needed by additional anoxic tank in the system. The capital cost further increases by 5-10 %. Nevertheless, denitrification gives 25 % oxygen credit which reduces 25 % aeration requirement.

3. Finally, overall capital and operational cost implications for achieving standards for metropolitan and class-I cities shall be 20-30 %.

4. Typical total unit costs for wastewater treatment based on experience gained in Western Europe and the USA is presented in Figure XX (WHO/ UNEP 1997), The total unit cost for secondary treatment (BOD < 20-30 mg/L, & TSS < 50-100 mg/L) varies between 1.5-2.0 US$/m3, while for tertiary treatment (BOD, TSS & TN < 10 mg/L) it is 2.0-2.5 US$/m3. The additional burden is approximately 25-33 % which matches with Indian experience as well.

5. In recent years, many STPs are constructed based on effluent BOD, TSS & TN < 10 mg/L) and all the well operated and maintained STPs are providing the desired effluent quality. Some of these STPs are monitored by lIT Roorkee in recent years under several research projects and NGT reports. The performance evaluation results for 20 MGD Nilothi STP, 20 MLD Pappan Kalan STP, 15 MLD Delhi Gate STP and 5 MGD Kapashera STP of Delhi submitted to NGT alongwith 3.0 MID

STP, Rishikesh, 1 MGD STP, Delhi, 27 MGD STP, Haridwar etc., monitored under various research projects is attached as Annexure 3.

6. CPCB has also conducted study on technological achievability of proposed standards. Delhi Jal Board has installed and commissioned 04 STPs on advanced treatment technology along with coliform reduction facilities.

7. In addition, the following STPs all over India are producing the desired quality: 1.5 MLD STP, Cubbon Park, Bangalore, 2.0 MLD STP, Pahalgam, 3.5 MLD STP, Tapovan, Rishikesh, 4.0 MLD STP, IIT' Madras, 12.5 MLD STP, Tonca, Goa, 15.0 MLD STP, Gorakhpur, 17.3 MLD STP, Zirakpur, Punjab, 18 MLD STP, Sarai, Haridwar, 20.0 MLD STP, Hyderabad, 20.0 MLD Sangvi, Pune, 30 MLD STP, Hyderabad, 37.5 MLD STP, UP Housing Board, Lucknow, 40.0 MLD Kharadi, Pune, 40.0 MLD STP, Hubbali, Karnataka, 45 MLD STP, Mundhwa, Pune, 50 MLD STP Kalamboli, Navi Mumbai, 54 MLD STP, Noida, 55.0 MLD, Singanpure, Surat, 56 MLD STP, Indirapuram, Ghaziabad, 68.0 MLD STP, Dehradun, 100 MLD STP, Vashi Navi Mumbai, 130 MLD STP, Nagpur, 137 MLD STP, Greater Noida, 245 MLD STP Indore, etc.

8. In practical experience with actual tendered cost, the experience has been quite differing. Many tenders based on old and less stringent quality standards have been awarded at much higher per MLD cost as compared to STPs having more stringent standards. Plus on a long term basis, new technologies have lower life cycle costs. Other factors which are encouraging most corporations and contractors to adopt new technologies are more compact designs, less land requirement, less construction time, better material of construction, less maintenance cost, automation and less dependency on expensive trained manpower to operate plants in remote locations."

9. Accordingly, the Committee further observed that:

"● *The new stringent standards are devised considering the deterioration condition of water bodies and unavailability of adequate dilution water in our water bodies. If not stringent quality standards are not implemented then in the coming future with more population burden on rivers, situation will further deteriorate.*

● *The greatest benefit of these standards is to achieve all purpose non-portable reuse quality effluent. Each STP is to be treated as a source of water for reuse and recycling, helping in mitigating drought/climate change in the country. It will also reduce exploitation of groundwater reserves and dependency on rainfall which has become quite unpredictable in the past few years. Climate change is a reality that should be addressed and adopted for in the coming future. It will go a long way in reducing agricultural dependency on bore well water.*

● *If treatment of wastewater is not carried out with intention of reuse and recycle expenditure on conveyance/long distance transport of water/sewage will be much higher. Even as on toady in many cities cost of conveyance of water is much higher than the treatment of sewage to make it fit for most uses including domestic uses. For example the cost of transporting water from Narmada to fulfil water supply needs of Indore city (approximately @ Rs. 20/cum) is much higher than the cost of treating sewage to tertiary level."*

In view of above and severity of depletion of aquatic resources vis-a-vis the financial aspects related to conveyance and treatment of water/sewage the committee recommended that the effluent discharge for STPs to be as follows:

“

SI. No.	*Industry*	*Parameters*	*Standards (Applicable to all mode of disposal)*			
1	*2*	*3*	*4*			
	Sewage Treat-ment Plants (STPs)		*Mega and Metropolitan Cities*	*Class I Cities*	*Others*	*Deep Marine Outfall*
		pH	*5.5-9.0*	*5.5-9.0*	*5.5-9.0*	*5.5-9.0*
		Bio-Chemical Oxygen Demand (BOD)	*10*	*20*	*30*	*30*
		Total Suspended Solids (TSS)	*20*	*30*	*50*	*50*
		Chemical Oxygen Demand (COD)	*50*	*100*	*150*	*150*
		Nitrogen-Total	*10*	*15*	*-*	*-*
		Phosphorus-Total(For Discharge into Ponds, Lakes)	*1.0*	*1.0*	*1.0*	
		Fecal Coliform (FC) (Most Probable	*Desireable-100 Permissible-*	*Desireable-230 Permissi*	*Desireable-1000 Permissible-*	*Desirable-1000 Permissibl*

		Number per 100 mililiter, MPN/100 ml	*230*	*ble-1000*	*10,000*	*e-10,000*

Note:

(i) Mega-Metropolitan Cities have population more than 1 crore, Metropolitan Cities-Population more than 10 Lakhs and Class-1 Population more than 1 Lakh.

(ii) All value in mg/l except for pH and Fecal Coliform.

(iii) These standards will be applicable for discharge into water bodies as well as for land disposal/applications.

(iv) These Standards shall apply to all new STPs for which construction is yet to be initiated.

(v) The existing/under construction STPs shall achieve these standards within 07 years from the date of notification.

(vi) In case where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100m away from discharge point, then norms for deep sea marine discharge shall be applied.

(vii) Reuse/Recycling of treated effluent shall be encouraged.

(viii) State Pollution Control Boards/Pollution Control Committees may make these norms more stringent taking into account the local conditions.

"

10. We have heard Learned Counsel for the parties.

11. Learned Counsel for the applicant submits that while the Expert Committee is fully justified in suggesting parameters as per its report for Mega-Metropolitan Cities, there is no justification for different and diluted standards for Class-I cities, Other cities or Deep Marine Outfall and to that extent the report of the Expert Committee fall short of the required scientific logic and database. While

recommending the diluted standards for Class-I cities, Other cities or Deep Marine Outfall the Committee has not given any explanation with regard to the existing pollution load in these areas, the available systems in place, the efficacy of the systems in terms of meeting of norms, the population impacted by deteriorating water quality and likely consequences on health of people if these diluted norms are permitted. There is no scientific justification offered for diluting the norms for these areas in which the majority of country's population resides. Also such standards we feel must apply not only to new STPs but also to the existing ones. Further, there is no justification for non-application of such standards for seven years for existing STPs.

12. Learned Counsel for CPCB and interveners are unable to justify dilution of standards for areas other than Mega Metropolitan Cities or for existing STPs.

13. We find that there is no justification for diluted standards for areas other than Mega and Metropolitan Cities. The water quality standards are required to be same for the population of major cities or other cities. No justification has been shown for different standards for persons living in cities other than Mega and Metropolitan Cities. Major population of this country will be affected by diluted standards and only persons in Mega and Metropolitan Cities will have comparatively better standards without any valid reason or distinction. We may note that filters, UV filters etc. are facilities

mainly available in major cities and not in smaller cities or villages where the standards are proposed to be diluted.

14. Accordingly, we accept the report of the Expert Committee with the modification that the standards recommended for Mega and Metropolitan Cities will also apply to rest of the country. We also direct that the standards will apply not only for new STPs but also for existing/under construction STPs without any delay and giving of seven years time stands disapproved.

MoEF & CC may issue an appropriate Notification in the matter within one month from today.

The Application is disposed of.

Adarsh Kumar Goel, CP

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

April 30, 2019
Original Application No. 1069/2018
SN

Table 1: SBR Plants under operations

Sl. No.	Capacity	Unit	User / Industries	Location
A	**PESTICIDE**			
1	1.25	MLD	United Phosphorous Limited	Jhagadia, Gujarat
B	**PHARMACEUTICAL**			
2	3.5	MLD	Jawaharlal Nehru Pharma City	Vizag, Andhra Pradesh
C	**REFINERY**			
3	16.8	MLD	BPCL/ (Engineers India Limited)	Kochi, Kerala, Tamil Nadu
4	15	MLD	Mangalore Refinery and Petrochemicals Limited	Mangalore, Karnataka
5	12	MLD	HPCL Mittal Energy Limited	Bhatinda, Punjab
6	9	MLD	Bharat Oman Refinery Limited	Bina, Madhya Pradesh
7	7.8	MLD	Chennai Petroleum Corporation Ltd.	Chennai, Tamil Nadu
8	7.2	MLD	Hindustan Petroleum Corporation Limited.	Mumbai, Maharashtra
9	4.3	MLD	Hindustan Petroleum Corporation Limited	Vizag, Andhra Pradesh
10	3.6	MLD	ONGC Petro Additions Limited-OPAL	Dahej, Gujarat
11	3.48	MLD	Brahmaputra Crackers & Polymers Limited	Lepetkata, Dibrugarh, Assam
12	2.88	MLD	Indian Strategic Petroleum Reserves Limited (ISPRL)	Punj-lloyd, Mangalore, Karnataka
13	1.2	MLD	ONGC Mangalore Petrochemicals Limited- OMPL	Aromatic Complex, Mangalore, Karnataka
14	0.48	MLD	Cairn Energy India Pty Ltd, Suvali	Surat, Gujarat
D	**TEXTILE**			
15	100	MLD	Pandesara Infrastructure Limited	Surat, Gujarat
16	80	MLD	Palsana Enviro Projects Limited	Surat, Gujarat
17	60	MLD	Gujarat Eco Textile Park Limited	Surat, Gujarat
18	45	MLD	New Palsana Industrial Co-Op Society Ltd.	Surat, Gujarat
19	18	MLD	Balotra Water Pollution Control & Research Foundation Trust.	Balotra, Rajasthan
20	16	MLD	The Haryana State Industrial & Infrastructure Development Corporation Ltd.	Barhi, Sonepat (Haryana)
21	15	MLD	Rajasthan Urban Infrastructure Development Project (RUIDP)	Pali, Rajasthan
22	12	MLD	Pali Water Pollution Control, Treatment &	Pali, Rajasthan

Sl. No.	Capacity	Unit	User / Industries	Location
			Research Foundation.	
23	2.5	MLD	Spectrum Dyes & Chemicals Pvt. Ltd. Surat	Surat, Gujarat
24	1	MLD	Detox Group of Companies.	Ankleshwar, Gujarat

Table 2:SBR Plants under construction

Sl. No.	Capacity	Unit	User / Industries	Location
A.	**Refinery**			
1	24	MLD	Hindustan Petroleum Corporation Ltd	Visakhapatnam, Andhra Pradesh
2	0.72	MLD	Indian Strategic Petroleum Reserves Limited (ISPRL)	Padur, Karnataka
B	**TEXTILE**			
3	40	MLD	Punjab Dyers Association, Tajpur Road, PDA	Ludhiana, Punjab
4	30	MLD	Ahmedabad Municipal Corporation	Ahmedabad, Gujarat
5	20	MLD	Dholera Industrial City Development Ltd.	Dholera, Gujarat
C	**FISHERY WASTE**			
6	1	MLD	Project Implementation Agency.	Puducherry, Tamil Nadu
D	**PHARMACEUTICAL**			
7	3.5	MLD	Jawaharlal Nehru Pharma City	Vizag, Andhra Pradesh

About Antea Group

From city to countryside, from air to water: Antea Group's engineers and consultants have been contributing to our living environment in the Netherlands for years now. We design bridges and roadways and create residential neighborhoods and water structures. But we are also involved in areas such as the environment, safety, asset management and energy. Under the name Oranjewoud, we expanded into an all-round, independent partner for companies and government bodies. As the Antea Group, we also apply this knowledge at a global level. By combining valuable knowledge, including on technical matters, with a pragmatic approach, we make solutions attainable and workable. Goal-oriented, with an eye for sustainability. In this way, we anticipate today's questions and tomorrow's answers. Just as we have been for over 60 years now.

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