KERALA WATER AUTHORITY

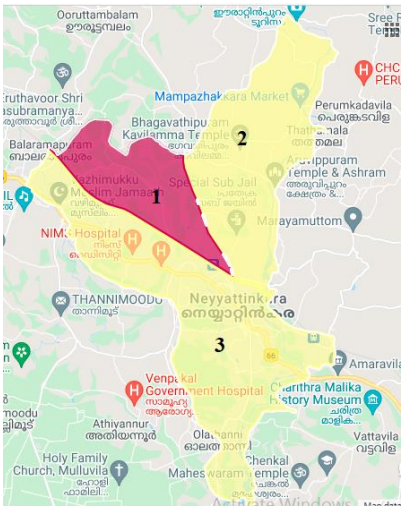
DETAILED ENGINEERING REPORT

SEWERAGE SCHEME TO

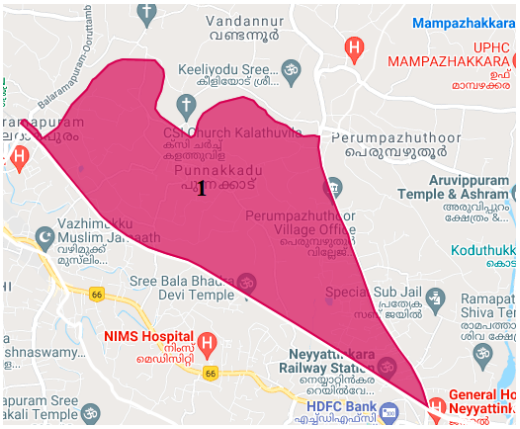
NEYYATTINKARA MUNICIPALITY ZONE I

THIRUVANANTHAPURAM DISTRICT

THIRUVANANTHAPURAM



NEYYATTINKARA MUNICIPALITY



ZONE I

Prepared by

PPD & SEWERAGE CIRCLE

JALABHAVAN, TVPM

JANUARY 2023

ACKNOWLEDGEMENT

We wish to express our sincere gratitude to the Sri. Pranabjyothi Nath IAS,Chairman KWA, Sri.Venkatasapathy S. IAS, Managing Director, KWA, Sri. Sreekumar G. Technical Member, KWA, Sri.Jayaprakash.C, Chief Engineer, PPD-WASCON & Sewerage Works, for the valuable guidance and support.

We express our gratitude to the authorities of Neyyattinkara Municipality for their support, without which this endeavour would not have been possible. We extend our sincere gratitude to M/S Techzone Insturments for timely completing the DGPS survey work. We trust that the project will become a reality as per the timeline shown, and it would be beneficial to reduce the pollution load on the Neyyar River and also improve the living standards in Neyyattinkara Municipality.

We express our greatfulness to all the staff of PPD Camp Office Thiruvananthapuram for their valuable support, especially to Sri. Sooraj kumar.S, Head Surveyor, Sri. ArunV.V, Sri.Arun.S, Sri. Alex S.S, Smt.Krishnapriya K.N, Smt.Jeeva D.P, Sri. Suraj.S, Sri. Sajeer.S, Sri.Gokul M.S, Sri.Gokul Krishnan G.A, Sri.Abhiraj.R, Sri.Ajeesh A.S, Miss.Liji Titus, Smt.Praveena K.P, Smt.Hansi.S, Surveyors of PPD Camp office Thiruvananthapuram for their dedication and hard work.

ASSISTANT EXECUTIVE ENGINEER III
PPD & Sewerage Circle
Jalabhavan, Kerala Water Authority
Thiruvananthapuram

Executive Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

Superintending Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

Smt.Tharadevi K.V	Smt. Bindu S.L	Smt.Seeja.J.Selin	Sri.P.K salim
Assistant Engineer	Assistant Executive Engineer	Executive Engineer	Superintending Engineer

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EXECUTIVE SUMMERY

The Kerala Water Authority (KWA) was constituted by the Government of Kerala through the Kerala Water Supply and Waste Water Ordinance 1984, converting the then existing Public Health Engineering Department .The organization deemed to have come into existance on the 1st day of March 1984.The ordinance was then replaced by the Kerala Water Supply and Sewerage Act 1986 (Act 14 of 1986). As per this act, KWA can render services in Water Supply as well as in Waste water collection and disposal. As such the authority has formulated a Sewerage Vertical within it to rise to need of the hour.

Environmental protection has been widely accepted as a vital aspect of sustainable development. Direct discharge of sewage to the water courses in un-sewered areas and discharging of septic tank effluents to streams and canals polluted the entire water course. Proper sewerage and septage management is a crucial parameter in environmental protection. Though considerable achievement has been marked by the state in the drinking water sector, the development in sewerage sector is lagging much behind. With unplanned urbanization, the sewage management and pollution of water resources has become a complex challenge to the environment as well as to the public health. Realizing the threat, the government in recent years, has made much deliberations and initiatives to address the situation. Moreover, the Honorable National Green Tribunal (NGT) has given a mandate to implement sewerage system in whole of the state in a time bound manner. As per the order of National Green Tribunal, all States/Union Territories through their concerned departments such as Urban/Rural development, Irrigation & Public health, Local bodies, Environment, etc. may ensure formulation and execution of plans for sewage treatment and utilization of treated effluent.

As a part of implementation of sewage management projects under Swatch Bharath Mission-Urban – 2.0, towns with population less than one lakh (as per 2011 census) have been taken as first priority under SBM- 2.0.

Accordingly for Thiruvanathapuram District two Municipalities Neyyattinkara and Varkala were identified.

Neyyattinkara town is situated on the banks of Neyyar River, one of the principal rivers in the district and hence its name. Neyyatinkara in Malayalam literally means the shore of the river Neyyar. Neyyattinkara is the second most densely populated municipality in the district after Varkala. The Public sector undertaking Kerala Automobiles Limited that manufactures electric auto rickshaws is situated at Aralummoodu in Neyyattinkar Municipality located around

18 km (11 mile) south of Trivandrum, on the National Highway 66 to Kanyakumari, the town spreads over an area of 29.5 km2 on the banks of the Neyyar River.

An organized sanitation system is an important aspect to create sanitary and healthy living conditions in any city. Neyyattinkara Municipality is broadly categorized in to three zones by considering topographical features such as ridges, rivers etcetera and manmade structures such as roads and railway lines. This is the Detailed Engineering Report for Sewage/Septage management for Neyyattinkara Municipality- Zone - I.

The extent of area covered is 4.71 square kilometers having a population of 12705 (as per census 2011). The projected population including floating population in the year 2054 is 16156. The population growth of Neyyattinkara Municipality shows a decreasing trend. The treatment facility for the present load can be used for the next 30 years. Considering the per capita water usage as 172.5 lpcd (Including business, industrial & commercial uses). Taking 80% of water consumption as sewage produced, the total sewerage load is arrived as 2.50 MLD. The project includes laying of sewerage network of 15.14 km, pumping main of 2100 m and construction of 2 numbers of collection wells. The domestic sewerage is collected by gravity through various underground pipes of diameter 225mm to 355mm, (PE-100, PN-8)

Land for the development of the scheme should be arranged by the local body administration. Necessary social awareness programs as well as Environment Impact Assessment studies have to be organized. -

Estimated cost is ₹ 84 crore (including O&M for 10 years)

ASSISTANT EXECUTIVE ENGINEER III
PPD & Sewerage Circle
Jalabhavan, Kerala Water Authority
Thiruvananthapuram

Executive Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

Superintending Engineer,
PPD & Sewerage Circle,
Jalabhavan,

CHIEF ENGINEER (I/c)
Sewerage, PPD & WASCON
Kerala Water Authority
Thiruvananthapuram -33

PROJECT AT A GLANCE

(NEYYATTINKARA MUNICIPALITY)

1	Name of the Project	:	Sewerage Scheme to Neyyattinkara Municipality Zone-I
2	Name of District	:	Thiruvananthapuram
3	Name of Municipality	:	Neyyattinkara
4	Project area covered(m^2)		4710000 m^2
5	Population benefitted	:	16156
6	STP Capacity	:	2.50 MLD
7	Total Network Length	:	15.141 km
8	Number of Wells	:	1 no
9	Number of Pumping Stations	:	1 no
10	Number of Manholes	:	585 nos
11	Number of Connections	:	2541 nos
12	O&M cost for 10 years including 18% GST(including electricity charges)	:	340365920.00
13	Electricity charge for one year	:	4860000.00
14	Amount required for Land Acquisition	:	300.00 Lakhs
15.	Total cost including 10 years O&M cost(excluding electricity charge)	:	84 Crore
16	Implementing Agency	:	Kerala Water Authority
17	Period of Execution	:	2 yeras

ASSISTANT EXECUTIVE ENGINEER III
PPD & Sewerage Circle
Jalabhavan, Kerala Water Authority
Thiruvananthapuram

Executive Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

Superintending Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala

SALIENT FETURES OF PROPOSED MUNCIPALITY

	Project Title	:	DPR for Sewerage Scheme to Neyyattinkara Municipality
1	District	:	Thiruvananthapuram
2	Taluk	:	Neyyattinkara
3	Municipality	:	Neyyattinkara
4	Assembly constituency	:	Neyyattinkara
5	Area benefitted	:	27.55Km2
6	Population [2011 Census]	:	70869
7	Current year	:	2022
8	Total Road Length	:	198 km
9	Execution Period	:	3yrs
10	Project implementation period	:	2022-2024
11	Design period	:	30 yrs
12	Projected Population 2054	:	95347
13	Total Networked Area	:	27.55 Sqkm
14	Total length of Sewerage Network	:	124.1 km
15	Number of Zones	:	3
17	Number of STP	:	4
18	Total Capacity of STP	:	15.50 mld (Appoximate)

ASSISTANT EXECUTIVE ENGINEER III
PPD & Sewerage Circle
Jalabhavan, Kerala Water Authority
Thiruvananthapuram

Executive Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

Superintending Engineer
PPD & Sewerage Circle
Jalabhavan,

CHIEF ENGINEER
Sewerage, PPD & WASCON

ABSTRACT OF ESTIMATE

Sewerage System in Zone-I of Neyyattinkara Municipality in Thiruvananthapuram District

(Dsor year: 2018)

Sl No	Heading Description	Amount
1	APPENDIX-A :- Construction of 2.5 MLD Sewerage Treatment Plant near Vempanikkara Pond in Zone-I of Neyyattinkara Municipality	96161596.00
2	APPENDIX-B:- Construction of Sewerage Collection Well Grit Chamber and allied works in Zone-I of Neyyattinkara Municipality	41139624.00
3	APPENDIX-C:- Construction of Lift Manhole in Zone-I of Neyyattinkara Municipality	17461313.00
4	APPENDIX-D:- Supplying, Laying, Jointing, Testing and Commissioning of PE-100/PN-8 pipe for Sewer Network in Zone-I of Neyyattinkara Municipality and Construction of Manhole Chamber	196244405.00
5	APPENDIX-E:- Supplying, Laying, Testing and Commissioning of 250mm & 200mm DI K9 Sewer Pumping Main from MPS to STP and 150mm DIK9 from IPS to MPS in Zone-I of Neyyattinkara Municipality	81565624.00
6	APPENDIX-F:- Construction of House service connections, SCADA & Automation, Installation of Pump Sets, Installation of Solar Power Plant, DG sets etc in Zone-I of Neyyattinkara Municipality	25000000
7	APPENDIX-G:- Provisional Sums (ie. Statutory payments for Electricity Connection, Road Crossing, Utility Shifting, IEC activities and Inspection Vehicles etc.)	2500000.00
8	APPENDIX- H :- Operation, Maintenance and Management Service for 10 years	218041009.00
9	APPENDIX-I:- Centage (10% of Appendix – A to H)	67811357.00
10	APPENDIX-J:- GST Payments (18% of Appendix- A to H)	81373629.00
11	APPENDIX-K:-DPR Preparation Charge (2.5% of Appendix-A to G)	11501814.00
	Total	838800370.70
	Lumpsum for round off	1199629
	GRAND TOTAL Rs.	840000000
	Rupees Eighty four Crore only	

CHIEF ENGINEER i/c
Sewerage, PPD & WASCON
Kerala Water Authority
Thiruvananthapuram -33

ASSISTANT EXECUTIVE ENGINEER

CHAPTER l

INTRODUCTION

The Unplanned urbanization, unorganized Sewerage Management and the resulting pollution of Water resources has become a complex challenge to the Environment as well as to the Public Health. Governments in recent years have made much deliberations and initiatives to address the situation. Due to the growing needs of planning and design of systems which serves healthy environment, the role of sewerage systems with meticulous planning and design is a must. Moreover the Honorable National Green Tribunal have directed (vide OA No. 148/2016- Mahesh Chandra Saxena Vs South Delhi Municipal Corporation &Others) all the States and Union Territories in India to prepare and furnish their action plans within three months to the Central Pollution Control Board so that they could review the same and issue further directions. All these factors paved the way for the proposal of sewerage schemes which can cover every human habitation for the entire State of Kerala in a scientific and systematic way

The KWA is the largest institutional entity in the field of water supply, and implemented thousands of small, medium and large urban and rural piped water supply schemes in Kerala. However, the presence of KWA in the field of sewerage schemes has been limited. KWA as knowledge partner, service provider and central agency for coordinating the activities related to the planning and implementation of sewerage systems for LSGDs and can contribute in many ways. Being a statewide establishment with qualified and experienced personnel in Public Health Engineering, the responsibility of waste water management can be taken up effectively. As a part of Swatch Bharath Mission – urban 2.0, Two Municipalities with population less than one lakh is identified in each district.

1. 1 Project Genesis

The project proposal is for the implementation of sanitary sewerage disposal in Neyyattinkara Municipality. The project will be carried out through KWA, subject to the approval of the Municipal Administration. The project proposal envisages a well-planned system to provide waste water collection, conveyance, treatment, recycle etc. and also a plan for long term operation and maintenance of the system. The control of pollution of natural water bodies will be possible by the implementation of the sewerage treatment project.

1.2 Study Organized

Necessary preliminary investigation on the pre-feasibility of implementing sewerage scheme to cover entire Municipality area has been carried out by the PPD camp team of KWA under the guidance of Regional office, Thiruvananthapuram. Data available with local bodies, census reports, and KWA's asset mapping documents, GIS data, DGPS survey, Social survey and spatial data sites has been used. And processed along with information available from open source.

1.3 Aim and Status of the Report

This is the Detailed Engineering report for Neyyattinkara Municipality- Zone I intended for seeking funds and approvals from the Authority / Department. Land for the development of the scheme should be arranged by the local body administration and necessary social awareness as well as environment assessment and detailed survey are also need to be organized before execution of this project.

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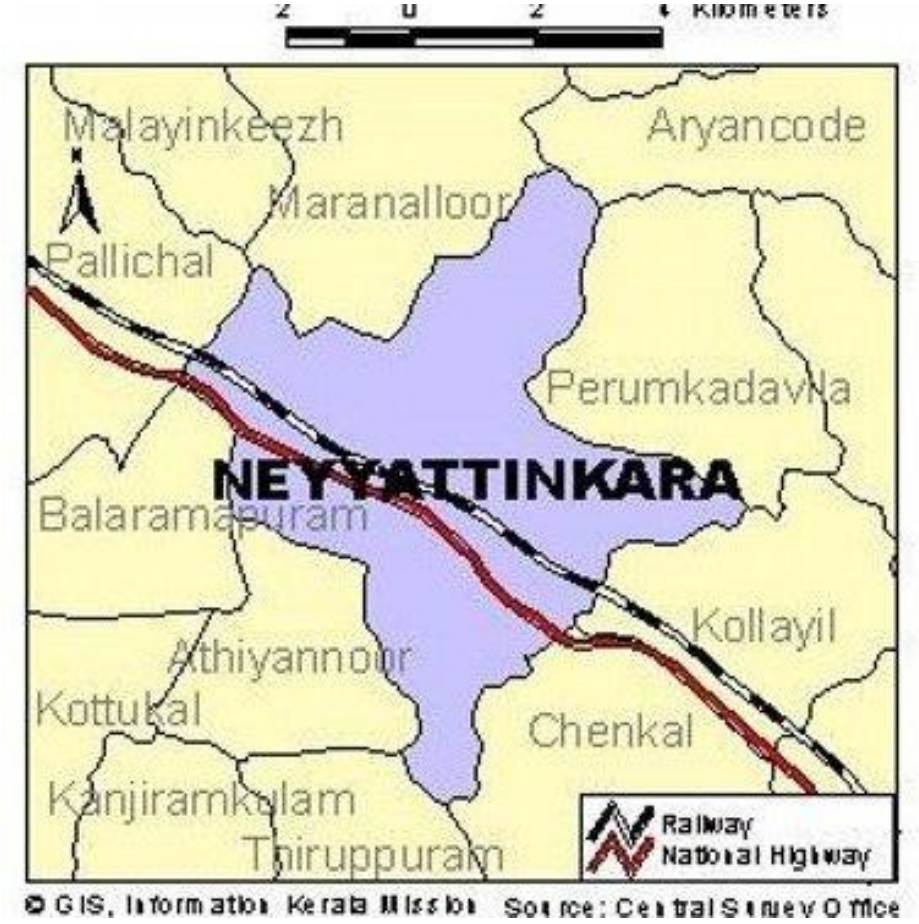
CHAPTER 2

OVER VIEW-NEYYATTINKARA MUNICIPALITY



2.1 HISTORY

Sree Krishna Swami Temple in the town-centre stands as a rare example of merger between legend and reality. According to the legend it was here the Travancore king Marthanda Varma once hid inside the hollow trunk of a Jackfruit tree to escape from his enemies during his war against the 'ettuveetil pillamar' (the eight nair chieftains). The King prayed to Lord Krishna for helping him as he was being surrounded by the enemies. At that time, a mysterious child asked the King to hide himself inside the hollow trunk of a large jack tree standing there. The jack tree popularly known as 'Ammachiplavu' (Grandmother Jack Tree) since then, could still be seen preserved in the Shri Krishna Swamy Temple located in the heart of the town. This temple was built by Marthanda Varma in the year 1755, as a thanks giving to the Lord Krishna, who helped him to win the ordeal.

The municipality is situated on the banks of Neyyar River, one of the principal rivers in the district and hence its name. Neyyatinkara in Malayalam literally means the shore of the river Neyyar. Neyyattinkarais the second most densely populated municipality in the district after Varkala. The Public sector undertaking Kerala Automobiles Limited that manufactures electric auto rickshaws is situated at Aralummoodu in Neyyattinkara. Located around 18 km (11 mile) south of Trivandrum, on the National Highway 66 to Kanyakumari, the town spreads over an area of 29.5 km2 on the banks of the Neyyar River.

The name 'Neyyattinkara' in Malayalam regional language means shore (kara) of Neyyar River. This river flows from Agasthyarkoodam, the highest peak (1868m above MSL) in southern end of the Western Ghats.

2.2 TOPOGRAPHY

Neyyattinkara is located at 8.4°N 77.08°E. It has an average elevation of 26 metres (85 feet). The town is situated on the Neyyar River side, one of the principal rivers in Trivandrum district. The river flows to the south part of the town. Water Supply for the town and the adjacent places is obtained from this river. Topography of the town is rather uneven, with higher areas in the downtown. Nearby the town is the hillock Aruvippuram. The Western Ghats form a scenic backdrop to the town. The town is sandwiched between the Western Ghats and the Arabian Sea. The nearby sea shore is just 10 km. away in west, and seven kilometre to the east can take you to the mammoth hillocks of Western Ghats

The important river of the Neyattinkara Municiplaity is Neyyar. The Neyyar River with catchments of 497 sq. km. originates from Agasthya hills at about 1860 m above msl and joins Lakshadweep Sea near Poovar which is perennial with dendritic drainage pattern. Neyyar Irrigation Project constructed across this river irrigates southern parts of Thiruvananthapuram district and adjoining Kanyakumari district of Tamil Nadu

The Neyyattinkara municipality comprises of 7 Villages and 44 wards and has population of 70,869 as per 2011 Census India. Neyyattikara Municipality has total administration over 18,176 houses to which it supplies basic amenities like water and sewerage.

For the purpose of planning sewerage/septage management system for Neyattinkara Municipality, the total area comes to 27.55 Square Kilometers. Project area is broadly categorized in THREE zones by considering topographical features such as ridges, rivers etcetera and manmade structures such as roads and railway lines. Geometrical progression method is used for population projection. 80% of water supply (including other sources viz., open well, bore wells, lorry supply,

etc.) is considered as sewerage generation. The ultimate sewerage load of the Municipality is 14. mld (approximate) including non-domestic demand and infiltration. It is decided to cover 100 percentage of the Municipality with sewerage network 4 decentralized Moving bed biofilm reactors (MBBR) based STPs having a total capacity of 15.5 mld are proposed for the scheme. The proposal also included collection wells, sewerage pumping mains, gravity sewers, manholes, collection/inspection chambers etc.

The land use pattern shows that major portion of the area is under agriculture, which is followed by forest. 64.27% and 22.7% respectively are the distributions of agriculture land and forest in the district. Irrigation is mainly by surface water. The total area irrigated by canals is 36.31 sq. km., which is about 53.7% of the total irrigated area. The land utilisation pattern shows that net area sown is 1338.62 sq. km. while area under forest cover is 498.61 sq. km. Agriculture constitutes the main source of economy and about 15 types of crops are being cultivated in the district. Paddy is the main dry land crop. The crop is mainly grown in rain fed condition excepting along the Ayacut area of Neyyar Irrigation project, which falls in Neyyatinkara taluk. Coconut is one of the most important crops of the district which are mainly grown along the coastal places and the slopes of midland District.

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2.3 GEOGRAPHY

Neyyar River

Neyyattinkara is located at 8.4°N 77.08°E.[2] It has an average elevation of 26 metres (85 feet). The town is situated on the Neyyar River side, one of the principal rivers in Trivandrum district. The river flows to the south part of the town. Water Supply for the town and the adjacent places is obtained from this river. Topography of the town is rather uneven, with higher areas in the downtown. Nearby the town is the hillock Aruvippuram. The Western Ghats form a scenic backdrop to the town. The town is sandwiched between the Western Ghats and the Arabian Sea. The nearby sea shore is just 10 km. away in west, and seven kilometres to the east can take you to the mammoth hillocks of Western ghats.

2.4 GEOLOGY

The geology is said to be typical of the Kerala soil - the Laterite and red soil. The town can still boast of a good green cover in residential and non-residential areas.

2.5 CLIMATE

The muncipality has a climate that borders between tropical savanna climate and tropical monsoon climate. Annual variation of mean air temperature at Neyyattinkara municipality is from 22° C to 32°C. The humidity is high and rises about 90% during the monsoon season. The average annual rainfall of the municipality is 2256 mm.

Climate data for Neyyattinkara													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	29.9 -85.8	30.7 -87.3	31.7 -89.1	31.8 -89.2	31.3 -88.3	29.1 -84.4	28.6 -83.5	28.9 -84	29.3 -84.7	29.3 -84.7	29.1 -84.4	29.3 -84.7	29.9 -85.8
Daily mean °C (°F)	26.1 -79	26.9 -80.4	28.1 -82.6	28.6 -83.5	28.2 -82.8	26.5 -79.7	25.9 -78.6	26.2 -79.2	26.5 -79.7	26.5 -79.7	26.2 -79.2	26 -79	26.8 -80.3
Average low °C (°F)	22.4 -72.3	23.2 -73.8	24.5 -76.1	25.4 -77.7	25.2 -77.4	23.9 -75	23.3 -73.9	23.5 -74.3	23.7 -74.7	23.7 -74.7	23.4 -74.1	22.7 -72.9	23.7 -74.7
Average precipitation mm (inches)	19 -0.7	27 -1.1	52 -2	144 -5.7	248 -9.8	457 -18	336 -13.2	222 -8.7	201 -7.9	290 -11.4	205 -8.1	55 -2.2	2,256 -88.8
Average rainy days	1	2	3	8	10	19	17	14	11	12	8	3	108
Mean daily sunshine hours	9	9	8	8	7	5	5	6	6	6	6	7	7
Source 1: Climate-Data.org[19]													
Source 2: Weatherbase Trivandrum, India[20] for sunshine and rainy days													

2.6 DEMOGRAPHY

Neyyattinkara is a Municipality in district of Thiruvananthapuram, Kerala. The municipality is divided into 44 wards for which elections are held every 5 years. The Neyyattinkara Municipality has population of 70,869 of which 34,532 are males while 36,337 are females as per report released by Census India 2011.

Population of Children with age of 0-6 is 6092 which is 8.60 % of total population of Neyyattinkara (M). In Neyyattinkara Municipality, Female Sex Ratio is of 1053 against state average of 1084. Moreover Child Sex Ratio in Neyyattinkara is around 930 compared to Kerala state average of 964. Literacy rate of Neyyattinkara city is 93.52 % lower than state average of 94.00 %. In Neyyattinkara, Male literacy is around 95.51 % while female literacy rate is 91.65 %.

Neyyattinkara Municipality at a glance

Area	29.5 km2	
Population (Census 2011)	70,869	Second most populous Town /Municipality in Thiruvananthapuram District
Decadal growth rate	2.07 %	Thiruvananthapuram District Growth rate
Population density	2400 / Km2	2nd Densly populated town of Thiruvananthapuram District
Households	18176	
LA Constituency	Neyyattinkara	
River	1	Major river - Neyyar, ,
Average Rainfall	2256 mm	

2.7 EXISTING SYSTEM

The open dumping of septage has become a major issue everywhere. While open defecation means fecal matter is spread around in smaller quantities, septage dumping means discharge of highly concentrated pathogens with potential to cause significant health and environmental damages. Along with the provision of safe drinking water, an organized sanitation system is an important aspect to create sanitary and healthy living conditions in any city. Most of the houses and commercial establishments have septic tanks. The septic tanks shall be emptied periodically (2 to 3 years as per design) for continued and efficient anaerobic reaction but the cleaning is done likely within 5-6 years. De-sludged septage is generally discharged into open spaces and water bodies. Few are letting out their sewerage directly into the sea, causing highly contaminated sewerage flows in the lagoon, leading to unhygienic conditions. As of now there is no septage treatment facility is in Neyyattinkara. To sustain the high growth rate of the town, development of septage system is an important aspect of the infrastructure that needs to be developed on priority. There is also ground water pollution posing a danger of cross-contamination for the water supply mains. In areas where there are no toilets, there is considerable open defecation posing a threat to public health.

2.8 VISION OF THE PROJECT

The entire municipality of Neyyattinkara become totally sanitized, healthy, livable, ensuring and sustaining good public health and environmental outcomes for all citizens, with a special focus on hygienic and affordable sanitation to its people with specific focus on the diverse coastal and marine ecosystem and its implications

2.9 POPULATION PATTERN

According to the 2011 census ,Neyyattinkara municipality has a population of 70869. Most populous Town /Municipality in Thiruvananthapuram District..The district has a population density of 2400 inhabitants per square kilometer which makes it the most densely populated municipality in Thiruvananthapuram District. Its population growth rate over the decade 2001–2011 was 2.07% same as that of Thiruvananthapuram. The population has been forecast to a design period of 30 year from the base year of 2024 by considering a decennial growth of state average rate of 4.91%.

Projection of Population

NO	Particulars	Year	Quantity	Unit
1	Last census Population	2011	70869	Persons
2	Decennial increase		2.07	%
3	Current year	2021	83257	persons
4	Design period		30	Years
5	Execution period		3	Years
6	Projected population	2054	96116	Persons

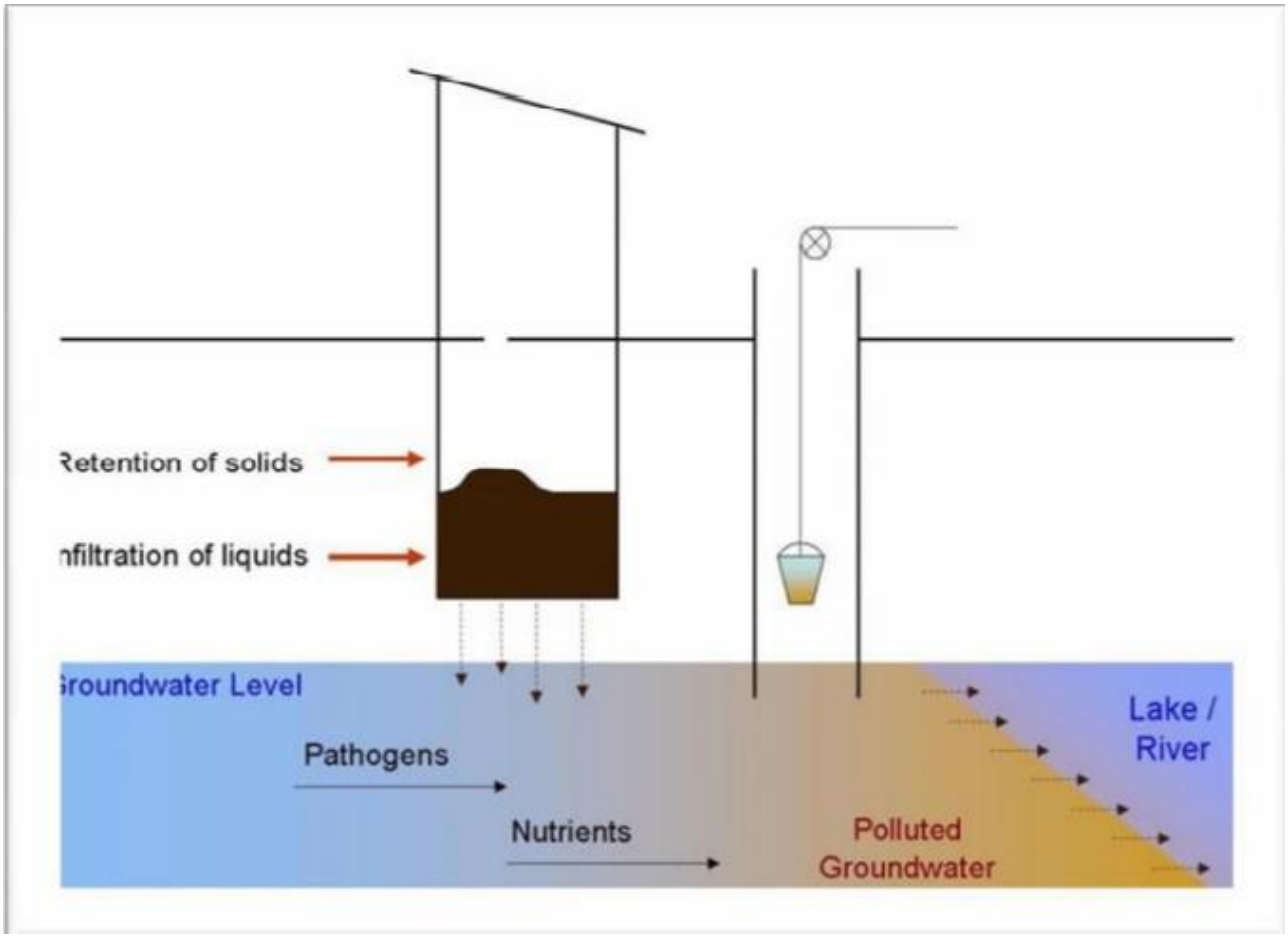
2.10 SECTOR INSTITUTIONS

Implementation of the proposed sewerage scheme shall be taken up by Kerala Water Authority. The capital investment required for the project shall be shared by LSGD, GoK and KWA. The capital cost sharing pattern shall be finalized after deliberations with the stake holders on approval of the Detailed Engineering Report. On successful completion of the defect liability period the scheme shall be handed over to the respective Authorities for Operation.

CHAPTER 3

NEED FOR THE PROJECT

It is quite evident that lack of a scientifically built sewerage system in the area causes poor sanitation, pollution of water bodies, unhygienic environment and much more difficulties as well as threats to the society. Realizing the threat, the Honorable National Green Tribunal (NGT) has given mandate to implement sewerage system in the whole of the state in a time bound manner. The septic tank, pit latrine and other means of existing practice is to be replaced with a better sanitation system.. Once a plan for sewerage system has been made for the district, it will be easier for integrating various development plans involving multiple departments.



CHAPTER 4

SEWERAGE TECHNOLOGY

Sewerage and Sewerage treatment technology is the branch of environmental engineering in which the basic principles of engineering are applied to solve the issues associated with the collection, those of biochemistry are applied to the treatment and environmental issues are applied in the disposal, and reuse of treated sewerage. The ultimate goal is the protection of public health in a manner commensurate with environmental, economic, social, and political concerns. While the conventional sewerage may be a comprehensive system for sewerage collection and transport, it also remains as a highly resource-intensive technology. Consequently, high capital cost, and significant O&M cost of this system inhibits its widespread adoption in all sizes of urban areas. The implementation of Centralized Wastewater Management System (CWMS) should not be considered as the only option available for collection, transportation and treatment of sewerage. There are certain factors which govern the selection of options between CWMS and Decentralized Wastewater Management System (DWMS). These have been elaborately discussed in relevant Chapter of the Sewerage Manual.

Decentralized wastewater management system (DWMS) may be designed as the collection, treatment, and disposal/reuse of sewerage from individual houses, cluster of houses, isolated communities, industries or institutional facilities as well as from portion of existing communities at or near the point of generation of sewerage. Decentralized systems maintain both the solids and liquid fraction, although the liquid portion and any residual solids can be transported to a centralized point for further treatment and reuse.

Recognizing the many applications and benefits of sewerage reuse, some important points may be kept in view such as (i) review of the impact of the population growth rate (ii) review of potential water reuse applications and water quality requirements (iii) review of appropriate technologies for sewerage treatment and reuse (iv) considering the type of management structure that will be required in the future and (v) identification of issues that must be solved to bring about water reuse for sustainable development on a broad scale. It has been emphasized that if treated effluent from sewerage treatment plants are reused for a variety of non-potable uses in the urban and semi urban areas , the demand on the potable water supply would be reduced.

The choice of appropriate technology will also depend on several factors such as composition of sewerage, availability of land, availability of funds and expertise. Different operation and maintenance options will have to be considered with respect to sustainable plant operation, the use of local resources, knowledge, and manpower.

CHAPTER 5

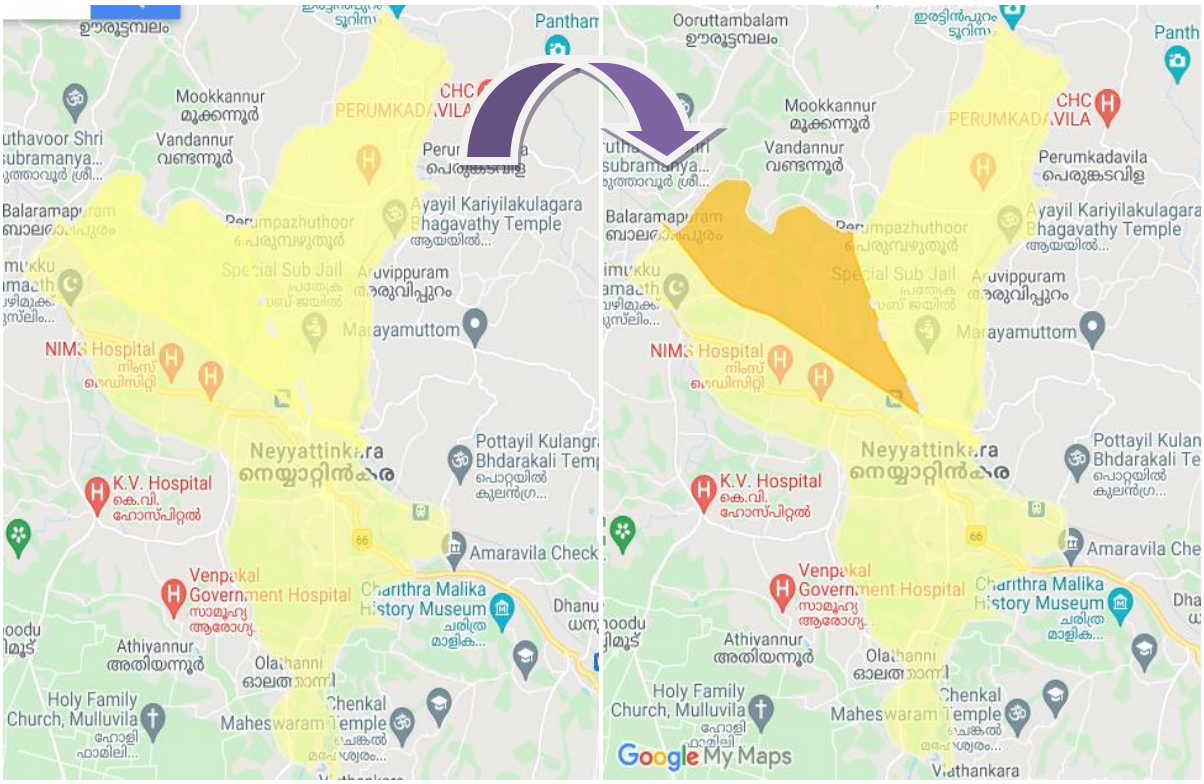
PROPOSED PROJECT

It is quite evident that lack of a scientifically built sewerage system in the area causes poor sanitation, pollution of water bodies, unhygienic environment and much more difficulties as well as threats to the society. The septic tank, pit latrine and other means of existing practice is to be replaced with a better sanitation system for the houses in the area. A well planned sewerage network is essential in the municipal town.

5.1. SCOPE OF THE PROJECT

A sewerage disposal system to cover the Zone I of Neyyattikara municipality is proposed The extent of area covered is 4.71square kilo meters having a population of 12705 (as per census 2011). The projected population including floating population in the year 2054 is 16146 current population 2021 is 13329 and as the trend of population growth of Neyyattikara Municipality shows decreasing, the treatment facility for the present load can be used for the next 30 years also.

Considering the percapita water usage as 172.5 lpcd, taking 80% of water consumption as sewerage produced, the total sewerage load is arrived as 2.45 MLD. The project includes laying of sewerage network of 15.14 km, pumping main 1900m (IPS to MPS) & 200M (MPS to STP), construction of 2 Nos of collection well. The domestic sewerage is collected by gravity through various underground pipes of diameter 225 to 355mm, HDPE (PE-100,PN-8) are proposed.



On completion of the proposed work approximately 2541 numbers of sewer connections to commercial and non commercial can be provided and thereby revenue in terms of centage of water charge can be realized. The one time connection charge will also boost the revenue of KWA. The sewer network proposed will improve

- Improve the quality of life
- Improvement in the unhygienic condition and safety to health
- Economic gains as the investment in sewerage system will be less compared to the cost of maintaining separate household sanitation system for each household and the gains resulting from improved health, less illness and more workdays will be significantly high.
- Improvement in environment by arresting pollution in the air and ground water and the reduction in nutrient level in the surrounding water bodies.

5.2. LAND

The proposal is to lay sewerage network lines through roads and to collect the sewerage in collection wells. In roads, at an interval of 30m, man holes are proposed to avoid choking of sewer lines and to perform maintenance work. The sewerage from an area is carried through pipes under gravity to collect in collection wells. In this project two collection wells included.

5.3. COLLECTION AND CONVEYANCE SYSTEM

5.3.1 Sewer Network

The proposed sewerage project for the service area comprises of collection, transmission and treatment of sewerage and disposal. Engineering decisions are required to specify the area and population to be served, the design period, the per capita sewerage flow, ground water infiltration, unauthorized roof water connection, nature and location of the treatment facilities and the method of disposal / utilization of the effluent. The type, quality and quantity of the materials for construction are also to be looked into. This project is prepared with adequate details for timely and proper implementation of the project.

5.4 Population Forecasting

5.4.1 Demographic forecasting

Population, household and related forecasts form the basis of social and economic planning and are fundamental to many other forecasting exercises. The many uses of population forecasts give rise to choices on several dimensions. Population forecasting is also highly uncertain. During the twentieth century, fertility was the most important component in determining population size. However, forecasting fertility proved to be difficult in the post-World War II era: neither the “baby booms” of the 1950s nor “baby busts” of the 1970s were foreseen. Neither was the post-war rapid decline in mortality foreseen. Both mortality and migration forecasting were negative for decades, official population forecasts widely assumed that mortality would not improve, at least beyond the immediate future, and migration was treated as an uninteresting constant. Water supply projects and sewerage projects are designed for 30 years. After 30 years the system needs renovation or to make a new system to accommodate load at that time. There are several methods developed for forecasting population but none of them are perfect. The population growth may change based on several factors such as attitude of community, social status, onset of pandemic diseases, war etc. which are unpredictable. Detailed population forecasting is shown in Table -1

Table -1

	Year	Population
Population As per census	2011	12705
Population Projected to year	2021	13329
Population Projected to year	2054	15387
Floating Population 5%	2054	769
Total population (Design)	2054	16156

5.4.2 Design Period:

Sewerage projects under normal circumstances are designed for a period of 30 years. The projected population including floating population in the year 2021 is 13329 and as the trend of population growth of Neyyattinkara Municipality shows decreasing rate, the treatment facility for the present load can be used for the next 30 years also. Considering immediate implementation this project is designed for the population in 2021 taking the base period as 2011. Population of project area in Neyyattinkara Municipality as per census 2011 is 12705, Population Projected to year 2054 is 16156 Floating Population (5%). The Construction of 2.5 MLD STP near Vempanikkara pond.

5.4.3 Estimation of Sanitary Sewerage :

Sanitary sewers are provided to carry the spent water of the community with some ground water and fraction of storm run-off, to the point of treatment and disposal. The factors which affect the quality of sewerage are

1. Per capita Sewerage flow
2. Peak factor
3. Ground water infiltration
4. Unauthorized roof water connection

Improvement in the unhygienic condition and safety to health economic gains as the investment in sewerage system will be less compared to the cost of maintaining separate household sanitation system for each household and the gains resulting from improved health, less illness and more workdays will be significantly high. Improvement in environment by arresting pollution in the air and ground water and the reduction in nutrient level in the surrounding water bodies.

5.4.4 Per capita Sewerage flow:

The entire spent water of the community contributes to the total flow in a sanitary sewer. Since some water is lost due to evaporation and seepage, only 80% of the average water supply is taken as sewerage flow.

Table -2

Muncipality	
PER CAPITA WATER SUPPLY LEVEL	150
BUSINESS,COMMERCIAL , INSTITUTIONAL NEEDS (%)	15
FLOATING (%)	0
TOTAL	172.5 lpcd

SEWERAGE GENERATION	80	%
INFILTRATION	10	%
DILUTION RATIO FOR FEACAL SLUDGE 1:	0	

5.4.5 Peak Factor

There may be hourly variations in flow and also seasonal variations. The peak factor or ratio of maximum to average flow depends on the contributory population. Evidently the peak factor trends to reduce with increase in population, since the different habits and customs of several group of people in large population, trend to reduce the variations in demand pattern. The recommended values as per CPHEEO manual are as follows.

Table -3 Peak Factor Values

Sl.No	Population	Peak Factor
1	Upto 20,000	3.00
2	20,000 to 50,000	2.50
3	50,000 to 7,50,000	2.25
4	Above 7,50,000	2.00

In this project peak factor 2.50 is proposed.

5.4.6 Ground water infiltration:

The flow in the sanitary sewers may include certain flows due to infiltration of ground water through joints. The suggested value for ground water infiltration for sewers laid below ground water table is as follows.

Table -4 Ground Water Infiltration

Norm	Minimum	Maximum
Litres/hectare/day	5000	50000
Litres/kilometer of sewer/day	500	5000
Liters/day/manhole	250	500

Infiltration in litres / Ha / day - 5000 to 50000. A value of 5000 litres / ha / day is adopted for design as per CPHEEO manual in the tool kit. However a higher infiltration rate is expecting due to the higher ground water table and nearness to backwaters.

5.4.7 Unauthorized roof water connection

The flow in the sanitary sewers may include certain flows due to unauthorized roof water connections from the households. Whereas the CPHEEO is of opinion that with strict rules and regulations this should be banned. Hence this flow is taken as zero Hence the flow through the server is calculated as follows.

Table -5 Peak Flow Calculation

1	Peak Flow	PF x DWF + GW Infiltration
2	Average Flow	2 DWF + GW Infiltration
3	Minimum Flow	DWF + GW Infiltration

5.4.8 Hydraulics of sewer

A properly functioning sewer has to carry the peak flow for which it is designed and transport suspended solids in such a manner that the deposits in a sewer are the minimum. Open channel flow or gravity flow is assumed in the collection sewer lines and closed conduit flow or pressure flow is assumed in pumping mains.

The various factors which are to be considered in the design of gravity sewer lines are

1. Selection of pipes
2. Depth of flow
3. Velocity of flow
4. Minimum and Maximum cover

5.4.9 Selection of Pipes

In the selection of pipes, the various aspects such as the life, the suitability of the pipe as a sewerage carrier its resistance to corrosion against the soil in which it is laid, availability, economy, easiness for installation and maintenance are considered. The following pipes are generally used for gravity sewers.

- Stone ware or vitrified clay pipes
- R.C.C. Pipes
- A.C. Pipes
- PVC /UPVC Pipes
- HDPE Pipes
- GRP Pipes.

When compared to other common wastewater piping system materials, such as PVC, ductile iron, or concrete, HDPE pipe offers significant benefits. Some of these include:

 Chemical Resistance. Hydrogen sulfide gas (H2S) corrosion is a serious threat to conventional sewer lines, like concrete and ductile iron, greatly reducing their service life. WL Plastics HDPE pipe is not attacked, corroded or degraded by H2S, ensuring a service life of 100 years.

 Anti-corrosive properties. HDPE piping systems are immune to the harmful effects of corrosion and tuberculation, common factors that reduces the operational life of concrete and ductile iron wastewater systems. HDPE also resists other corrosive or harmful agents, including scaling and organics such as fungi, bacteria, and other microbial contaminants.

 Leak-free. HDPE pipe is joined together via heat fusion, creating a welded, leak- free joint unlike conventional bell and spigot joints. These leak-free joints prevent infiltration and exfiltration making it a truly sanitary piping system.

 Durability. HDPE pipe is resistant to fatigue from water hammer and surge events in sewer force mains. HDPE pipe is also abrasion resistant, ensuring that flowing water and slurries won't damage the pipe throughout its service life.

 Lightweight. HDPE pipes are much lighter in weight compared with ductile iron or concrete alternatives, which makes transportation and installation significantly easier and safer.

 Cost-effectiveness. HDPE pipe is cost competitive with other sewer pipe options. HDPE pipe is faster, easier, and safer to install due to longer cut lengths and more linear footage per truck, which significantly reduce the overall project costs. With low maintenance costs and long service life, HDPE pipe is the ideal solution for wastewater systems. Hence HDPE-PN8 pipes are proposed for the sewer lines from diameters 225mm to 355mm. The minimum size of pipes used for sanitary sewers is 110 mm.

5.4.10 Depth of flow:

From the consideration of ventilation in waste water flow, the sewers are not allowed to run full. All the sewers are designed in such a way that the maximum depth of flow at ultimate peak flow is limited to 0.80 diameters. Whenever the depth of flow exceeds 0.80 D, either the diameter or the slope of the pipe is changed to adjust the depth of flow.

5.4.11 Velocity of flow:

The velocity of flow in the sewers lines are to be adjusted in such a way that there is minimum deposition in the line and no scouring occurs in the line. A minimum velocity of 0.6 m/s and maximum velocity of 2.50 m/s is adopted for design. The slopes of the pipes lines are adjusted to get the minimum / maximum velocity. In the Neyyattinkara municipality is and surrounding areas alluvial soils are found in major portions. The water table is also high. So trenching in this area will be difficult. Hence in order to limit the depth of cutting, the slopes in the 225mm pipes are adjusted in such a way that as far as possible the velocity in the line gets minimum self- cleaning velocity. But in certain initial stretches, the velocity is less than 0.6m/sec, to avoid silting in the upper reaches due to less flow, flushing will be necessary and has to be provided periodically.

5.4.12 Minimum and maximum cover

The minimum earth cover over the pipe line shall be 1.00 m. Due to the difficulty in trenching in the water logged area, the maximum depth of cutting is restricted to 4.50m, with few exemptions, where the depth of cutting slightly exceeds above 4.50m. The gravity sewers all designed for the peak flow. Manning formulae for open channel flow is used for the design of gravity sewers. The coefficient of roughness is as follows:

- Stoneware pipes = 0.015
- PVC pipes = 0.011
- R.C. C. Pipes = 0.015
- PE Pipes =0.011

5.4.13 Laying Sewerage lines through Roads

The project aims to lay sewerage lines through various roads in Neyyattinkara municipality is to collect sewerage in collection wells and then to pump it to the proposed STP near Vempanikkara pond for further treatment.

5.4.14 Sewer Appurtenance – Manholes

Sewer appurtenances are devises necessary in addition to pipes and conduits, for the proper functioning of the sanitary sewers. These include ordinary manholes, Junction manholes, drop manholes, siphon's etc.

Man holes are provided at every 30m intervals to facilitate manual cleaning. For higher diameter pipes, in straight lengths, the interval has been increased up to 90 m maximum. Manholes are also provided at every change of alignment, gradient and diameter. Junction man holes are proposed at junctions where two or more lines meet.

Circular man holes are proposed in all the cases. An Internal diameter of 1200mm is proposed for man holes for 200 mm dia pipes, 1500 mm for 250 mm dia pipes a, 1800 mm for 315 mm dia pipes and 2250 mm for 400mm dia pipes as per CPHEEO standards. Inverted siphons are proposed at places, where the sewer lines have to cross obstructions like railway lines, water bodies etc.

Number of manholes proposed in this project are as follows.

Table No.6 No. of Manholes in the Project area with different Diameter

Diameter of manholes(mm)	900	1200	1500
No. of manholes	467	40	78

5.4.15 Sewerage Pumping Stations - Collection well and pump house

The pump houses proposed are located in vacant lands, but to minimize extend of land to be acquired and it is proposed to provide submerged wet well pumps and circular pump houses. Normally detention period up to 2 hrs is allowed for the sewerage in the collection well, before being pumped into the Treatment plant. Two numbers pump sets with 100% standby are to be housed in each pump house to meet DWF, 2DWF and 3DWF. There are 2 new Pump Houses in this proposal, near Vempanikkara pond and near Vazhuthoor. At many locations which cannot naturally (with gravity flow) contribute to gravity sewers will be connected with lift manholes. These lift manholes will pump to the nearest gravity manholes.

Table No.7 No. of Lift Manholes

Nos of lift manholes	23 Nos
No of pumps per lift manholes	2 Nos
Total no of pumps required	46 Nos

CHAPTER 6

DESIGN OF SEWERAGE SYSTEM

The components of the sewerage system have to be designed for economy, Functioning to the expected level etc. The main components of the project are listed below.

1. Sewerage Network – For collecting sewerage from user end and to transport it to the main trunk and finally to collection wells.
2. Man Holes – It is required to provide man holes in the sewer line at an interval of 30m to make clear the lines if clogging or choking occurs. Flushing can also be done in man holes.
3. Collection wells – These wells collect sewerage from network and from there is pumped to the STP. It also serves as storage tank in the case of minimum flow condition to avoid frequent starting and stopping of pump sets.
4. Pumping mains – The pumping main carries sewerage from collection well to STP under pressure.
5. Pump sets – These are used to create a driving force to transport sewerage from collection well to STP with the aid of power.

6.1 Design of Sewerage Network

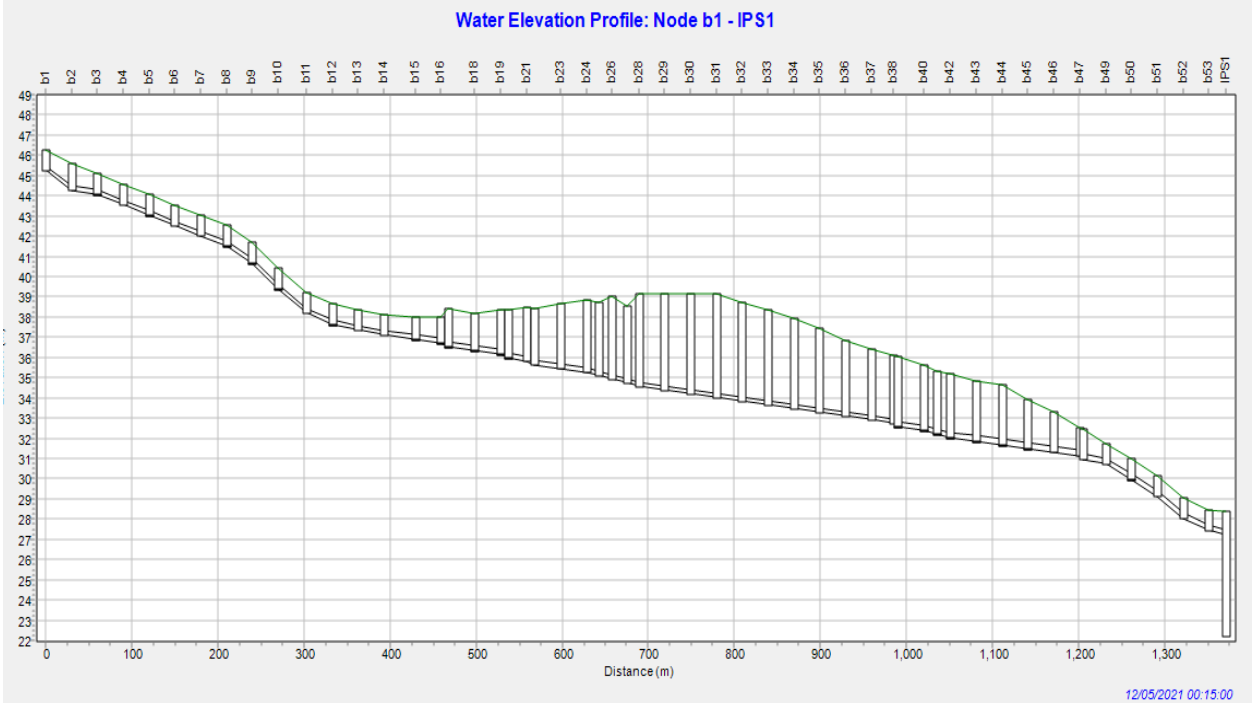
In the project area the main roads are identified and ground levels have been extracted from DGPS Survey. The junction points and control points were cross-checked with field survey data with DGPS equipment as the water supply details taken years back. Social survey was done to ascertain the living conditions and amenities provided in the house holds. Reconnaissance survey was also carried out to assess the nature of buildings such as offices, institutions such as schools, colleges, hospitals, lodges, etc.

The software EPASWMM was used to design the network owing to the fineness in the results. The EPA Storm Water Management Model (SWMM) is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas. The runoff component of SWMM operates on a collection of sub catchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion of SWMM transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators. SWMM tracks the

quantity and quality of runoff generated within each sub catchment, and the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period comprised of multiple time steps. As the sewerage network system is designed by considering it as open channel flow, this software is the most apt for the design of sewer network. Moreover, we can visualize the output in a three dimensional platform and hence it can be refined to least error.

The manholes are first plotted in the scaled, geo referenced, AutoCAD base map. Using this AutoCAD base map prepared, a windows metafile format used as back drop in the EPASWMM window. The nodes representing manholes and links representing the conduits are plotted for developing the model in the EPASWMM software, consequently entered the parameters regarding the nodes and links. Based on the population scattered in the area especially taking into consideration the point load from various flats located in the selected zone, the sewerage load is assessed in each manhole and fed as dry weather flow in the model. The peak factor considered is 2.5. Flow routing is done correcting the invert levels of manholes by trial and error to the proposed outfalls . By several trials it was refined to successfully run with least error. The detailed output of EPASWMM for zone I .

225mm to 355mm HDPE PN 8 pipes are selected for the network for smooth functioning with little maintenance. The inverted level of manholes has been selected by providing the required slope for the movement of sewerage with gravity. The EPASWMM model of Neyyattinkara Municipality is as follows.



Sewer Details					
Sl No	Dia of sewer (mm)	Material	No of sewer	Length (m)	Method of laying
1	208/225	HDPE (PE-100,PN-8)	467	12178	Open Trench
2	260/280	HDPE (PE-100,PN-8)	40	936	Open Trench
3	329/355	HDPE (PE-100,PN-8)	77	2027	Open Trench
Total			**1654**	**15141**	

6.2 Pumping Main

In the project there are 23 lift manholes and sewage from these manhole is pumped through pumping mains to nearest sewer line/manholes. Two collection wells proposed near Vempanikkara pond and at Vazhuthoor. Sewage from these collection wells is pumped through pumping main to STP proposed near Vempanikkara pond.

EPANET software is used to design pumping mains. In this software, minor losses and major losses are taken into account. The software is capable of modeling system.

Manhole Details				
Sl No	**Cutting depth**	**No**	**Average depth (m)**	**Diameter (mm)**
1	Cutting depth upto 1.65	467	1.1	900
2	Cutting depth 1.65 to 2.3	40	1.9	1200
3	Cutting depth 2.3 to 5	75	3.7	1500
4	Cutting depth above 5	2	5.1	1500
Total		**584**		

Pumping main			
From	**Size of pipe**	**Total length (m)**	**Average length (m)**
Lifting manhole	100mm DIK9	8050	350
IPS	150mm DIK9	1900	1900
MPS	250mm DIK9	30	30
	200mm DIK9	170	170
Total		**10150**	

6.3 Pump Sets

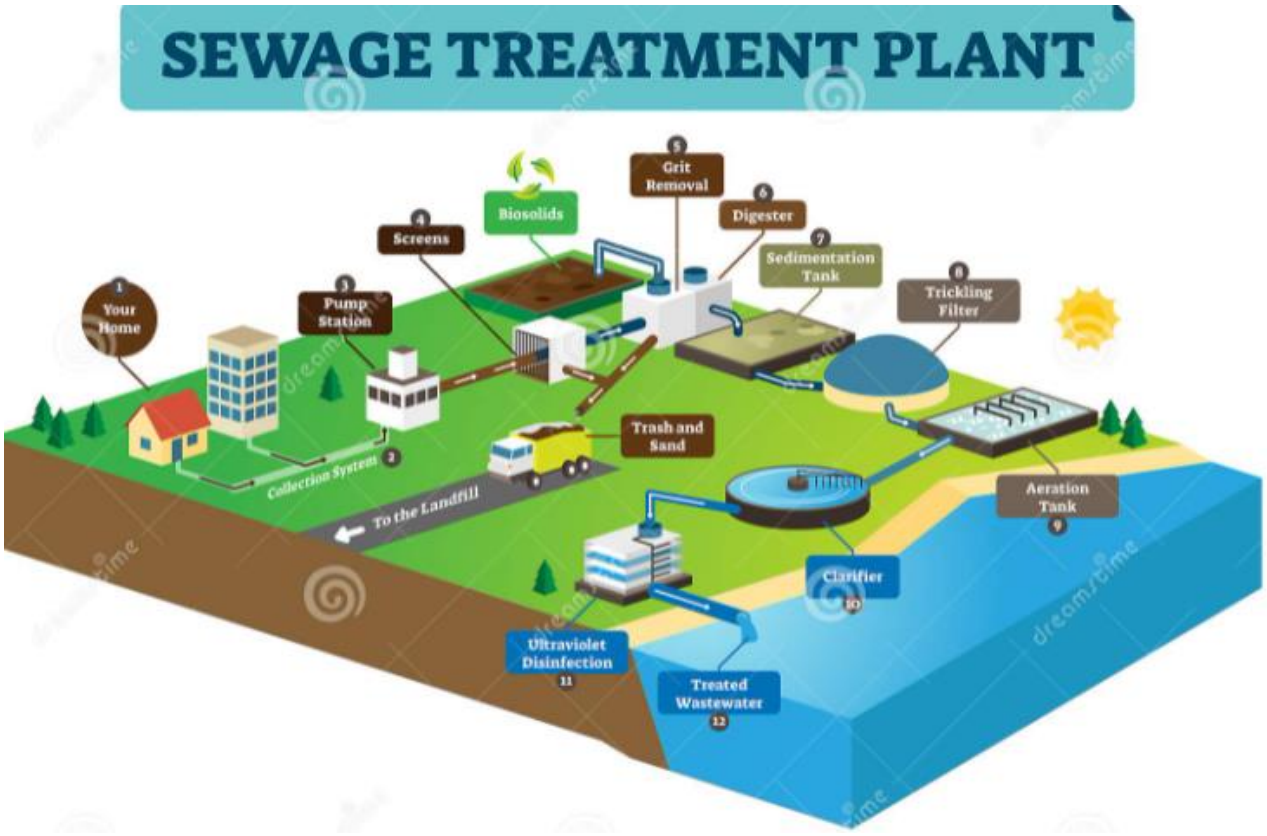
Submersible Pump sets are proposed in this project due to simplicity of operation and absence of suction head.

Following pump sets are proposed,

MPS- 70 hp (non-clog submersible) - 2 Nos (1 standby)
IPS - 25 hp (non-clog submersible) - 2 Nos (1 standby)
Liftmanhole- 2 hp (non-clog submersible) - 23 Nos hp (23 standby)

CHAPTER 7
TECHNOLOGY FOR STP

7.1 SEWERAGE TREATMENT



Sewerage treatment is a type of wastewater treatment which aims to remove contaminants from sewerage to produce an effluent that is suitable for discharge to the surrounding environment or an intended reuse application, thereby preventing water pollution from raw sewerage discharges. Sewerage contains wastewater from households and businesses and possibly pre-treated industrial wastewater. There is a high number of sewerage treatment processes to choose from. These can range from decentralized systems (including on-site treatment systems) to large centralized systems involving a network of pipes and pump stations which convey the sewerage to a treatment plant.

Sewerage is typically transported through a sewer system. Sewerage consists of wastewater discharged from residences and from commercial, institutional and public facilities that exist in the locality. Sub-types of sewerage are grey water (from sinks, bathtubs, showers, dishwashers, and clothes washers) and black water (the water used to flush toilets, combined with the human waste that it flushes away). Sewerage also contains soaps and detergents. Food waste may be present from dishwashing. Sewerage may contain micro-pollutants and pollutants from industrial wastewater.

The main parameters in sewerage that are measured to assess the sewerage strength or quality as well as treatment options include: solids, indicators of organic matter, nitrogen, phosphorus, and indicators of fecal contamination. The following four types of pathogens from fecal matter are found in sewerage: bacteria, viruses, protozoa, helminthes and their eggs. In order to quantify the organic matter, indirect methods are commonly used: mainly the Biochemical Oxygen Demand (BOD) and the Chemical Oxygen Demand (COD). Typical values for physical–chemical characteristics of raw sewerage in developing countries have been published as follows: 180 g/person/d for total solids (1100 mg/L concentration), 50 g/person/d for BOD (300 mg/L), 100 g/person/d for COD (600 mg/L), 8 g/person/d for total nitrogen (45 mg/L), 4.5 g/person/d for ammonia-N (25 mg/L) and 1.0 g/person/d for total phosphorus (7 mg/L).

Sewerage can be treated close to where the sewerage is created, which may be called a "decentralized" system or even an "on-site" system (on-site sewerage facility, septic tanks, etc.). Alternatively, sewerage can be collected and transported by a network of pipes and pump stations to a municipal treatment plant. This is called a "centralized" system. The procedure for removing contaminants from the wastewater basically from the household sewerage is called sewerage treatment. It has to undergo the chemical, physical and biological procedure to remove these contaminants and give out an environmentally safe treated effluent.

Choosing the most suitable treatment process is complicated and requires expert inputs, often in the form of feasibility studies. This is because the main important factors to be considered when evaluating and selecting sewerage treatment processes are numerous: process applicability, applicable flow, acceptable flow variation, influent characteristics, inhibiting or refractory compounds, climatic aspects, process kinetics and reactor hydraulics, performance, treatment residuals, sludge processing, environmental constraints, chemical product requirements, energy requirements, requirements of other resources, personnel requirements, operating and maintenance requirements, ancillary processes, reliability, complexity, compatibility, area availability. With regards to environmental impacts the following aspects are included in the selection process: Odors, vector attraction, sludge transportation, sanitary risks, air contamination, soil and subsoil contamination, surface water pollution or groundwater contamination, devaluation of nearby areas, inconvenience to the nearby population.

The different stages of the treatment process involved for the treatment of sewerage is shown in the flow diagram.

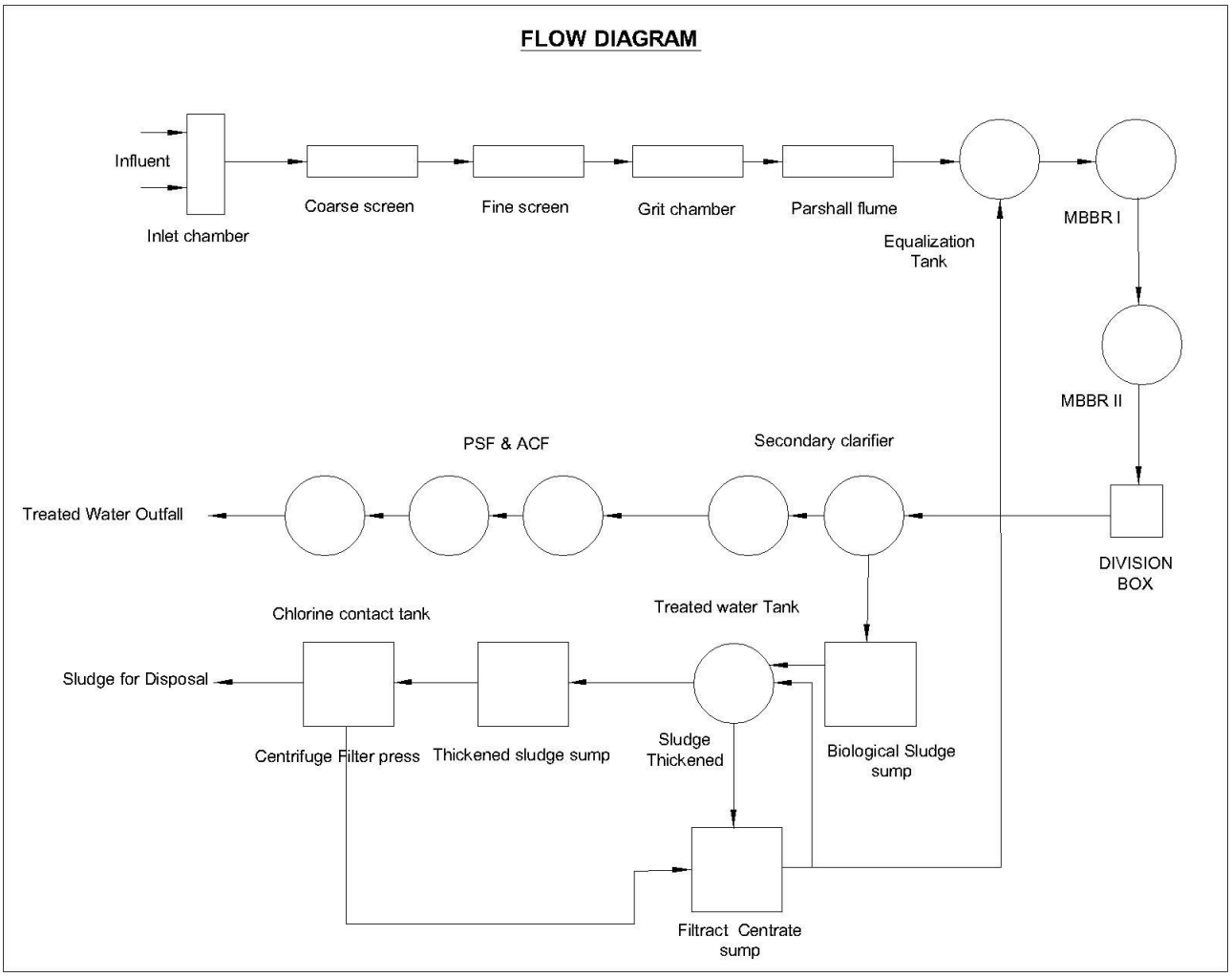


Figure- 7.1 Hydraulic Flow Diagram

7.2 TREATMENT UNITS

7.2.1 Pre-treatment

Pre-treatment removes all materials that can be easily collected from the raw sewerage before they damage or clog the pumps and sewerage lines of treatment. Objects commonly removed during pretreatment include trash, tree limbs, and other large objects. The influent in sewerage water passes through a bar screen to remove all large objects like cans, rags, sticks, plastic packets, etc. carried in the sewerage stream. This is most commonly done with an automated mechanically raked bar screen in modern plants serving large populations, while in smaller or less modern plants, a manually cleaned screen may be used. The raking action of a mechanical bar screen is typically paced according to the accumulation on the bar screens and/or flow rate. The solids are collected and later disposed of in a landfill, or incinerated.

7.2.1.1 Grit removal

Grit consists of sand, gravel, cinders, and other heavy materials. Pretreatment may include a sand or grit channel or chamber, where the velocity of the incoming sewerage is adjusted to allow the settlement of sand and grit. Grit removal is necessary to

- Reduce formation of heavy deposits in aeration tanks, aerobic digesters, pipelines, channels, and conduits
- Reduce the frequency of digester cleaning caused by excessive accumulations of grit and
- Protect moving mechanical equipment from abrasion and accompanying abnormal wear.

The removal of grit is essential for equipment with closely machined metal surfaces such as comminutors, fine screens, centrifuges, heat exchangers, and high pressure diaphragm pumps. Grit chambers come in 3 types: horizontal grit chambers, aerated grit chambers, and vortex grit chambers. Sand and other particles of specific gravity > 2.65 are settled in the Grit Chamber. Grit removal systems have been designed to remove clean inorganic particles that are greater than 0.210 millimetres, most grit passes through the grit removal flows under normal conditions. During periods of high flow deposited grit is resuspended and the quantity of grit reaching the treatment plant increases substantially. It is, therefore, important that the grit removal system not only operate efficiently during normal flow conditions but also under sustained peak flows when the greatest volume of grit reaches the plant.

7.2.1.2 Parshall flume

The Parshall flume is an open channel flow metering device that was developed to measure the flow. It is used to measure volumetric flow rate in municipal sewer lines, and influent/effluent flows in wastewater treatment plants. In Parshall flume flow should be measured at a point that is 2/3 the length of the converging wall measured back from the throat. It is important to note that this distance is NOT simply 2/3 of the distance back from the throat, but 2/3 of the length of the side wall. The advantages of the Parshall flume are

- It passes sediment and small trash easily
- It requires only a small head loss, and
- It allows accurate flow measurements even when partially submerged. A disadvantage of the Parshall flume is that it is not accurate at low flow rates.

7.2.1.3 Equalization tank

Flow equalization is used to minimize the variability of water and wastewater flow rates and composition. The main function of the equalization tank is to act as a buffer: to collect the raw incoming sewerage that comes at widely fluctuating rates and pass it on to the rest of the sewerage treatment plant at a steady flow rate. The tank is rectangular in shape to provide

placement of air diffusers for full floor coverage. Each unit operation in a treatment train is designed for specific wastewater characteristics. Improved efficiency and control are possible when all unit operations are carried out at uniform flow conditions. The equalization tanks are provided (i) to balance fluctuating flows or concentrations, (ii) to assist self- neutralization, or (iii) to even out the effect of a periodic "slug" discharge from a batch process. In STP design equalization tank is provided to enable the source to operate at a predetermined rate. Waste water generated does not flow at a constant rate. Even in dry weather, the flow rate varies from hour to hour. Flow equalization is a process of controlling flow velocity and flow composition. It is necessary in many municipal treatment processes to dampen severe variation in inflow and water quality. Providing consistent flow and loading to a biological process is important to maintain optimal treatment. The principal factors considered in the design of equalization tanks are

- Location and configuration,
- Volume
- Tanks geometry,
- Mixing and air requirements,
- Appurtenances (accessories, trappings) and
- Pumping facilities

Considering the variation in hourly flow pattern adopted as shown in appendix, volume of equalization tank is arrived at around 1055 m3. Thus in order to maintain uniform flow rate the retention time is considered as 5.06 hrs. Due to the additional retention time, aeration and mixing is required to prevent the raw wastewater from becoming septic and to maintain solids in suspension. Homogeneous mixture in Equalization Tank is done via the actions of coarse bubble diffusers, oxygen transfer efficiency of a coarse bubble diffuser is 10%-20% and are capable of delivering 6 - 12 m3 / hour air , typical diameter of coarse bubble diffuser is 150 mm other role is to make water homogeneous in nature.

7.2.2 Secondary treatment

Secondary treatment removes the soluble organic matter that escapes primary treatment. It also removes more of the suspended solids. Removal is usually accomplished by biological processes in which microbes consume the organic impurities as food, converting them into carbon dioxide, water, and energy. MBBR has been proposed as a secondary treatment option due to the following reasons.

1.MBBR has been in existence sufficiently for a long time, also in India and is a proven technology.

2. Minimum footprint

3. Better stabilized sludge
4. Better Effluent Quality
5. Less sophisticated
6. Spare parts available
7. Lower life cycle cost
8. Nil odour nuisance and other environmental hazards

The MBBR process is an attached growth biological wastewater treatment process. That is, the microorganisms that carry out the treatment are attached to a solid medium, as in trickling filters or RBC systems. The microorganisms that carry out the treatment are kept suspended in the mixed liquor in the aeration tank.

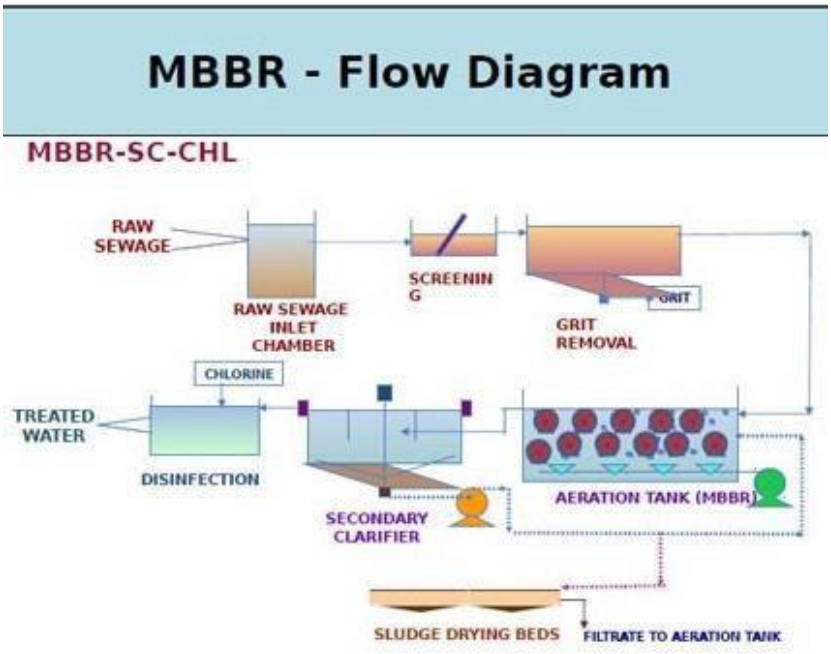
7.2.2.1 Moving bed bio reactor (mbbr) technology

Moving Bed Bio Reactor (MBBR) / Fixed Aerated Bioreactor (FAB) With the moving bed bio reactor (MBBR) an economically solution is offered for waste water treatment if the "bulk" of the pollution load must be disposed of (as means of cost reduction) or if applicable discharge regulations are not as strict. With this application we offer advanced waste water treatment solutions for the industrial and municipal markets. These solutions significantly increase the capacity and efficiency of existing waste water treatment plants, while minimizing the size of new plant deployments.

This method makes it possible to attain good efficiency results of disposal with low energy consumption. This process is used for the removal of organic substances, nitrification and denitrification.

The MBBR system consists of an activated sludge aeration system where the sludge is collected on recycled plastic carriers. These carriers have an internal large surface for optimal contact water, air and bacteria.

MBBR technology employs thousands of polyethylene biofilm carriers operating in mixed motion within an aerated wastewater treatment basin. Each individual bio- carrier increases productivity through providing protected surface area to support the growth of heterotrophic and autotrophic bacteria within its cells. It is this high-density population of bacteria that achieves high-rate biodegradation within the system, while also offering process reliability and ease of operation.



This technology provides cost-effective treatment with minimal maintenance since MBBR processes self-maintain an optimum level of productive biofilm.

Additionally, the biofilm attached to the mobile bio carriers within the system automatically responds to load fluctuations.

7.2.2.2 process benefits

- Compact Design: A fraction of the size of conventional systems
- Expandable: Capacity can be easily upgraded by simply increasing the fill fraction of biofilm carriers
- Single Pass Process: No return activated sludge stream required
- Load Responsive: Actively sloughed biofilm automatically responds to load fluctuations
- Minimal Maintenance
- No F/M ratios or MLSS levels to maintain MBBR processes are an excellent solution for common wastewater applications including
- BOD Reduction
- Nitrification
- Total Nitrogen Removal
- Moving Bed Biofilm Reactor systems deliver a flexible, cost-effective, and easy-to- operate means to address current wastewater requirements and the expandability to meet future loads or more stringent discharge requirements within a compact design.

Advantages of the MBBR system over other activated sludge processes are:

- Reduced footprint for the aeration tank (MBBR reactor) and overall plant footprint Relatively stable and can withstand shock loads
- Low sludge production
- Mother Liquor Suspended Solids (MLSS) is not a design parameter so no need for Return Activated Sludge (RAS) and the associated
- pumps/pumping facilities
- Modular design, easy to expand
- Utilizes medium/coarse bubble diffusers, instead of more expensive fine bubble systems

7.2.2.3 Features of mbbr

In Fluidized aerobic process a non-clogging biofilm reactor with special grade plastic media having density close to that of water is used. This plastic media has more surface area and biofilm grows on these media which move along with the water in the reactor. This movement within the reactor is generated by providing aeration with the help of diffusers placed at the bottom of the aerobic reactor. The thin biofilm on the elements enables the bacteria to act upon the biodegradable matter in sewerage and reduce BOD / COD content in the presence of oxygen present in air. Area requirement for this process is 1/10 of space required for conventional sewerage treatment plants. Power requirements are low as recycling of sludge is not done in this method as required in ASP. This can take shock loads and can withstand variation. Expected

COD/BOD removal is more than 95%.

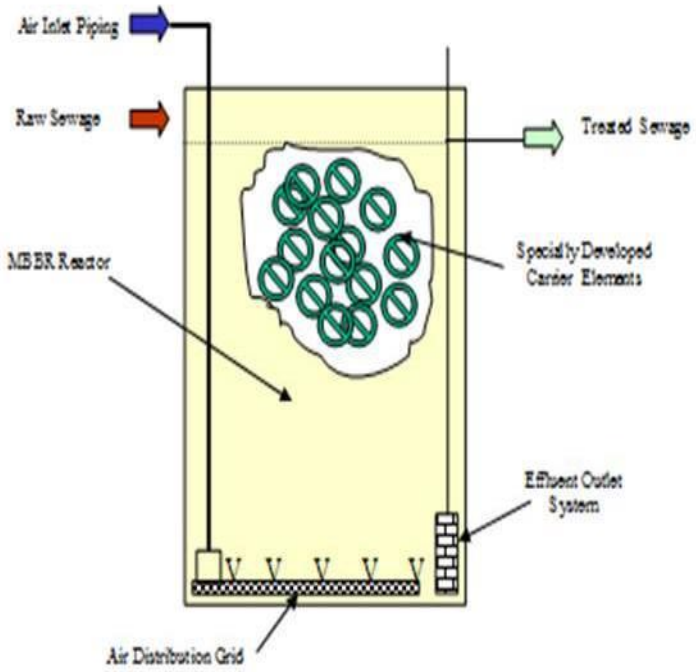


Fig 7.2: Essential Components of MBBR

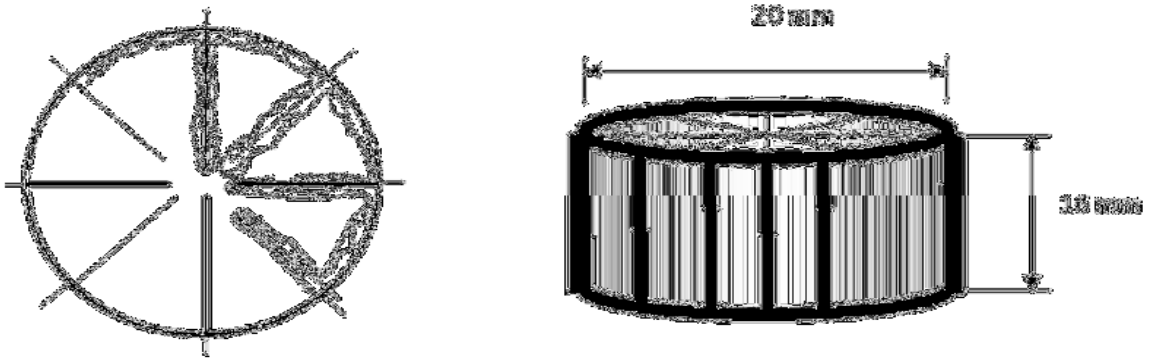


Fig 7.3: MBBR Media

7.2.2.4MBBR Wastewater treatmentprocessalternatives

The MBBR wastewater treatment process is quite flexible and can be used in several different ways. The figure shows the flow diagram of the options adopted for the proposed treatment plant, with single stage BOD removal, nitrification, post anoxic denitrification with raw sewerage feeding for carbon source and thereafter removing low grade BOD in the subsequent reactor

7.2.2.5 Post anoxic de-nitrification alternative

In order to carry out the de-nitrification of the waste water flow (removal of the Nitrogen from the waste water), it is necessary to first nitrify the waste water, conversion of ammonia nitrogen typically present in the influent wastewater to nitrate. Nitrification will only take place at a reasonable rate in the MBBR reactor if the BOD level is quite low, thus an MBBR de- nitrification process will need a reactor for BOD removal, one for nitrification and one for de- nitrification. Nitrification reactor will always follow the BOD removal reactor because of the need for low BOD level in the nitrification reactor. De-nitrification reactor is provided after the nitrification reactor as the post anoxic de-nitrification.

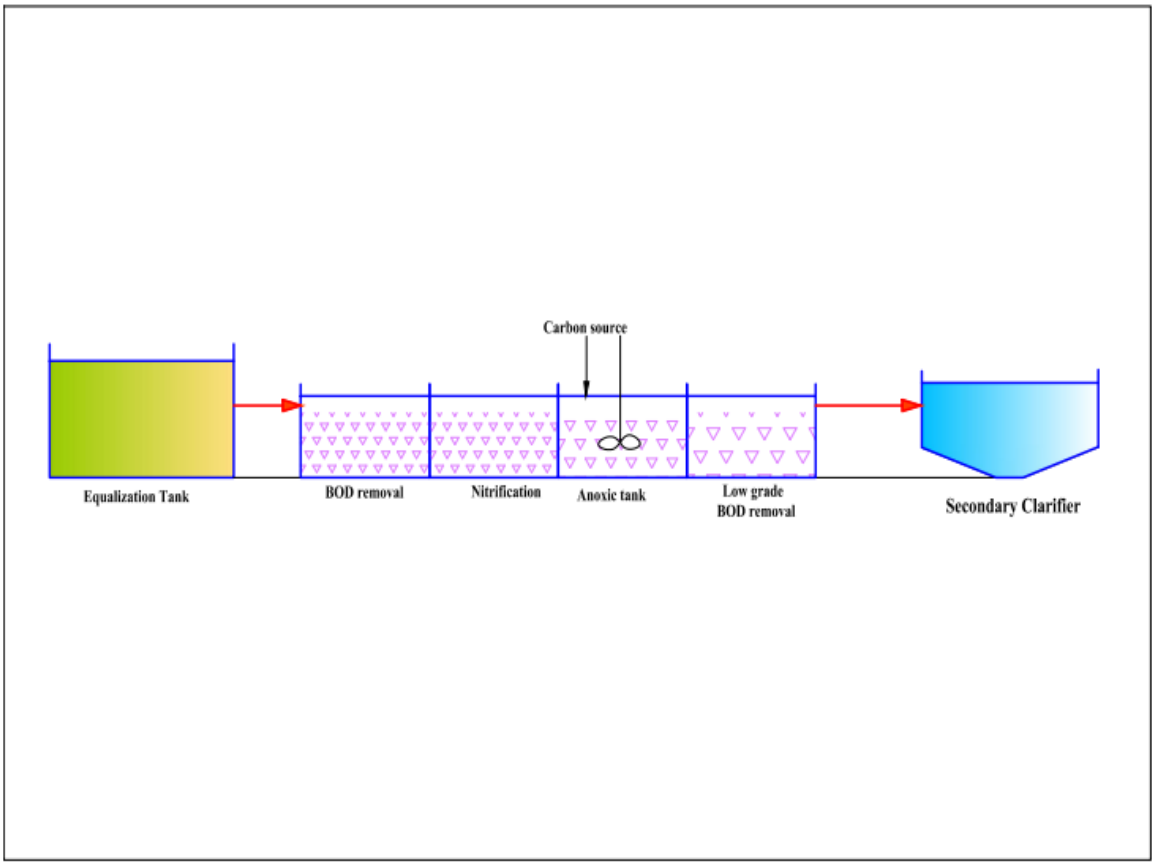


Figure 7.4 Nitrification and De-nitrification Reactors

7.2.2.6 Nitrification tank

Ammonia in wastewater could originate from a variety of sources, including Proteins (meat and blood), urea, amino acid products, casein, corrosion inhibitors, process chemicals and raw materials or cleaning chemicals containing quaternary ammonium compounds. Nitrification is a bio-chemical reaction that occurs inside bacteria. Two species of bacteria are involved in the process – Nitrosomonas and Nitrobacter. These bacteria are collectively known as nitrifiers and are autotrophic, i.e. they get their carbon source from inorganic carbon (carbonates, bicarbonates) or carbon dioxide. A healthy and stable population of nitrifiers (Nitrosomonas and Nitrobacter) will not exist without the following conditions:

- **Oxygen**: Nitrifiers are obligate aerobes, i.e. they require free molecular oxygen and are killed off by anaerobic conditions. Maximum nitrification occurs at a D.O. (Dissolved Oxygen) level of 3.0 mg/l. Significant nitrification occurs at a D.O. level of 2.0 to 2.9 mg/l. Nitrification ceases at D.O. levels of <0.5 mg/l. Approximately 4.6 kg of oxygen are required for every kg of ammonium ions oxidized to nitrate (This compares with a requirement of 1 kg of oxygen to oxidize 1 kg of carbonaceous B.O.D.). An absence of oxygen for <4 hours does not adversely affect nitrifiers when oxygen is restored. To ensure effective nitrification, always maintain a D.O. level of 1.5 mg/l.

•**Temperature**:Nitrification is temperature sensitive. The optimum temperature for nitrification is generally considered to be 30°C.

TEMPERATURE EFFECT UPON NITRIFICATION

>45°C	Nitrification ceases
28-32°C	Optimal temperature range
16°C	Approx. 50% of nitrification rate at 30°C
10°C	Significant reduction in nitrification rate – 20% of rate at 30°C
<5°C	Nitrification ceases

●**Alkalinity and pH**: Alkalinity is lost in an activated sludge process during nitrification. Nitrifiers use alkalinity as a carbon source, i.e., they use an inorganic form of carbon. Hydrogen ions (H+) are produced when ammonium ions are oxidized to nitrite:

$NH4^{++} + 1.5O2 \rightarrow 2H^{+} + NO2^{-} + 2H_2O.$

Nitrous acid (HNO2) is also produced during the oxidation of ammonium ions. This destroys alkalinity:

$H^{+} + NO2^{-} \rightarrow HNO2^{-}$

7.14 mg of alkalinity as CaCO3 are destroyed for every mg of ammonium ions oxidized. If the pH drops below 6.7, there is a significant decrease in nitrification. Therefore, it is important to maintain an adequate alkalinity in the aeration tank to provide pH stability and also to provide inorganic carbon for nitrifiers. After complete nitrification, a residual alkalinity of 50 mg/l in the aeration tank is desirable. If this alkalinity is not present, then alkalinity should be added to the aeration tank. The optimal pH range for nitrification is 7.2 to 8.0. A substantial reduction in nitrification activity occurs at pH levels below 6.7.

● **High mean cell residence time (sludge area) or low f:m:** The necessary MCRT or F: M values are temperature dependent. Nitrifier activity and reproduction are decreased during cold temperatures. Therefore, in winter, an increase in the quantity of nitrifiers (MLVSS) or an increase in MCRT is often required to maintain effective nitrification. Reducing the wasting rate (WAS rate) will increase the MCRT.

Inhibition/toxicity: Inhibition is temporary short-term or long-term loss of enzymatic activity. Toxicity is permanent loss of enzymatic activity or irreversible damage to cellular structure. Small increases in inhibitory wastes can cause a dramatic reduction in

nitrification. Nitrifiers grow slowly and only account for a small portion of the bacterial assemblage in an aeration system. Nitrifiers are excellent indicators of toxic shock in an effluent treatment plant. Significant loss of nitrification will occur before loss in efficiency of carbonaceous BOD removal. Nitrifying bacteria are also inhibited by relatively low concentrations of free ammonia (10 mg/l for Nitrosomonas; 0.1 mg/l for Nitrobacter) and free nitrous acid (1.0 mg/l for both Nitrosomonas and Nitrobacter). Free ammonia (NH3) is produced from ammonium ions under a high pH in the aeration tank. Free nitrous acid (NHO2) is produced from nitrite ions under a low pH in the aeration tank. This type of inhibition is known as substrate inhibition. Substrate inhibition usually occurs at a concentration of 400-500 mg/l ammonium ions or when ammonium ions are converted to nitrite ions at a faster rate than nitrite ions are converted to nitrate ions.

● **BOD:** Soluble and simplistic forms of cBOD can inhibit the activity of nitrifying bacteria. They are able to enter the cells of nitrifying bacteria and inactivate their enzyme systems. This form of cBOD must be degraded significantly or completely by organotrophs in order for nitrifying bacteria to oxidize ammonium and nitrite ions. Nitrifiers are dependent on organotrophs to reduce cBOD to relatively low concentrations (<40-50 mg/l). Excess BOD can cause a significant oxygen demand, which may cause a drop in D.O. that adversely affects nitrifying bacteria. Fluctuations in BOD loading may lead to intermittent nitrification.

7.2.2.7 De-nitrification process in the reactor

Denitrification is the process that converts nitrate to nitrogen gas, thus removing bioavailable nitrogen and returning it to the atmosphere. Unlike nitrification, denitrification is an anaerobic process, occurring mostly in soils and sediments and anoxic zones in lakes and oceans. In a biological water treatment, denitrification is generally the next step following nitrification. Here nitrate (NO3) and nitrite (NO2) are transformed into nitrogen (N2). The gaseous nitrogen escapes out of the water into the air. Air exists for 78% out of nitrogen (N2) and for 21% out of O2 (oxygen), so N2 is absolutely not polluting the atmosphere. A large number of aerobic bacteria is able to perform denitrification. When there is no oxygen in the water, these bacteria use nitrate and nitrite as a source of oxygen.

The denitrification reaction requires a carbon source. Hence raw sewerage is proposed to dose from the equalization tank to the denitrification tank and BOD in the primary effluent waste water is used as the carbon source for the denitrification. Thereafter a reactor is also proposed for dealing low grade BOD in the effluent.

7.2.2.8 Secondary clarifier

Secondary clarifiers are to separate biological floc from the treated liquid waste stream. Plate settlers are also being proposed in the clarifier to get more clarified water. Clarifiers are settling tanks built with mechanical means for continuous removal of solids being deposited by sedimentation. A clarifier is generally used to remove solid particulates or suspended solids from liquid for clarification. Necessary coagulants are being added before feeding the clarifier.

7.2.2.9 Clarified water collection tank

After treatment, the effluent is stored in this tank from where it is taken for further treatment.

7.2.2.10 Sludge collection sump

The dead bacteria that dies after consuming BOD and COD are retained in the form of sludge from the bottom of the tank.

7.2.2.11 Dewatering unit

A dewatering unit is required to further dry the sludge. The centrate at the outlet of the dewatering unit is then recirculated to the system.

7.2.3 tertiary treatment

Tertiary treatment refers to secondary treatment followed by a filtration step, such as media filtration, so that the turbidity and TOC concentrations are generally lower, and if coagulation with metal salts is used, then the phosphate concentration will also be reduced.

7.2.3.1 Pressure sand filter (psf)

The treated water which is collected in the filter feed tank shall be pumped into the Pressure Sand Filter using the Filter Feed Pumps. They are the most popular method for removal of turbidity from water. The Pressure Sand Filter consists of a multiple layer of sand with a variety in size and specific gravity. These Filters are designed to remove turbidity and suspended particles present in the feed water with minimum pressure drop. Raw water flows downwards through the filter bed and as the suspended matter, which is treated by addition of a coagulant like alum or poly electrolyte, is retained on the sand surface and between the sand grains immediately below the surface. There is steady rise in the loss of head over a period of time and the flow reduces once the pressure drop across the filter is excessive. The filter is then taken out of service and cleaning of the filter media is affected by flow reversal also called as backwash. To assist in cleaning the bed, the backwash operation is sometimes preceded by air scouring by way of

agitation through the under drain system. The air scouring agitates the sand with a scrubbing action, which loosens the intercepted particles.

Fig 5.5 Pressure Sand Filter

7.2.3.2 Activated carbon filter (acf)

Filtered wastewater from Pressure sand filter is then passed through the Activated Carbon Filter. They are generally employed in the process of removing organic compounds and/or extracting free chlorine from water, thereby making the water suitable for discharge. Activated carbon is commonly used for removing organic constituents and residual disinfectants in water supplies. This not only improves taste and minimizes health hazards; it protects other water treatment units such as reverse osmosis membranes and ion exchange resins from possible damage due to oxidation or organic fouling. Activated carbon is a favoured water treatment technique because of its multifunctional nature and the fact that it adds nothing detrimental to the treated water. Most activated carbons are made from raw materials such as nutshells, wood, coal and petroleum.

Carbon filtering is a method of filtering that uses a bed of activated carbon to remove contaminants and impurities, using chemical adsorption. Each particle/granule of carbon provides a large surface area/pore structure, allowing contaminants the maximum possible exposure to the active sites within the filter media.

Fig 5.6 Activated Carbon Filter

7.2.3.3 Chlorine contact tank

Chlorination is by far the most common method of wastewater disinfection and is used worldwide for the disinfection of pathogens before discharge into receiving streams, rivers or oceans. Chlorine is known to be effective in destroying a variety of bacteria, viruses and protozoa, including Salmonella, Shigella and Vibrio cholera. Disinfection is achieved at this facility through chlorination using chlorine gas. The purpose of the Chlorine Contact Tanks is to allow sufficient time for the chlorine to disinfect the water.

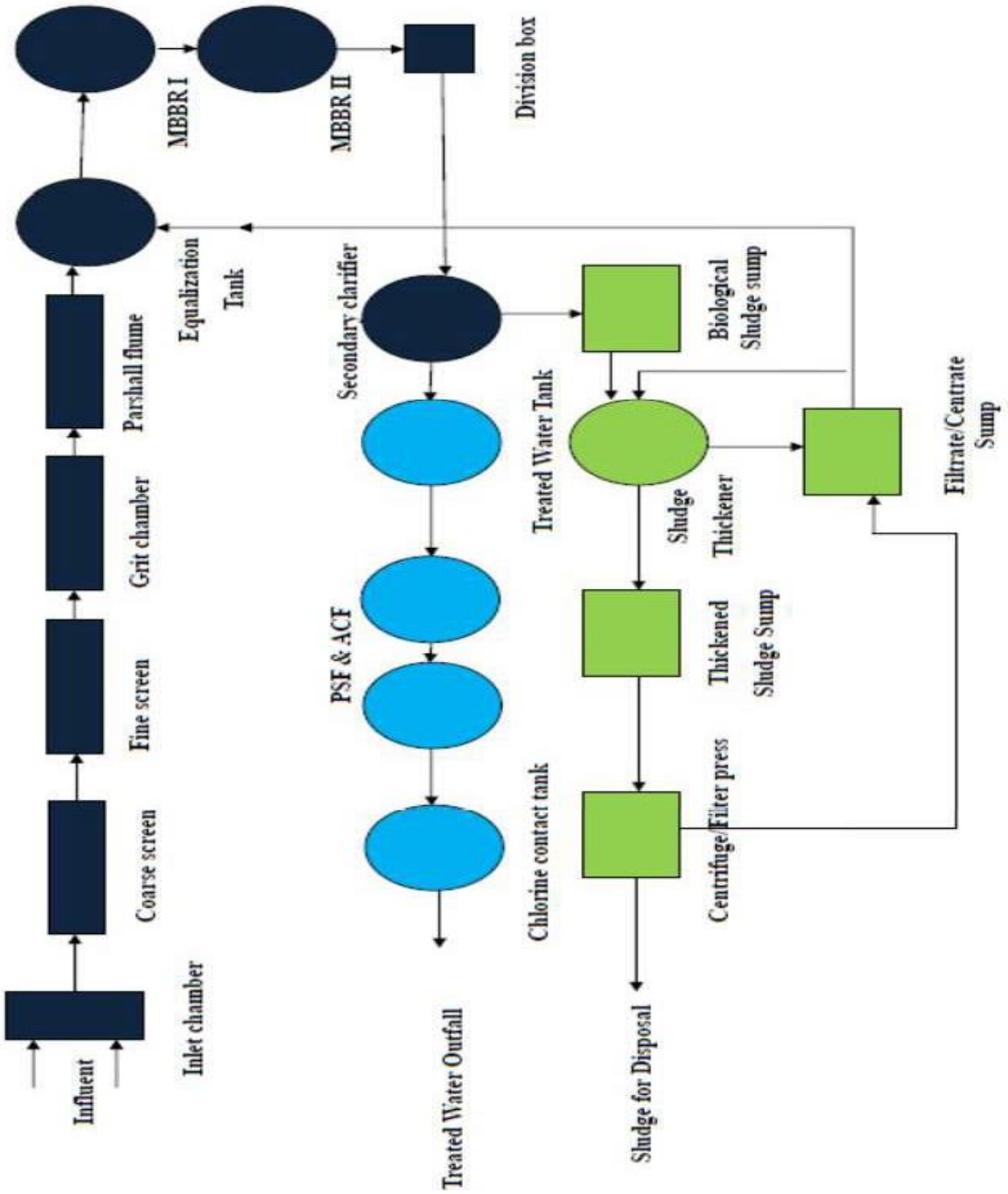
7.2.3.4 Treated water tank

Treated water is being collected in treated water tank before being disposed of to river.

7.2.4 Sludge management

The solid particles separated from wastewater is in the form of slurry and known as sludge. The volume of sludge is more as it contains more water. Hence to reduce the volume of sludge, dewatering process is done with the help of centrifuges, sludge thickening units and sludge press. After this process, it is converted in the form of cake. The sludge from sewerage is rich with nitrogen, phosphorous, Sulphur and other minerals which are essential for the growth of plants. Hence it can be used as a manure. Further researches are going on this field to make this cake as a construction material but is in its infant stage.

7.2.5 Process flow and design



7.2.6 Process Design

MBBR PROCESS				
Capacity: Average Flow			**2.5MLD**	
Sl No	Description of Parameter	Value	Unit	Reference/ Remarks
a.	Quantity of Sewerage Generated	2500000.00	LPD	
RAW SEWERAGE CHARACTERISTICS				
a.	COD	500.00	mg/Lt	
b.	BOD	250.00	mg/Lt	
c.	TSS	400.00	mg/Lt	
d.	Total Nitrogen (As N)	40.00	mg/Lt	
e.	Total Phosphorous (As P)	7.00	mg/Lt	
f.	Fecal Coliform	3×10^7	mpn/100ml	
g.	E Coliform	4×10^7	mpn/100ml	
h.	Chlorides as Cl	170.00	mg/Lt	
i.	pH	6 to 9		

7.3 Plan for Reuse of Recycled Sewage

In the planning and implementation of water reclamation and reuse, the reclaimed water application will usually govern the wastewater treatment needed to protect public health and the environment, and the degree of reliability required for the treatment processes and operation (Metcalf and Eddy). The major wastewaters re use categories are as follows:

a] agricultural irrigation, crop irrigation and commercial nurseries

b] landscape irrigation

c] industrial recycling and reuse

d] groundwater recharge, groundwater replenishment and saltwater intrusion control

e] recreational/environmental uses

f] non-potable urban uses

e] potable reuse

In the present project, the dewatered sludge can be used as manure for cultivating vegetables and other plant life.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

- . Safe water supply and hygienic sanitation facilities are the two basic essential amenities the community needs on a top priority for healthy living.

- The 73rd and 74th amendment act 1992 of the Constitution has identified Water Supply, Public Health, Sanitation, Conservancy and Solid Waste Management as function of local bodies. Kerala Water Authority based on Kerala Water Supply and Sewerage Act 1986 can render all the necessary services in regard to Water Supply and Collection & Disposal of waste water.

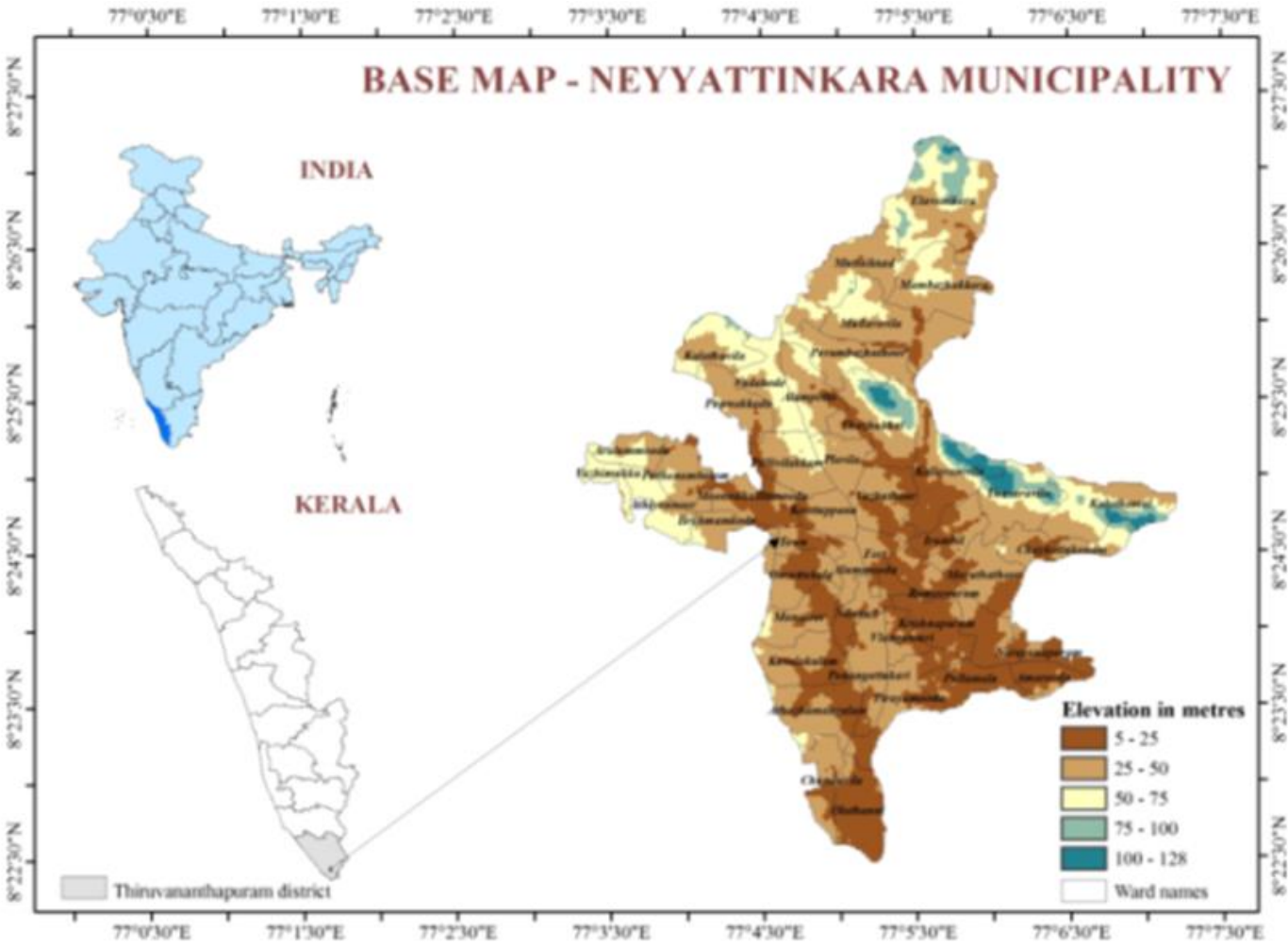
- The cost estimate of the project is excluding land cost. Land for the development of the scheme should be arranged by the local body administration.

- Necessary social awareness as well as environment assessment are also need to be organized

CHAPTER-9
ANNEXURES

Maps

NEYYATTINKARA MUNCIPALITY



STP DESIGN

DESIGN OF STP WITH MOVING BED BIOFILM-REACTOR (MBBR)						
Average flow from network	**2.5**	MLD				
Working hours	**23**					
Flow from septage dilution tank	12.18	m^3/hour	0.29	MLD		
Design flow	**2.90**	MLD	2900898	LPD	2901	m^3/day
			2901	KLD	120.87	m^3/hour
Assumed peak factor	**3**					
Peak design flow	8.70	MLD	8702695	LPD	8703	m^3/day
					362.61	m^3/hour
Raw Sewage Characteristics						
Average sewage flow entering the STP	120.87	m^3/hour				
Peak flow entering the STP	362.61	m^3/hour				
COD	**500**	mg/l				
Primary ST/ET effluent BOD	**250**	mg/l				
Thickener overflow return as fraction of plant flow	**0.15**					
Thickener overflow return	0.435	MLD				
Thickener overflow return BOD	**350**	mg/l				
Centrate from sludge dewatering as fraction of plant flow	**0.006**					
Centrate from sludge dewatering return	0.01741	MLD				
Centrate from sludge dewatering return BOD	**280**	mg/l				
Influent BOD to aeration tank	263.1	mg/l				
TSS	**400**	mg/l				
Total Nitrogen (As N)	**40**	mg/l				
Total Phosphorous (As P)	**7**	mg/l				
Faecal Coliform	**30000000**	mpn/100 ml				
E Coliform	**40000000**	mpn/100 ml				
Chlorides as Cl	**125**	mg/l				
pH	**6**					
Treated Sewage Characteristics (after filtration)						
COD	**50**	mg/l				
BOD	**10**	mg/l				
TSS	**20**	mg/l				
Total Nitrogen (As N)	**10**	mg/l				
Total Phosphorous (As P)	**1**	mg/l				
E Coliform	**1000**	mpn/100 ml				
pH	**7**					
Receiving Chamber						
Average quantity of flow	120.87	m^3/hour				
Peak flow	362.61	m^3/hour				
	0.1007	m^3/sec				
Average Retention Time for peak flow	**30**	sec	offset to wall	**0.3**	m	
Volume of the inlet chember	3.02	m^3	free board	**0.85**	m	
Assumed depth of flow	**2.1**	m	total height	2.95	m	
Area required for inlet chamber	1.44	m^2	wall thickness	**0.25**	m	
Length of the tank	**1.5**	m	slab thickness	**0.3**	m	
Breadth of the tank	0.96	fix	**1**	m	area in m^2	**5.46**
Oil and Grease Trap						
Average quantity of flow	120.87	m^3/hour				
Peak flow	362.61	m^3/hour				
	0.1007	m^3/sec				
Average Retention Time for peak flow	**300**	sec	offset to wall	**0.15**	m	
Volume of the inlet chamber	30.22	m^3	free board	**0.75**	m	
Assumed depth of flow	**2.5**	m	total height	3.25	m	

Area required for inlet chamber	12.09	m^2	wall thickness	**0.3**	m	
Length of the tank	**4**	m	slab thickness	**0.35**	m	
Breadth of the tank	3.02	fix	**3.1**	m	area in m^2	**19.6**
Breadth of baffle wall inside	3.1	m				
Manual Coarse Screen Channel						
Peak design flow	0.1007	m^3/sec				
Number of screen	**1**					
Peak flow rate per screen	0.1007	m^3/sec				
Velocity at peak flow	**1**	m/sec	assumed			
Velocity through clean bar screen	**1.10**	m/sec				
Length of channel U/S	**1**	m	wall thickness	**0.25**	m	
Width of channel provided	**0.75**	m	offset to wall	**0.25**	m	
Depth of flow	0.13	m	slab thickness	**0.30**	m	
Area required for screen	0.101	sqm				
Headloss through bar screen	0.02	m	*assuming head loss coefficient = 0.7*			
Assumed depth of flow after inserting bar screen	**0.1**	m	0.15	(control value)		
Width of channel required	1.01	m	fix	**1.1**	m	
Clear bar spacing	**20**	mm	*(20 to 50 mm)*			
Bar thickness	**10**	mm	*(5 to 15 mm)*			
Number of bars	**25**					
Clear bar spacing obtained	35	mm	OK			
Inside width of screen (openings)	0.85	m			area in m^2	**4.62**
Full height of channel	**1.2**	m	fb	**0.3**		
Angle of inclination	**45**	degree	0.79	rad		
Actual velocity at peak flow	0.79	*(between 0.60 m/sec and 0.90 m/sec)*				
Length of channel required D/S	1.20	m	fix	**1.2**	m	
Manual Fine Screen Channel						
Peak design flow	0.1007	m^3/sec				
Number of screen	**1**					
Peak flow rate per screen	0.1007	m^3/sec				
Velocity at peak flow	**0.7**	m/sec	assumed			
Velocity through clean bar screen	**1.00**	m/sec				
Length of channel U/S	**1.5**	m	wall thickness	**0.25**	m	
Width of channel provided	**1.5**	m	offset to wall	**0.25**	m	
Depth of flow	0.10	m	slab thickness	**0.30**	m	
Area required for screen	0.14	sqm				
Headloss through bar screen	0.04	m	*assuming head loss coefficient = 0.7*			
Assumed depth of flow after inserting bar screen	**0.1**	m	0.13	(control value)		
Width of channel required	1.44	m	fix	**1.5**	m	
Clear bar spacing	**6**	mm	*upto 6 mm*			
Bar thickness	**10**	mm	*(5 to 15 mm)*			
Number of bars	**47**					
Clear bar spacing obtained	22	mm	OK			
Inside width of screen (openings)	1.03	m			area in m^2	**7.5**
Full height of channel	**1.5**	m	fb	**0.3**		
Angle of inclination	**45**	degree	0.79	rad		
Actual velocity at peak flow	0.73	*(between 0.60 m/sec and 0.90 m/sec)*				
Length of channel required D/S	1.50	m	fix	**1.5**	m	
Daily screening quantity						
Daily sewage quantity	2900.90	m^3/day				
Rate of screening quantity	**0.015**	m^3/1000 m^3				
Daily screening quantity	0.0435	m^3/day				
Grit Separator						
Number of grit units	**1**	SB	**0**			

Peak flow	0.1007	m^3/sec				
Flow in one unit	0.1007	m^3/sec				
Grit particle size	**0.15**	mm				
HRT	**60**	sec	*(45 to 90 sec, typical 60)*			
Volume of grit chamber	6.04	m^3				
SOR	**900**	m^3/m^2/day	*(empirical, from observations)*			
	0.010	m^3/m^2/sec				
Area required	9.67	m^2	wall thickness	**0.30**	m	
SWD	**3.00**	m	slab thickness	**0.30**	m	
Side of square channel	3.11	m	offset to wall	**0.3**	m	
Fix length	**3.5**	m	freeboard	**0.8**	m	
Fix width	**3**	m	area given	10.5	m^2	OK
Shape factor	**0.85**		volume given	31.5000	m^3	OK
Specific gravity of liquid	**2.65**					
Kinematic viscosity	**1.003E-06**	m^2/sec				
V_p in m/sec	0.020	*let Nr < 1, apply Stoke's law to get terminal velocity vp*				
N_r	3	*apply Newton's equation*				
assumed velocity in m/sec	**0.0146**					
Nr	2				area in m^2	**19.74**
drag coefficient Cd	15.47					
vp in m/sec	0.014					
Critical displacement velocity, Vc	0.0145	m/sec		R_t	1.17	
Horizontal velocity of flow, Vh	0.0112	m/sec	OK	R_v	1.29	
Equalization Tank						
Average design flow	120.87	m^3/hour				
Volume of tank required	**350.00**	m^3	*from detailed analysis*			
HRT	2.90	hours				
SWD	**3.6**	m				
Area required for equalization tank	97.22	m^2	free board	**0.50**	m	
Number of tanks proposed	**1**		offset to wall	**0.45**	m	
Area required for each tank	97.22	m^2	wall thickness	**0.3**	m	
Diameter of circular tank	11.13	m	fix	**11.2**	m	
Side if square tank	9.86	m	fix length	**10**	m	
Thickness of foundation slab	**0.45**	m	fix breadth	**10**	m	
Actual capacity provided	354.7	m^3	circular	OK		
	360	m^3	rectangular	OK	area in m^2	**132.25**
Sewage pump- for pumping to MBBR tank						
Number of pumps	**1**	SB	**1**			
Type of pump set	submersible centrifugal sewage transfer-non clog					
Average flow	2900.90	m^3/day				
Peak design flow	8702.69	m^3/day				
Working hours	**24**					
Flow capacity of each pump	120.87	m^3/hour				
Peak factor	**1.20**					
Discharge	40.29	LPS	0.0403	m^3/sec		
Head required	**12**	m				
Efficiency	**45%**					
Power required	14.33	HP	fix	**15**	HP	
Energy	256.48	kwh				
Moving Bed Bio-Reactor (MBBR)-Single Stage						
Average design flow	2900.90	m^3/day				
Number of streams	**1**					

BOD of incoming sewage	263.13	mg/l				
TSS of incoming sewage	400	mg/l				
BOD expected after treatment	10	mg/l				
BOD to be removed	253.13	mg/l				
BOD removal % expected	96.20					
Number of tanks proposed	**1**					
BOD loading rate/volume	**4**	$kg/m^3/day$	*4-7 kg/m^3 /day as per M&E*			
Actual BOD loading rate	763.32	kg/day				
Quantity of BOD to be removed per day	734.31	kg/day				
Volume of reactor required	190.83	m^3				
Surface area loading rate (SALR) for BOD removal	**7.50**	$g/m^2/day$				
Required carrier surface area	101775.69	m^2				
Specific surface area of carrier	**600.00**	m^2/m^3				
Required carrier volume	169.63	m^3				
Volume of media required	**40%**					
	76.33	m^3	depth of base	**0.9**	m	
Volume of tank required-BOD loading rate/volume method	267.16	m^3	slab thickness	**0.35**	m	
Volume of tank required- SALR method	424.07	m^3	offset to wall	**0.45**	m	
Volume of each tank	424.07	m^3	total height	4.10	m	
SWD	**3.6**	m	wall thickness	**0.30**	m	
Area of each tank	117.80	m^2	fix dia	**12.5**	m	
Diameter of circular tank	12.25	m	length	**12**	m	
Side of square tank	10.85	m	breadth	**12**	m	
Actual capacity provided-circular	441.79	m^3	OK			
Actual capacity provided-rectangular	518.40	m^3	OK			
Fix capacity	**441.79**	m^3				
Actual volume of media obtained	176.72	m^3				
Actual carrier surface area	106029.60	m^2				
Volume of liquid in the tank	371.10	m^3				
Hydraulic Retension Time at design average flow	3.07	hours	184.2	minutes		
Hydraulic Retension Time at peak flow	1.02	hours	61.4	minutes		
SARR for the given SALR	6.94	$g/m^2/day$			area in m^2	**182.25**
Estimated BOD removal rate	735.58	kg/day				
Actual BOD removal rate %	96.37	BOD of effluent		9.56	mg/l	ok
Moving Bed Bio-Reactor (MBBR)-Single Stage Nitrification						
Average design flow	2900.90	m^3/day				
Number of streams	**1**					
BOD of incoming sewage	**20.00**	mg/l				
NH_4-N of incoming sewage	**40.00**	mg/l				
Alkalinity as $CaCO_3$	**140.00**	mg/l				
Target effluent NH_3-N	**3.30**	mg/l	% removal	91.75		
DL level to be maintained in tank	**2.00**	mg/l				
Design minimum waste water temperature	**20.00**	^oC				
$SARR_{max}$	0.61		SARR temp coefft. Θ		1.058	
Minimum NH_3-N at $SARR_{max}$	0.50		$SARR_T$	0.81	$g/m^2/day$	
Design value of SALR	0.88	$g/m^2/day$				
NH_3-N loading rate	116.04	kg/day				
Required carrier surface area	131655.92	m^2/day				
Specific surface area of carrier	**600.00**	m^2/m^3				
Required carrier volume	219.43	m^3/day	depth of base	**0.65**	m	
Volume of media required	**40%**		slab thickness	**0.35**	m	

Volume of tank required- SALR method	548.57	m^3	offset to wall	**0.45**	m	
Volume of each tank	548.57	m^3	total height	4.10	m	
SWD	**3.6**	m	wall thickness	**0.30**	m	
Area of each tank	152.38	m^2	fix dia	**14**	m	
Diameter of circular tank	13.93	m	length	**12.5**	m	
Side of square tank	12.34	m	breadth	**12.5**	m	
Actual capacity provided-circular	554.18	m^3	OK			
Actual capacity provided-rectangular	562.50	m^2	OK			
Fix capacity	**562.50**	m^3				
Actual volume of media obtained	225.00	m^3				
Actual carrier surface area	135000.00	m^2			area in m^2	**196.00**
Volume of liquid in the tank	472.50	m^3				
Hydraulic Retension Time at design average flow	3.91	hours	234.55	minutes		
Hydraulic Retension Time at peak flow	1.30	hours	78.18	minutes		
BOD SALR	0.43	$g/m^2/day$	*should be < 0.5 to achieve good nitrification*			
Using the equivalent weight of $CaCO_3$ as 50, the equivalent weight of $NaHCO_3$ as 84, the alkalinity use for nitrification as 7.14 g $CaCO_3$/g NH_3-N and the target effluent alkalinity as 80 mg/L as $CaCO_3$, give the calculated alkalinity requirement as 118.5 mg/L as $CaCO_3$.						
Influent alkalinity	**140.00**	mg/l				
Target effluent alkalinity	**80.00**	mg/l				
Alkalinity used for Nitrification	**7.14**	g $CaCO_3$/g NH_3-N				
Alkalinity to be added	202.04	mg/l				
Rate of alkalinity addition needed as $CaCO_3$	586.09	kg/day				
Equiv wt. of $CaCO_3$	50.00	g/equivalent				
Equiv wt. of $NaHCO_3$	84.00	g/equivalent				
Daily $NaHCO_3$ requirement	984.63	kg/day $NaHCO_3$				
Moving Bed Bio Reactor (MBBR)-post-anoxic denitrification						
Carbon:Nitrogen ratio (C/N)	6.58					
Average design flow	2901	m^3/day				
Number of post-anoxic tanks	**1.00**					
Target effluent NO_3-N concentration	**4.00**	mg/l				
SALR for post-anoxic stage	**2.00**	g NO_3 N /m^2/day				
Estimate of SARR/SALR ratio	0.886	mg/l				
Target % N removal	91.75					
Specific surface area of carrier	**600.00**	m^2/m^3				
NO_3-N daily loading rate	106.46	kg/day				
Required carrier surface area	53231.484	m^2				
Required carrier volume	88.72	m^3				
Volume of media required	**40%**		depth of base	**0.65**	m	
Volume of tank required- SALR method	221.80	m^3	slab thickness	**0.35**	m	
Volume of each tank	221.8	m^3	offset to wall	**0.45**	m	
SWD	**3.6**	m	total height	4.10	m	
Area of each tank	61.61	m^2	wall thickness	**0.30**	m	
Diameter of circular tank	8.86	m	fix	**9**	m	
Side of square tank	7.85	m	length	**8**	m	
Actual capacity provided-circular	229.02	m^3	breadth	**8**	m	
Actual capacity provided-rectangular	230.40	m^3	OK			
Fix capacity	**230.40**	m^3	OK			
Actual volume of media obtained	92.16	m^3				
Actual carrier surface area	55296.00	m^2				

Volume of liquid in the tank	193.54	m^3				
Hydraulic Retension Time at design average flow	1.60	hours	96.07	hours		
Hydraulic Retension Time at peak flow	0.53	hours	32.02	hours		
SARR	1.77	$g/m^2/day$				
Estimated NO_3-N removal rate	98.00	kg/day				
NO_3-N of effluent	2.92	mg/l				
Alkalinity produced by denitrification	**3.57**	g $CaCO_3$/g NO_3-N removed				
Actual alkalinity to be added	81.44	mg/l				
Rate of alkalinity addition needed as $CaCO_3$	236.24	kg/day				
Equiv wt. of $CaCO_3$	50.00	g/equivalent				
Equiv wt. of $NaHCO_3$	84.00	g/equivalent				
Daily $NaHCO_3$ requirement	396.89	kg/day $NaHCO_3$				
4.6 lb COD/lb NO_3-N removed and 1.5 lb COD/lb Methanol. The required methanol dosage is then calculated as: 4.6/1.5 = 3.1 lb						
Methanol requirement in kg/day	330.04	kg/day				
Considering toxicity, economy and safety considerations it is better to adopt retrun activated sludge feed into anoxic tank for carbon source. Alkaline fermentation can be adopted for better results.						
Moving Bed Bio-Reactor (MBBR) chamber after de-nitrification						
Average design flow	2900.90	m^3/day				
Number of streams	**1**					
BOD of incoming sewage (including return activated sludge as carbon source)	**86.83**	mg/l				
TSS of incoming sewage	**50**	mg/l				
BOD expected after treatment	**7**	mg/l				
BOD to be removed	79.83	mg/l				
BOD removal % expected	91.94					
Number of tanks proposed	**1**					
BOD loading rate/volume	**4**	kg/m^3/day	*4-7 kg/m^3/day as per M&E*			
Actual BOD loading rate	251.89	kg/day				
Quantity of BOD to be removed per day	231.59	kg/day				
Volume of reactor required	62.97	m^3				
Surface area loading rate (SALR) for BOD removal	**15.00**	$g/m^2/day$				
Required carrier surface area	16792.99	m^2				
Specific surface area of carrier	**600.00**	m^2/m^3				
Required carrier volume	27.99	m^3				
Volume of media required	**35%**					
	22.04	m^3	depth of base	**0.45**	m	
Volume of tank required-BOD loading rate/volume method	85.01	m^3	slab thickness	**0.35**	m	
Volume of tank required- SALR method	79.97	m^3	offset to wall	**0.45**	m	
Volume of each tank	85.01	m^3	total height	4.10	m	
SWD	**3.6**	m	wall thickness	**0.30**	m	
Area of each tank	23.62	m^2	fix dia	**5.5**	m	
Diameter of circular tank	5.48	m	length	**5**	m	
Side of square tank	4.86	m	breadth	**5**	m	
Actual capacity provided-circular	85.53	m^3	OK			
Actual capacity provided-rectangular	90.00	m^3	OK			
Fix capacity	**90.00**	m^3				
Actual volume of media obtained	31.50	m^3				
Actual carrier surface area	18900.00	m^2				
Volume of liquid in the tank	77.40	m^3				
Hydraulic Retension Time at design average flow	0.64	hours	38.4	minutes		
Hydraulic Retension Time at peak flow	0.21	hours	12.8	minutes		
SARR for the given SALR	13.13	$g/m^2/day$			area in m^2	**42.25**
Estimated BOD removal rate	248.06	kg/day				
Actual BOD removal rate %	98.48	BOD of effluent		1.32	mg/l	ok
Blower air requirement						
BOD loading	850.15	kg/day				

NH_3-N loading rate	116.04	kg/day				
Oxygen uptake ratio-BOD	**1.50**	kg of O_2/kg of BOD				
Oxygen uptake ratio-NH_3-N	**4.57**	kg of O_2/kg of NH_3-N				
Oxygen required for BOD loading	1275.23	kg/day				
Oxygen required for NH_3-N loading	530.28	kg/day				
Percentage of O_2 in air	**21.00**					
Weight of air required-BOD loading	6072.51	kg/day				
Weight of air required-NH_3-N loading	2525.16	kg/day				
Density of air	**1.225**	kg/m^3				
Volume of air-BOD loading	4957.15	m^3/day				
Volume of air-NH_3-N loading	2061.36	m^3/day				
Air transfer efficiency of diffuser	**0.075**					
Quantity of air required-BOD loading	66095.32	m^3/day				
Quantity of air required-NH_3-N loading	27484.77	m^3/day				
Factor of saftey	**1.20**					
Volume of air required-BOD loading	3304.77	m^3/hour				
Volume of air required-NH_3-N loading	1374.24	m^3/hour				
Volume of equalisation tank	350.00	m^3				
Normal inflow	0.034	m^3/sec				
Air requirement for equalisation tank	**1.25**	m^3/m^3/hour				
Air requirement for sludge tank	**3.00**	m^3/m^3/hour				
Volume of ET	350.00	m^3				
Volume of air required for ET	437.50	m^3/hour				
Volume of air required for ST	22.62	m^3				
Total air required	5139.12	m^3/hour				
Capacity of blower	5139.00	m^3/hour				
Number of blowers working	**2.00**	SB	**1**			
Air required per blower	2569.50	m^3/hour				
Pressure given	**0.60**	kg/cm^2	5.89	m		
Volumetric efficiency	**60%**					
Power required for blower motor	94.01	HP	70.13	kw		
Fix power of blower motor	**105.00**	HP				
Energy	3759.84	kwh				
Alum solution tank						
number of units	**2**					
dosage of alum	**50**	ppm				
requirement for 8 hours	48.350	kg				
volume of solution at 10% strength/unit	0.22	m^3				
length of tank	**0.6**	m				
breadth of tank	**0.6**	m				
liquid depth	0.61	m				
total depth	**1**	m				
solution flow rate	0.0275	m^3/hour				
Lime solution tank						
number of units	**2**					
dosage of lime	**35**	ppm				
requirement for 8 hours	33.84	kg				
volume of solution at 10% strength/unit	0.16	m3				
length of tank	**0.6**	m				
breadth of tank	**0.6**	m				
liquid depth	0.43	m				

total depth	**1**	m				
solution flow rate	0.01938	m^3/hour				
Secondary Clarifier with Plate/Tube Settler						
Average output required from tube settler in MLD	2.901	120.87	m^3/hour	33.58	LPS	
Number of batteries	**1**					
Average design flow as input in MLD/unit	2.90	120.87	m^3/hour	33.58	LPS	
Width of plates in mm	**900**	space between plates		**20**	mm	23.10
Length of plates adopted in m	**0.75**					
Angle of inclination of tubes adopted in deg.	**60**	1.05	rad			
Relative length of settler (dimensionless) Lr = L/d	37.5		wall thickness	**0.3**	m	
Relative length is changed by L' = 0.058 x [Vo x d/v]			column size	**0.35**	m	
Where Vo is velocity of flow along tube settler			offset to wall	**0.6**	m	
v is kinematic viscosity of water			depth of raft	**0.75**	m	
Effective relative length of tube, L = Lr- [0.058 x Vo x d/v]			slab thickness	**0.35**	m	
Kinematic viscosity of water in m/day	0.087264		r-beam depth	**0.6**	m	
Effective relative length of tube/plate , L	37.5	(-)	0.013	Vo		
	34.50					
desirable value of relative length =	*around 20 but below 40*					
for one unit:			freeboard	**0.5**	m	
Vertical water height in chamber in m	**3**		t-beam width	**0.425**	m	
Height of chamber in hopper portion in m	**3.5**		t-beam depth	**0.45**	m	
Side of large square in m	**5.5**		r-beam width	**0.425**	m	
Side of small square in m	**5**		inlet pipe dia	**0.2**	m	
h_3 in m (height of the truncated cone)	35.00					
Angle of inclination of hopper side to vertical	0.071	4.09	degree	85.91	*deg. with hor.*	
Larger inclined length L_i of slanting slab in m	38.60	area in m^2	106.14			
Smaller inclined length l_i of slanting slab in m	35.09	area in m^2	87.72			
Contact area in m^2	73.69					
SOR in m^3/m^2/day for upflow clarifier	**39.37**	<	**50**			
Trial volume in m^3 of one unit	186.33	volume of hopper in m^3			95.58	
Detention time in hours	1.54	in square	0.75	in hopper	0.79	hours
Fix volume	**186.33**	m^3				
Performance parameter of tube settler S = Vs/Vo x [sinθ + L x cosθ]						
For laminar flow regime, critical performance parameter value for complete removal of particle,						
Critical value of performance parameter, Sc =	1.333	circular				
	1.375	square				
	1	parallel plates				
Particle size in mm	**0.025**					
Settling velocity of particle in m/sec, V_s (laminar)	0.0006	m/sec	48.08	m/d		
Reynolds number, Nr	0.014					
Trial value of flow along plate settler V_o in m/day	**226**					
Shape of cross section of tubes	**plates**	(square, circular, or plates)				
Critical of performance parameter obtained, Sc	[(Vs/Vo) x (sinθ+Lcosθ)					
	3.86					
Plate entrance area/one unit	12.30	m^2				
Number of modules of plates	**2**					
Number of plates required/module	341.69					
Fix number of plates required/module	**158**					
Length/module of tray holding plates	**3900**	mm				
Thickness of plate	**1.5**	mm				
Number of plates configured in one module	159.53	OK				
Height of plate module for 1m length of tubes inclined:	0.87					
Hence height of tube module	0.65	m				
Fix length of plate module	**0.75**	m				

Fix height of plate module	**0.65**	m				
Fix number of plates required per module	**160**					
Angle of inclination	60	degree to horizontal				
Contact area	216	m^2			area in m^2	**53.29**
SOR in m^3/m^2/day for plate settler	**12.87**	<	**40**			
Total plate entrance area	5.76	m^2				
Actual velocity of flow in m/day	482.64	***now correct velocity***				
Sludge Sump						
Average flow	2900.90	m^3/day				
TSS	400	mg/l				
BOD	263.13	mg/l				
Assumed TSS Sludge	**30%**					
Assumed BOD Sludge	**35%**					
Sludge generated-TSS	348.1	kg/day				
Sludge generated-BOD	267.2	kg/day				
Total sludge	615.27	kg/day				
% sludge with 1.02 specific gravity	**10%**					
Sludge volume per day	60.32	m^3/day				
	2.51	m^3/hour				
Assumed HRT	**3**	hours	freeboard	**1.6**	m	
Volume of tank	7.54	m^3	slab thickness	**0.3**	m	
Assumed SWD	**1.5**	m	offset to wall	**0.3**	m	
Area of the tank	5.03	m^2	wall thickness	**0.3**	m	
Diameter of circular tank	2.53	m	fix	**3**	m	
Actual capacity provided	10.60	m^3			area in m^2	**4.20**
Pump for Sludge transfer to Thickner						
Number of pumps	**1.00**	W	**1**	SB		
Specific gravity of liquid	**1.03**					
Tipe of pump set	submersible centrifugal sewage transfer-non clog					
Working hours	**5.00**	hours				
Discharge required	12.06	m^3/hour	0.003351	m^3/sec		
Required head	**15.00**	m				
Velocity in sludge transfer pipe adopted	**0.70**	m/sec				
Pipe diameter required	78.07	mm	fix	**100**	mm	
Efficiency	**50%**					
Power required	1.34	HP	fix	**1.50**	HP	
Energy	5.00	kwh				
Sludge Thickener						
Number of units	**1**					
Total sludge	615.27	kg/day				
Solids Loading Rate	**40**	kg/m^2/day				
Thickening area required	15.38	m^2				
Surface Loading Rate	**12**	m^3/m^2/day				
Thickening area required	5.03	m^2	freeboard	**0.5**	m	
Maximum area	15.38	m^2	slab thickness	**0.35**	m	
Area of distribution chamber	**20%**		offset to wall	**0.35**	m	
Total area required	18.46	m^2	wall thickness	**0.3**	m	
Diameter of circular tank	4.85	m	fix	**5**	m	
Thickening area available	19.64	m^2				
SWD	**2**	m				
Actual volume provided	39.27	m^3				
Thickened sludge consistency	**3%**	of total sludge volume				

Thickened sludge volume	18.46	m^3/day			area in m^2	**6.30**
Pump for Sludge transfer to Centrifuge						
Type of pump set	Screw pump					
Number of pumps	**1.00**	W	**1**	SB		
Volume of thickened sludge to be pumped	18.46	m^3/day				
Working hours of centrifuge	**5.00**	hours				
Discharge required	3.69	m^3/hour	1.0E-03	m^3/sec		
Head required	**15.00**	m				
Efficiency	**50%**					
Power required	0.410	fix	**0.50**	HP		
Energy	1.530	kwh				
Sludge Centrifuge and Dosing Tanks						
Number of centrifuges	**1**	SB	**1**			
Capacity of centrifuge	**0.25**	m^3/hour				
Poly electrolyte dozing for centrifuge & thickener	**10%**					
Sludge volume	615.27	kg/day				
Dose	**2**	kg/1000 kg				
Quantity of Poly Electrolyte	1.23	kg/day				
Concentration	**0.1**					
Volume of tanks @ 24 hour	1.23	m^3				
	1230.54	litres				
Volume	51.27	litres/hour				
Volume required for 8 hours	0.41	m^3				
Liquid depth of tank	**1**	m				
Area required	0.41	m^2				
side of square tank	0.64	m	fix	**1**	area in m^2	2
Chlorine contact tank						
HRT	**30**	minutes	offset to wall	**0.3**	m	
Average flow	120.87	m^3/hour	wall thickness	**0.3**	m	
Volume of tank	60.44	m^3	slab thickness	**0.35**	m	
Assumed liquid depth	**2**	m	freeboard	**0.35**	m	
Area of the tank	30.22	m^2			area in m^2	**51.84**
side of square tank	5.50	m	fix	**6**	m	
Filter feed tank						
HRT	**20**	minutes	offset to wall	**0.3**	m	
Average flow	120.87	m^3/hour	wall thickness	**0.25**	m	
Volume of tank	40.29	m^3	slab thickness	**0.3**	m	
Assumed liquid depth	**2**	m	freeboard	**0.35**	m	
Area of the tank	20.15	m^2				
side of square tank	4.49	m	fix	**5**	m	
			fix breadth	**5**	m	
Volume provided	50.00	OK			area in m^2	**37.21**
Pressure Sand Filter						
Average flow	2900.90	m^3/day				
Filter operating hours	**20**	hours				
Operating flow	145.04	m^3/hour				
Filter Loading Rate	12	m^3/m^2/hour				
Area of the filter required	12.09	m^2				
Number of filters	**3**					
Area of each filter	4.03	sqm				
Diameter of filter required	2.26	m	fix	**2.5**	m	
Height of the filter	**2.5**	m	offset to wall	**0.5**	m	

Operating pressure	**3.5**	Bar				
Filter media	Sand				area in m^2	**12.25**
Activated Carbon Filter						
Average flow	2900.90	m^3/day				
Filter operating hours	**20**	hours				
Operating flow	145.04	m^3/hour				
Filter Loading Rate	10	m^3/m^2/hour				
Area of the filter required	14.50	m^2				
Number of filters	**1**					
Area of each filter	14.50	sqm				
Diameter of filter required	4.30	m	fix	**4.5**	m	
Height of the filter	**2.5**	m	offset to wall	**0.5**	m	
Operating pressure	**3.5**	Bar				
Filter media	Activated Carbon				area in m^2	**30.25**
Pump for clarified water to PSF and ACF						
Type of pump set	CF					
Number of pumps	**1.00**	W	SB	**1**		
Discharge of clarified water required	120.87	m^3/hour				
Working hours of pumps	**20.00**	hours				
Discharge required	145.04	m^3/hour	4.0E-02	m^3/sec		
Head required	**35.00**	m				
Efficiency	**50%**					
Power required	37.60	fix	**40.00**	HP		
Energy	561.06	kwh				
Treated Water Tank						
HRT	**60**	minutes	offset to wall	**0.3**	m	
Average flow	120.87	m^3/hour	wall thickness	**0.25**	m	
Volume of the tank	120.9	m^3	slab thickness	**0.3**	m	
Assumed liquid depth	**2.5**	m	freeboard	**0.35**	m	
Area of the tank	48.35	m^2				
Number of tanks	**1**		fix length	**7.5**	m	
Area of one tank	48.35	m^2	fix breadth	**7.5**	m	
Side of square tank	6.95	m				
Volume provided	140.63	m^3	OK			
Total area of units	525.12	m^2			area in m^2	**73.96**
Movement space factor	**1.5**					
Total area rquired	1246.83	m^2	**0.31**	**Acre**		

DESIGN OF CO-TREATMENT UNIT FOR SEPTAGE WITH MOVING BED BIOFILM-REACTOR (MBBR)						
Design population	**16156**					
Sludge deposit coefficient	**95**	litres/person/year				
Sludge deposit	4.20	KLD				
Average septage flow	**4.2**	KLD				
Working hours	**24**					
Design flow	4.20	KLD	4200	LPD	4.2	m^3/day
Maximum peak factor expected	**1.5**		4	KLD	0.18	m^3/hour
Peak design flow	6.30	KLD	6300	LPD	6.3	m^3/day
					0.26	m^3/hour
Number of trips/day	**8**				0.00007	cum/sec
Quantity of septage obtained in single trip with peak factor	0.79	m^3				
Raw Septage Characteristics						
COD	**25000**	mg/l				
BOD	**5000**	mg/l				
TSS	**7000**	mg/l				
Treated Sewage Characteristics (after filtration)						
COD	**50**	mg/l				
BOD	**10**	mg/l				
TSS	**20**	mg/l				
Receiving Chamber						
Average quantity of flow	0.18	m^3/hour				
Peak flow	0.26	m^3/hour				
	0.00007	m^3/sec				
Average Retention Time for peak flow	**600**	sec	offset to wall	**0.3**	m	
Volume of the inlet chember	0.0438	m^3	free board	**0.85**	m	
Assumed depth of flow	**0.5**	m	total height	1.35	m	
Area required for inlet chamber	0.088	m^2	wall thickness	**0.25**	m	
Length of the tank	**0.75**	m	slab thickness	**0.3**	m	
Breadth of the tank	0.12	fix	**0.5**	m	area in m^2	**2.96**
Design of Dilution Chamber from Mass-balance Principle						
Target outflow BOD (actual incoming BOD to STP)	**265**	mg/l	offset to wall	**0.45**	m	
Target outflow TSS (actual incoming TSS to STP)	**400**	mg/l	free board	**0.85**	m	
Volume of recycled water used for dilution	**54000**	litres	total height	3.35	m	
Quantity of septage obtained as above	0.79	m^3				
BOD of diluted septage	81.72	mg/l	**ok**			
TSS of diluted septage	120.33	mg/l	**ok**			
Total volume of dilution tank	54.79	m^3				
Liquid depth adopted inside dilution tank	**2.50**	m	wall thickness	**0.3**	m	
side of square tank	4.68	m	slab thickness	**0.45**	m	
Length of dilution tank adopted	**6.00**	m				
Breadth of dilution tank adopted	**4.00**	m	ratio of dilution		68.57	
Average outflow from dilution tank	12.18	m^3/hour	volume	60.00	m^3	ok
Average sewage flow entering the STP with diluted septage	120.87	m^3/hour	% of diluted sepatge to sewage			10.07
Oil and Grease Trap						
Average quantity of flow	12.18	m^3/hour				
Peak flow	18.26	m^3/hour				
	0.00507	m^3/sec				
Average Retention Time for peak flow	**300**	sec	offset to wall	**0.15**	m	
Volume of the inlet chamber	1.52	m^3	free board	**0.75**	m	
Assumed depth of flow	**1.5**	m	total height	2.25	m	
Area required for inlet chamber	1.01	m^2	wall thickness	**0.25**	m	

Length of the tank	**1.5**	m	slab thickness	**0.3**	m	
Breadth of the tank	0.68	fix	**0.75**	m	area in m^2	**3.565**
Breadth of baffle wall inside	0.75	m				
Manual Coarse Screen Channel						
Peak design flow	0.00507	m^3/sec				
Number of screen	**1**					
Peak flow rate per screen	0.0051	m^3/sec				
Velocity at peak flow	**0.8**	m/sec	assumed			
Velocity through clean bar screen	**0.85**	m/sec				
Length of channel U/S	**1**	m	wall thickness	**0.25**	m	
Width of channel provided	**0.6**	m	offset to wall	**0.25**	m	
Depth of flow	0.01	m	slab thickness	**0.30**	m	
Area required for screen	0.01	sqm				
Headloss through bar screen	0.01	m	*assuming head loss coefficient = 0.7*			
Assumed depth of flow after inserting bar screen	**0.1**	m	0.02	(control value)		
Width of channel required	0.06	m	fix	**0.5**	m	
Clear bar spacing	**20**	mm	*(20 to 50 mm)*			
Bar thickness	**10**	mm	*(5 to 15 mm)*			
Number of bars	**15**					
Clear bar spacing obtained	25	mm	OK			
Inside width of screen (openings)	0.35	m			area in m^2	**3.75**
Full height of channel	**1.5**	m	fb	**0.3**		
Angle of inclination	**45**	degree	0.79	rad		
Actual velocity at peak flow	0.87	*(between 0.60 m/sec and 0.90 m/sec)*				
Length of channel required D/S	1.50	m	fix	**1.5**	m	
Sewage pump- for pumping to receiving chamber/equalisation tank of STP						
Number of pumps	**1**	SB	**1**			
Type of pump set	submersible centrifugal sewage transfer-non clog					
Average flow	12.18	m^3/hour				
Peak design flow	18.26	m^3/hour				
Working hours	**24**					
Flow capacity of each pump	18.26	m^3/hour				
Peak factor	**1.20**					
Discharge	6.09	LPS	0.0061	m^3/sec		
Head required	**18**	m				
Efficiency	**50%**					
Power required	2.92	HP	fix	**3**	HP	
Energy	52.32	kwh				

Assistant Engineer
PPD Camp Office
Kerala Water Authority
Thiruvananthapuram

ASSISTANT EXECUTIVE ENGINEER III
PPD & Sewerage Circle
Jalabhavan, Kerala Water Authority
Thiruvananthapuram

Executive Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

Superintending Engineer,
PPD & Sewerage Circle,
Jalabhavan,
Kerala Water Authority,
Thiruvananthapuram

HYDRAULIC DESIGN

Appendix-I

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

NEYYATTINKARA ZONE1

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units **LPS**
Process Models:

Rainfall/Runoff	NO
RDII	NO
Snowmelt	NO
Groundwater	NO
Flow Routing	YES
Ponding Allowed	NO
Water Quality	NO
Flow Routing Method	DYNWAVE
Surcharge Method	EXTRAN
Starting Date	12/05/2021 00:00:00
Ending Date	12/06/2021 00:00:00
Antecedent Dry Days	0.0
Report Time Step	00:15:00
Routing Time Step	30.00 sec
Variable Time Step	YES
Maximum Trials	8
Number of Threads	1
Head Tolerance	0.001500 m

Volume Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow	0.245	2.447
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.238	2.384
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.003	0.032
Continuity Error (%)	1.288	

Time-Step Critical Elements

Link C138 (99.27%)

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	1.33 sec
Average Time Step	:	2.01 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
30.000 - 13.228 sec	:	0.30 %
13.228 - 5.833 sec	:	0.08 %
5.833 - 2.572 sec	:	9.28 %
2.572 - 1.134 sec	:	90.34 %
1.134 - 0.500 sec	:	0.00 %

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
a1	JUNCTION	0.05	0.06	76.35	0 07:12	0.06
a2	JUNCTION	0.06	0.06	75.26	0 07:17	0.06
a3	JUNCTION	0.06	0.06	74.36	0 07:16	0.06
a4	JUNCTION	0.06	0.06	73.46	0 07:18	0.06
a5	JUNCTION	0.06	0.06	72.56	0 07:26	0.06
a6	JUNCTION	0.06	0.06	72.22	0 07:26	0.06
a7	JUNCTION	0.06	0.06	71.42	0 07:33	0.06
a8	JUNCTION	0.06	0.06	69.25	0 07:30	0.06
a9	JUNCTION	0.06	0.06	67.96	0 07:44	0.06
a10	JUNCTION	0.06	0.07	66.92	0 07:10	0.07
a11	JUNCTION	0.06	0.07	66.43	0 07:27	0.07
a12	JUNCTION	0.06	0.07	65.84	0 07:44	0.07
a13	JUNCTION	0.07	0.07	65.37	0 07:30	0.07
a14	JUNCTION	0.06	0.07	65.09	0 07:39	0.07
a15	JUNCTION	0.06	0.06	63.46	0 07:59	0.06
a16	JUNCTION	0.06	0.07	61.07	0 07:59	0.07
a17	JUNCTION	0.06	0.07	60.48	0 07:32	0.07
a18	JUNCTION	0.06	0.07	58.88	0 07:59	0.07
a19	JUNCTION	0.07	0.08	57.58	0 07:29	0.08
a20	JUNCTION	0.07	0.07	57.12	0 07:54	0.07
a21	JUNCTION	0.07	0.07	56.15	0 07:33	0.07
a22	JUNCTION	0.07	0.07	55.22	0 07:35	0.07
a23	JUNCTION	0.07	0.08	54.33	0 07:35	0.08
a24	JUNCTION	0.07	0.07	53.48	0 07:33	0.07
a25	JUNCTION	0.07	0.08	52.45	0 07:44	0.08
a26	JUNCTION	0.07	0.08	52.27	0 07:54	0.08
a27	JUNCTION	0.07	0.08	51.16	0 07:56	0.08
a28	JUNCTION	0.07	0.08	49.86	0 07:42	0.08
a29	JUNCTION	0.07	0.08	48.76	0 07:44	0.08
a30	JUNCTION	0.08	0.09	47.79	0 07:46	0.09
a31	JUNCTION	0.08	0.09	47.43	0 07:57	0.09
a32	JUNCTION	0.08	0.10	46.98	0 07:44	0.10
a33	JUNCTION	0.11	0.14	46.85	0 08:00	0.14
a34	JUNCTION	0.11	0.14	46.64	0 08:00	0.14
a35	JUNCTION	0.11	0.15	46.44	0 08:00	0.15
a36	JUNCTION	0.11	0.13	46.25	0 08:00	0.13
a37	JUNCTION	0.06	0.07	46.53	0 07:31	0.07
a38	JUNCTION	0.06	0.07	46.85	0 07:06	0.07
a39	JUNCTION	0.06	0.07	47.18	0 07:53	0.07
a40	JUNCTION	0.06	0.06	47.86	0 07:20	0.06
a41	JUNCTION	0.06	0.06	48.82	0 07:29	0.06
a42	JUNCTION	0.06	0.06	49.75	0 07:15	0.06
a43	JUNCTION	0.06	0.06	50.56	0 07:14	0.06
a44	JUNCTION	0.05	0.06	51.36	0 07:13	0.06
a45	JUNCTION	0.12	0.16	50.47	0 08:00	0.16
a46	JUNCTION	0.13	0.17	50.30	0 08:00	0.17
a47	JUNCTION	0.13	0.17	50.12	0 08:00	0.17
a48	JUNCTION	0.13	0.17	49.94	0 08:00	0.17
a49	JUNCTION	0.13	0.17	49.76	0 08:00	0.17
a50	JUNCTION	0.12	0.16	49.56	0 08:00	0.16
a51	JUNCTION	0.11	0.13	49.23	0 08:00	0.13

a52	JUNCTION	0.10	0.13	48.46	0	08:00	0.13
a53	JUNCTION	0.11	0.14	47.69	0	08:00	0.14
a54	JUNCTION	0.12	0.16	47.19	0	08:00	0.16
a55	JUNCTION	0.13	0.17	46.95	0	08:00	0.17
a56	JUNCTION	0.13	0.18	46.77	0	08:00	0.18
a57	JUNCTION	0.12	0.15	46.57	0	08:00	0.15
a58	JUNCTION	0.13	0.17	46.40	0	08:00	0.17
a59	JUNCTION	0.13	0.18	46.23	0	08:00	0.18
a60	JUNCTION	0.14	0.18	46.05	0	08:00	0.18
a61	JUNCTION	0.14	0.18	45.87	0	08:00	0.18
a62	JUNCTION	0.14	0.18	45.69	0	08:00	0.18
a63	JUNCTION	0.14	0.18	45.51	0	08:00	0.18
a64	JUNCTION	0.14	0.18	45.33	0	08:00	0.18
a65	JUNCTION	0.14	0.18	45.15	0	08:00	0.18
a66	JUNCTION	0.14	0.18	44.97	0	08:00	0.18
a67	JUNCTION	0.13	0.18	44.79	0	08:00	0.18
a68	JUNCTION	0.14	0.19	44.62	0	08:00	0.19
a69	JUNCTION	0.14	0.19	44.44	0	08:00	0.19
a70	JUNCTION	0.14	0.19	44.26	0	08:00	0.19
a71	JUNCTION	0.14	0.19	44.08	0	08:00	0.19
a72	JUNCTION	0.14	0.19	43.90	0	08:00	0.19
a73	JUNCTION	0.14	0.19	43.72	0	08:00	0.19
a74	JUNCTION	0.14	0.18	43.53	0	08:00	0.18
a75	JUNCTION	0.14	0.19	43.36	0	08:00	0.19
a76	JUNCTION	0.14	0.19	43.18	0	08:00	0.19
a77	JUNCTION	0.14	0.19	43.00	0	08:00	0.19
a78	JUNCTION	0.10	0.13	42.76	0	08:00	0.13
a79	JUNCTION	0.10	0.12	41.40	0	08:00	0.12
a80	JUNCTION	0.10	0.12	39.74	0	08:00	0.12
a81	JUNCTION	0.09	0.11	37.95	0	08:00	0.11
a82	JUNCTION	0.11	0.13	35.35	0	08:00	0.13
a83	JUNCTION	0.10	0.12	34.15	0	08:00	0.12
a84	JUNCTION	0.08	0.10	31.51	0	08:00	0.10
a85	JUNCTION	0.11	0.14	27.44	0	08:00	0.14
a86	JUNCTION	0.12	0.16	26.49	0	08:00	0.16
a87	JUNCTION	0.11	0.14	26.14	0	08:00	0.14
a88	JUNCTION	0.11	0.14	25.68	0	08:00	0.14
a89	JUNCTION	0.11	0.14	24.83	0	08:00	0.14
a90	JUNCTION	0.12	0.16	24.04	0	08:00	0.16
a91	JUNCTION	0.13	0.17	23.62	0	08:00	0.17
a92	JUNCTION	0.15	0.19	23.46	0	08:00	0.19
b1	JUNCTION	0.05	0.06	45.29	0	07:15	0.06
b2	JUNCTION	0.06	0.06	44.29	0	07:53	0.06
b3	JUNCTION	0.06	0.06	44.10	0	07:54	0.06
b4	JUNCTION	0.06	0.06	43.57	0	07:53	0.06
b5	JUNCTION	0.06	0.06	43.06	0	07:54	0.06
b6	JUNCTION	0.06	0.06	42.55	0	07:57	0.06
b7	JUNCTION	0.06	0.07	42.05	0	07:57	0.07
b8	JUNCTION	0.06	0.06	41.55	0	07:57	0.06
b9	JUNCTION	0.06	0.06	40.70	0	07:58	0.06
b10	JUNCTION	0.06	0.07	39.42	0	07:57	0.07
b11	JUNCTION	0.08	0.09	38.25	0	07:59	0.09
b12	JUNCTION	0.09	0.10	37.69	0	07:57	0.10
b13	JUNCTION	0.09	0.10	37.43	0	07:58	0.10
b14	JUNCTION	0.09	0.11	37.18	0	07:54	0.11
b15	JUNCTION	0.09	0.12	36.97	0	07:56	0.12
b16	JUNCTION	0.08	0.10	36.78	0	07:59	0.10

b17	JUNCTION	0.10	0.12	36.61	0	07:57	0.12
b18	JUNCTION	0.10	0.12	36.43	0	07:56	0.12
b19	JUNCTION	0.08	0.10	36.24	0	07:57	0.10
b20	JUNCTION	0.10	0.12	36.07	0	07:58	0.12
b21	JUNCTION	0.09	0.11	35.88	0	07:59	0.11
b22	JUNCTION	0.10	0.12	35.72	0	07:59	0.12
b23	JUNCTION	0.10	0.12	35.54	0	07:59	0.12
b24	JUNCTION	0.09	0.11	35.35	0	08:00	0.11
b25	JUNCTION	0.10	0.12	35.18	0	07:56	0.12
b26	JUNCTION	0.10	0.12	35.00	0	07:59	0.12
b27	JUNCTION	0.10	0.12	34.82	0	07:59	0.12
b28	JUNCTION	0.11	0.14	34.65	0	07:57	0.14
b29	JUNCTION	0.11	0.14	34.47	0	07:58	0.14
b30	JUNCTION	0.11	0.14	34.29	0	07:58	0.14
b31	JUNCTION	0.11	0.14	34.12	0	07:57	0.14
b32	JUNCTION	0.11	0.14	33.94	0	07:58	0.14
b33	JUNCTION	0.11	0.14	33.76	0	07:58	0.14
b34	JUNCTION	0.11	0.14	33.58	0	07:59	0.14
b35	JUNCTION	0.11	0.14	33.40	0	07:59	0.14
b36	JUNCTION	0.12	0.15	33.23	0	07:58	0.15
b37	JUNCTION	0.11	0.15	33.04	0	07:59	0.15
b38	JUNCTION	0.10	0.12	32.84	0	07:59	0.12
b39	JUNCTION	0.11	0.14	32.68	0	07:59	0.14
b40	JUNCTION	0.11	0.13	32.49	0	08:00	0.13
b41	JUNCTION	0.11	0.14	32.31	0	08:00	0.14
b42	JUNCTION	0.12	0.15	32.14	0	07:58	0.15
b43	JUNCTION	0.12	0.15	31.96	0	07:59	0.15
b44	JUNCTION	0.12	0.15	31.78	0	07:59	0.15
b45	JUNCTION	0.12	0.15	31.60	0	07:59	0.15
b46	JUNCTION	0.12	0.15	31.43	0	07:59	0.15
b47	JUNCTION	0.10	0.12	31.22	0	07:59	0.12
b48	JUNCTION	0.12	0.15	31.06	0	08:00	0.15
b49	JUNCTION	0.10	0.12	30.83	0	08:00	0.12
b50	JUNCTION	0.10	0.12	30.05	0	07:59	0.12
b51	JUNCTION	0.09	0.11	29.20	0	07:59	0.11
b52	JUNCTION	0.10	0.12	28.12	0	07:59	0.12
b53	JUNCTION	0.12	0.15	27.56	0	08:00	0.15
b54	JUNCTION	0.07	0.08	28.63	0	07:58	0.08
b55	JUNCTION	0.07	0.08	29.70	0	07:58	0.08
b56	JUNCTION	0.08	0.10	29.90	0	07:58	0.10
b57	JUNCTION	0.08	0.09	30.07	0	07:52	0.09
b58	JUNCTION	0.08	0.09	30.26	0	07:53	0.09
b59	JUNCTION	0.07	0.07	32.76	0	07:51	0.07
b60	JUNCTION	0.05	0.06	29.73	0	07:12	0.06
b61	JUNCTION	0.05	0.06	28.61	0	07:17	0.06
b62	JUNCTION	0.06	0.06	26.92	0	07:17	0.06
b63	JUNCTION	0.06	0.06	25.29	0	07:18	0.06
b64	JUNCTION	0.06	0.06	24.20	0	07:30	0.06
b65	JUNCTION	0.06	0.06	23.55	0	07:30	0.06
b66	JUNCTION	0.06	0.07	22.54	0	07:39	0.07
b67	JUNCTION	0.06	0.06	22.35	0	07:41	0.06
b68	JUNCTION	0.06	0.07	19.94	0	07:44	0.07
b69	JUNCTION	0.06	0.06	19.51	0	07:48	0.06
b70	JUNCTION	0.06	0.07	17.96	0	07:50	0.07
b71	JUNCTION	0.07	0.07	17.19	0	07:50	0.07
b72	JUNCTION	0.07	0.07	16.86	0	07:50	0.07
b73	JUNCTION	0.06	0.06	16.56	0	07:52	0.06

b74	JUNCTION	0.06	0.06	8.14	0	07:50	0.06
b75	JUNCTION	0.07	0.07	4.31	0	07:58	0.07
c1	JUNCTION	0.05	0.06	29.86	0	07:14	0.06
c2	JUNCTION	0.06	0.06	28.86	0	07:21	0.06
c3	JUNCTION	0.06	0.06	28.28	0	07:24	0.06
c4	JUNCTION	0.06	0.06	27.80	0	07:25	0.06
c5	JUNCTION	0.06	0.06	25.57	0	07:25	0.06
c6	JUNCTION	0.06	0.06	23.65	0	07:26	0.06
c7	JUNCTION	0.06	0.07	22.95	0	07:26	0.07
c8	JUNCTION	0.07	0.07	22.50	0	07:43	0.07
c9	JUNCTION	0.06	0.07	22.31	0	07:36	0.07
c10	JUNCTION	0.07	0.07	22.01	0	07:45	0.07
c11	JUNCTION	0.06	0.06	21.82	0	07:48	0.06
c12	JUNCTION	0.06	0.06	17.42	0	07:45	0.06
c13	JUNCTION	0.07	0.07	13.83	0	07:53	0.07
c14	JUNCTION	0.07	0.07	13.47	0	07:46	0.07
c15	JUNCTION	0.07	0.08	13.30	0	07:45	0.08
d1	JUNCTION	0.05	0.06	32.50	0	07:14	0.06
d2	JUNCTION	0.06	0.06	31.51	0	08:00	0.06
d3	JUNCTION	0.06	0.06	31.33	0	07:37	0.06
d4	JUNCTION	0.06	0.07	31.15	0	07:49	0.07
d5	JUNCTION	0.06	0.06	30.97	0	07:49	0.06
d6	JUNCTION	0.06	0.06	30.02	0	07:46	0.06
d7	JUNCTION	0.06	0.06	28.01	0	07:52	0.06
d8	JUNCTION	0.06	0.06	24.76	0	07:55	0.06
d9	JUNCTION	0.06	0.06	20.68	0	07:56	0.06
d10	JUNCTION	0.06	0.06	15.49	0	07:59	0.06
d11	JUNCTION	0.07	0.07	13.95	0	07:59	0.07
e1	JUNCTION	0.05	0.06	33.77	0	07:14	0.06
e2	JUNCTION	0.06	0.06	32.78	0	07:39	0.06
e3	JUNCTION	0.06	0.06	32.45	0	07:40	0.06
e4	JUNCTION	0.06	0.06	31.96	0	07:40	0.06
e5	JUNCTION	0.06	0.06	31.42	0	07:38	0.06
e6	JUNCTION	0.06	0.07	30.17	0	07:43	0.07
e7	JUNCTION	0.06	0.06	29.98	0	07:45	0.06
e8	JUNCTION	0.06	0.06	27.68	0	07:45	0.06
e9	JUNCTION	0.06	0.07	24.93	0	07:53	0.07
f1	JUNCTION	0.05	0.06	34.52	0	07:14	0.06
f2	JUNCTION	0.06	0.06	33.52	0	07:53	0.06
f3	JUNCTION	0.06	0.06	33.32	0	07:59	0.06
f4	JUNCTION	0.06	0.06	32.72	0	08:00	0.06
f5	JUNCTION	0.06	0.06	31.53	0	07:50	0.06
f6	JUNCTION	0.06	0.06	30.76	0	07:51	0.06
f7	JUNCTION	0.06	0.06	29.53	0	07:51	0.06
f8	JUNCTION	0.06	0.06	27.81	0	07:51	0.06
f9	JUNCTION	0.06	0.07	26.09	0	07:51	0.07
g1	JUNCTION	0.05	0.06	36.49	0	07:14	0.06
g2	JUNCTION	0.06	0.06	35.49	0	07:06	0.06
g3	JUNCTION	0.06	0.06	35.31	0	07:12	0.06
g4	JUNCTION	0.06	0.06	34.97	0	07:13	0.06
g5	JUNCTION	0.06	0.06	33.56	0	07:13	0.06
g6	JUNCTION	0.06	0.06	32.04	0	07:14	0.06
g7	JUNCTION	0.06	0.06	30.57	0	07:14	0.06
g8	JUNCTION	0.06	0.06	29.10	0	07:15	0.06
g9	JUNCTION	0.06	0.06	27.82	0	07:15	0.06
g10	JUNCTION	0.06	0.07	26.71	0	07:16	0.07
g11	JUNCTION	0.06	0.06	25.45	0	07:16	0.06

g12	JUNCTION	0.07	0.07	23.88	0	07:17	0.07
h1	JUNCTION	0.05	0.05	37.69	0	07:14	0.05
h2	JUNCTION	0.06	0.06	36.20	0	07:06	0.06
h3	JUNCTION	0.06	0.06	35.48	0	07:08	0.06
h4	JUNCTION	0.06	0.06	33.96	0	07:09	0.06
h5	JUNCTION	0.06	0.06	32.19	0	07:09	0.06
h6	JUNCTION	0.06	0.06	30.40	0	07:10	0.06
h7	JUNCTION	0.06	0.06	28.86	0	07:11	0.06
h8	JUNCTION	0.06	0.07	27.91	0	07:12	0.07
i1	JUNCTION	0.05	0.06	36.93	0	07:12	0.06
i2	JUNCTION	0.06	0.06	35.64	0	07:15	0.06
i3	JUNCTION	0.06	0.06	34.48	0	07:15	0.06
i4	JUNCTION	0.06	0.06	34.06	0	07:22	0.06
i5	JUNCTION	0.06	0.06	33.27	0	07:36	0.06
i6	JUNCTION	0.06	0.06	31.78	0	07:26	0.06
i7	JUNCTION	0.06	0.06	29.94	0	07:16	0.06
i8	JUNCTION	0.06	0.06	27.50	0	07:28	0.06
i9	JUNCTION	0.06	0.06	24.42	0	07:21	0.06
i10	JUNCTION	0.06	0.07	20.95	0	07:25	0.07
j1	JUNCTION	0.05	0.06	37.87	0	07:23	0.06
j2	JUNCTION	0.01	0.01	36.82	0	07:29	0.01
j3	JUNCTION	0.06	0.06	35.84	0	07:30	0.06
j4	JUNCTION	0.06	0.06	34.51	0	07:32	0.06
j5	JUNCTION	0.06	0.06	32.06	0	07:39	0.06
j6	JUNCTION	0.06	0.06	31.79	0	07:47	0.06
j7	JUNCTION	0.06	0.06	26.74	0	07:33	0.06
j8	JUNCTION	0.06	0.06	24.06	0	07:35	0.06
j9	JUNCTION	0.06	0.06	23.46	0	07:35	0.06
j10	JUNCTION	0.07	0.07	23.17	0	07:53	0.07
j11	JUNCTION	0.07	0.07	22.99	0	07:46	0.07
j12	JUNCTION	0.07	0.07	22.81	0	07:49	0.07
k1	JUNCTION	0.05	0.05	48.58	0	07:10	0.05
k2	JUNCTION	0.05	0.06	45.98	0	07:11	0.06
k3	JUNCTION	0.06	0.06	44.07	0	07:15	0.06
k4	JUNCTION	0.06	0.06	42.70	0	07:28	0.06
k5	JUNCTION	0.06	0.06	41.64	0	07:28	0.06
k6	JUNCTION	0.06	0.06	41.31	0	07:40	0.06
k7	JUNCTION	0.06	0.06	41.13	0	07:52	0.06
k8	JUNCTION	0.06	0.07	40.96	0	07:27	0.07
k9	JUNCTION	0.06	0.06	40.71	0	07:32	0.06
k10	JUNCTION	0.06	0.06	39.06	0	07:23	0.06
k11	JUNCTION	0.06	0.06	36.68	0	07:59	0.06
k12	JUNCTION	0.01	0.01	32.30	0	07:25	0.01
k13	JUNCTION	0.01	0.01	30.22	0	07:32	0.01
k14	JUNCTION	0.06	0.06	28.13	0	07:36	0.06
k15	JUNCTION	0.07	0.08	25.68	0	07:33	0.08
k16	JUNCTION	0.07	0.08	25.50	0	07:14	0.08
k17	JUNCTION	0.07	0.08	25.25	0	07:45	0.08
k18	JUNCTION	0.07	0.08	25.07	0	07:52	0.08
k19	JUNCTION	0.07	0.08	24.89	0	07:57	0.08
k20	JUNCTION	0.07	0.08	24.72	0	07:57	0.08
k21	JUNCTION	0.07	0.08	24.53	0	07:57	0.08
k22	JUNCTION	0.10	0.12	24.39	0	08:00	0.12
l1	JUNCTION	0.05	0.05	35.85	0	07:11	0.05
l2	JUNCTION	0.05	0.06	34.37	0	07:12	0.06
l3	JUNCTION	0.05	0.06	32.91	0	07:12	0.06
l4	JUNCTION	0.06	0.06	31.06	0	07:21	0.06

l5	JUNCTION	0.06	0.06	29.84	0	07:21	0.06
l6	JUNCTION	0.06	0.06	25.87	0	07:17	0.06
l7	JUNCTION	0.06	0.06	23.02	0	07:21	0.06
l8	JUNCTION	0.06	0.07	22.52	0	07:20	0.07
m1	JUNCTION	0.05	0.05	50.61	0	07:11	0.05
m2	JUNCTION	0.05	0.06	49.23	0	07:14	0.06
m3	JUNCTION	0.06	0.06	47.78	0	07:19	0.06
m4	JUNCTION	0.06	0.06	47.22	0	07:32	0.06
m5	JUNCTION	0.06	0.07	46.99	0	07:31	0.07
m6	JUNCTION	0.06	0.06	46.81	0	07:32	0.06
m7	JUNCTION	0.06	0.07	46.63	0	07:43	0.07
m8	JUNCTION	0.07	0.07	46.46	0	07:49	0.07
m9	JUNCTION	0.07	0.07	46.28	0	07:15	0.07
m10	JUNCTION	0.07	0.07	46.10	0	07:55	0.07
m11	JUNCTION	0.06	0.07	45.92	0	07:43	0.07
m12	JUNCTION	0.07	0.07	45.31	0	07:53	0.07
m13	JUNCTION	0.06	0.07	45.06	0	07:57	0.07
m14	JUNCTION	0.07	0.07	44.48	0	07:52	0.07
m15	JUNCTION	0.07	0.07	44.01	0	07:55	0.07
m16	JUNCTION	0.07	0.07	43.46	0	07:50	0.07
m17	JUNCTION	0.07	0.08	43.07	0	07:46	0.08
m18	JUNCTION	0.07	0.08	42.89	0	07:52	0.08
m19	JUNCTION	0.07	0.08	42.71	0	07:59	0.08
m20	JUNCTION	0.07	0.08	42.54	0	07:59	0.08
m21	JUNCTION	0.07	0.08	42.36	0	07:52	0.08
m22	JUNCTION	0.08	0.09	42.18	0	07:53	0.09
m23	JUNCTION	0.08	0.09	42.00	0	07:49	0.09
m24	JUNCTION	0.09	0.11	41.84	0	07:59	0.11
m25	JUNCTION	0.09	0.11	41.66	0	08:00	0.11
m26	JUNCTION	0.08	0.09	41.26	0	07:59	0.09
m27	JUNCTION	0.07	0.08	39.12	0	08:00	0.08
m28	JUNCTION	0.07	0.08	35.74	0	08:00	0.08
m29	JUNCTION	0.08	0.09	31.76	0	07:59	0.09
m30	JUNCTION	0.08	0.09	29.82	0	08:00	0.09
m31	JUNCTION	0.08	0.09	28.32	0	08:00	0.09
m32	JUNCTION	0.09	0.10	27.02	0	08:00	0.10
m33	JUNCTION	0.08	0.10	26.41	0	08:00	0.10
m34	JUNCTION	0.09	0.11	25.66	0	08:00	0.11
m35	JUNCTION	0.09	0.10	25.26	0	08:00	0.10
m36	JUNCTION	0.10	0.12	24.78	0	08:00	0.12
m37	JUNCTION	0.10	0.12	24.59	0	08:00	0.12
m38	JUNCTION	0.12	0.16	24.45	0	08:00	0.16
o1	JUNCTION	0.05	0.05	35.11	0	07:10	0.05
o2	JUNCTION	0.05	0.06	32.84	0	07:16	0.06
o3	JUNCTION	0.06	0.06	30.32	0	07:16	0.06
o4	JUNCTION	0.06	0.06	29.26	0	07:17	0.06
o5	JUNCTION	0.06	0.07	28.64	0	07:04	0.07
o6	JUNCTION	0.06	0.07	28.46	0	07:05	0.07
o7	JUNCTION	0.06	0.07	28.28	0	07:12	0.07
o8	JUNCTION	0.06	0.07	28.10	0	07:12	0.07
o9	JUNCTION	0.06	0.07	27.92	0	07:13	0.07
p1	JUNCTION	0.05	0.06	38.82	0	07:14	0.06
p2	JUNCTION	0.06	0.06	37.82	0	07:21	0.06
p3	JUNCTION	0.06	0.06	37.64	0	07:25	0.06
p4	JUNCTION	0.06	0.06	37.46	0	07:26	0.06
p5	JUNCTION	0.06	0.07	37.29	0	07:44	0.07
p6	JUNCTION	0.06	0.07	37.11	0	07:05	0.07

p7	JUNCTION	0.06	0.07	36.79	0	07:38	0.07
p8	JUNCTION	0.06	0.07	36.40	0	07:29	0.07
p9	JUNCTION	0.06	0.06	36.21	0	07:35	0.06
p10	JUNCTION	0.06	0.07	35.07	0	07:35	0.07
p11	JUNCTION	0.07	0.07	34.89	0	07:36	0.07
p12	JUNCTION	0.07	0.08	34.72	0	07:53	0.08
p13	JUNCTION	0.07	0.08	34.34	0	07:52	0.08
p14	JUNCTION	0.07	0.07	34.00	0	07:58	0.07
p15	JUNCTION	0.07	0.08	33.13	0	07:53	0.08
p16	JUNCTION	0.07	0.07	32.70	0	07:48	0.07
p17	JUNCTION	0.07	0.08	31.02	0	07:53	0.08
p18	JUNCTION	0.07	0.08	29.39	0	07:50	0.08
p19	JUNCTION	0.07	0.08	27.69	0	07:53	0.08
p20	JUNCTION	0.07	0.08	27.08	0	07:51	0.08
p21	JUNCTION	0.07	0.08	26.43	0	07:51	0.08
p22	JUNCTION	0.07	0.08	25.30	0	07:59	0.08
p23	JUNCTION	0.07	0.08	24.20	0	07:56	0.08
p24	JUNCTION	0.08	0.10	23.41	0	07:52	0.10
p25	JUNCTION	0.07	0.08	23.15	0	07:57	0.08
p26	JUNCTION	0.07	0.07	22.57	0	07:56	0.07
p27	JUNCTION	0.07	0.08	21.20	0	07:57	0.08
p28	JUNCTION	0.08	0.09	20.11	0	07:54	0.09
q1	JUNCTION	0.05	0.05	46.36	0	07:10	0.05
q2	JUNCTION	0.06	0.06	44.54	0	07:21	0.06
q3	JUNCTION	0.06	0.06	43.90	0	07:21	0.06
q4	JUNCTION	0.06	0.06	43.73	0	07:23	0.06
q5	JUNCTION	0.06	0.06	43.54	0	07:27	0.06
q6	JUNCTION	0.06	0.07	43.37	0	07:37	0.07
q7	JUNCTION	0.06	0.06	43.19	0	07:38	0.06
q8	JUNCTION	0.06	0.06	42.33	0	07:27	0.06
q9	JUNCTION	0.06	0.07	41.54	0	07:53	0.07
q10	JUNCTION	0.06	0.07	41.08	0	07:38	0.07
q11	JUNCTION	0.06	0.07	40.47	0	07:39	0.07
q12	JUNCTION	0.06	0.07	39.72	0	07:31	0.07
q13	JUNCTION	0.06	0.07	38.92	0	07:41	0.07
q14	JUNCTION	0.06	0.06	37.72	0	07:37	0.06
q15	JUNCTION	0.07	0.08	36.64	0	07:47	0.08
r1	JUNCTION	0.05	0.05	44.94	0	07:10	0.05
r2	JUNCTION	0.05	0.06	42.78	0	07:15	0.06
r3	JUNCTION	0.06	0.06	40.58	0	07:23	0.06
r4	JUNCTION	0.06	0.06	38.52	0	07:16	0.06
r5	JUNCTION	0.06	0.06	36.47	0	07:24	0.06
r6	JUNCTION	0.06	0.06	35.56	0	07:19	0.06
r7	JUNCTION	0.06	0.06	33.73	0	07:19	0.06
r8	JUNCTION	0.06	0.07	32.63	0	07:33	0.07
r9	JUNCTION	0.06	0.06	32.06	0	07:25	0.06
r10	JUNCTION	0.06	0.06	31.85	0	07:35	0.06
r11	JUNCTION	0.06	0.07	30.08	0	07:59	0.07
r12	JUNCTION	0.07	0.07	29.63	0	07:39	0.07
s1	JUNCTION	0.05	0.05	49.05	0	07:09	0.05
s2	JUNCTION	0.06	0.06	48.06	0	07:23	0.06
s3	JUNCTION	0.06	0.06	47.88	0	07:32	0.06
s4	JUNCTION	0.06	0.07	47.71	0	07:35	0.07
s5	JUNCTION	0.06	0.07	47.53	0	07:59	0.07
s6	JUNCTION	0.06	0.07	47.35	0	08:00	0.07
s7	JUNCTION	0.01	0.01	47.11	0	07:43	0.01
t1	JUNCTION	0.05	0.05	49.28	0	07:08	0.05

t2	JUNCTION	0.05	0.06	43.75	0	07:12	0.06
t3	JUNCTION	0.06	0.06	41.64	0	07:15	0.06
t4	JUNCTION	0.06	0.06	39.35	0	07:18	0.06
t5	JUNCTION	0.06	0.06	37.11	0	07:21	0.06
t6	JUNCTION	0.06	0.07	36.61	0	07:26	0.07
u1	JUNCTION	0.05	0.05	50.51	0	07:10	0.05
u2	JUNCTION	0.06	0.06	49.52	0	07:27	0.06
u3	JUNCTION	0.06	0.06	49.34	0	07:37	0.06
u4	JUNCTION	0.06	0.06	49.16	0	07:39	0.06
u5	JUNCTION	0.06	0.07	48.98	0	07:40	0.07
u6	JUNCTION	0.06	0.07	48.80	0	07:57	0.07
u7	JUNCTION	0.06	0.07	48.62	0	07:59	0.07
u8	JUNCTION	0.06	0.07	48.29	0	07:59	0.07
u9	JUNCTION	0.06	0.07	47.97	0	07:59	0.07
u10	JUNCTION	0.06	0.06	47.63	0	08:00	0.06
u11	JUNCTION	0.06	0.06	46.08	0	07:46	0.06
u12	JUNCTION	0.06	0.06	44.12	0	07:46	0.06
u13	JUNCTION	0.06	0.06	40.93	0	07:52	0.06
u14	JUNCTION	0.06	0.06	36.49	0	07:55	0.06
u15	JUNCTION	0.06	0.06	32.61	0	07:55	0.06
v1	JUNCTION	0.05	0.05	74.67	0	07:10	0.05
v2	JUNCTION	0.06	0.06	72.81	0	07:13	0.06
v3	JUNCTION	0.06	0.06	71.96	0	07:19	0.06
v4	JUNCTION	0.06	0.06	71.42	0	07:19	0.06
v5	JUNCTION	0.06	0.06	69.68	0	07:44	0.06
v6	JUNCTION	0.06	0.06	64.27	0	07:24	0.06
v7	JUNCTION	0.06	0.06	59.58	0	07:57	0.06
v8	JUNCTION	0.06	0.07	58.92	0	07:28	0.07
v9	JUNCTION	0.07	0.07	58.74	0	07:59	0.07
v10	JUNCTION	0.07	0.07	58.56	0	07:04	0.07
v11	JUNCTION	0.07	0.08	58.38	0	07:54	0.08
v12	JUNCTION	0.06	0.06	58.19	0	07:39	0.06
v13	JUNCTION	0.06	0.07	56.16	0	07:44	0.07
v14	JUNCTION	0.06	0.07	54.58	0	07:51	0.07
v15	JUNCTION	0.06	0.07	52.99	0	07:30	0.07
v16	JUNCTION	0.07	0.08	52.05	0	07:59	0.08
v17	JUNCTION	0.02	0.03	51.73	0	07:41	0.03
v18	JUNCTION	0.01	0.01	52.01	0	08:00	0.01
v19	JUNCTION	0.06	0.06	53.25	0	08:00	0.06
v20	JUNCTION	0.06	0.06	54.16	0	08:00	0.06
v21	JUNCTION	0.06	0.06	54.57	0	08:00	0.06
v22	JUNCTION	0.06	0.06	55.39	0	08:00	0.06
v23	JUNCTION	0.06	0.06	56.04	0	08:00	0.06
v24	JUNCTION	0.07	0.07	56.07	0	08:00	0.07
v25	JUNCTION	0.05	0.06	56.21	0	07:17	0.06
v27	JUNCTION	0.07	0.08	55.86	0	08:00	0.08
v28	JUNCTION	0.07	0.08	55.53	0	08:00	0.08
v29	JUNCTION	0.07	0.08	55.17	0	08:00	0.08
v30	JUNCTION	0.07	0.07	54.74	0	08:00	0.07
v31	JUNCTION	0.07	0.07	52.88	0	08:00	0.07
v32	JUNCTION	0.07	0.08	50.84	0	08:00	0.08
v33	JUNCTION	0.07	0.08	49.58	0	08:00	0.08
v34	JUNCTION	0.07	0.07	48.50	0	07:59	0.07
v35	JUNCTION	0.08	0.09	47.09	0	08:00	0.09
v36	JUNCTION	0.08	0.10	46.92	0	08:00	0.10
v37	JUNCTION	0.08	0.10	46.74	0	08:00	0.10
v38	JUNCTION	0.08	0.10	46.56	0	08:00	0.10

v39	JUNCTION	0.07	0.08	46.36	0	08:00	0.08
v40	JUNCTION	0.07	0.07	44.99	0	08:00	0.07
v41	JUNCTION	0.06	0.07	41.06	0	08:00	0.07
v42	JUNCTION	0.07	0.07	36.01	0	08:00	0.07
v43	JUNCTION	0.07	0.08	32.88	0	08:00	0.08
v44	JUNCTION	0.08	0.09	31.69	0	08:00	0.09
v45	JUNCTION	0.09	0.10	31.09	0	08:00	0.10
v46	JUNCTION	0.08	0.10	30.90	0	08:00	0.10
v47	JUNCTION	0.09	0.11	30.74	0	08:00	0.11
w1	JUNCTION	0.05	0.06	49.58	0	07:15	0.06
w2	JUNCTION	0.06	0.06	48.59	0	07:34	0.06
w3	JUNCTION	0.06	0.06	48.41	0	07:35	0.06
w4	JUNCTION	0.06	0.07	48.23	0	07:38	0.07
w5	JUNCTION	0.07	0.07	48.06	0	07:57	0.07
w6	JUNCTION	0.06	0.06	47.87	0	07:57	0.06
w7	JUNCTION	0.06	0.07	46.66	0	07:58	0.07
w8	JUNCTION	0.06	0.06	46.27	0	07:58	0.06
w9	JUNCTION	0.06	0.07	44.41	0	07:59	0.07
w10	JUNCTION	0.06	0.06	42.91	0	07:59	0.06
w11	JUNCTION	0.06	0.06	40.72	0	07:55	0.06
w12	JUNCTION	0.07	0.07	38.53	0	07:59	0.07
w13	JUNCTION	0.07	0.07	38.22	0	07:57	0.07
w14	JUNCTION	0.07	0.08	37.98	0	07:59	0.08
w15	JUNCTION	0.07	0.07	37.79	0	07:58	0.07
w16	JUNCTION	0.07	0.08	37.58	0	07:59	0.08
w17	JUNCTION	0.07	0.07	37.35	0	07:59	0.07
w18	JUNCTION	0.07	0.07	36.61	0	07:59	0.07
w19	JUNCTION	0.07	0.07	35.75	0	08:00	0.07
w20	JUNCTION	0.07	0.08	34.91	0	07:59	0.08
w21	JUNCTION	0.07	0.08	34.74	0	07:59	0.08
w22	JUNCTION	0.08	0.09	34.57	0	08:00	0.09
w23	JUNCTION	0.07	0.08	34.38	0	07:59	0.08
w24	JUNCTION	0.08	0.09	34.07	0	07:59	0.09
w25	JUNCTION	0.08	0.09	33.89	0	08:00	0.09
w26	JUNCTION	0.07	0.08	33.71	0	07:59	0.08
w27	JUNCTION	0.08	0.09	33.53	0	08:00	0.09
w28	JUNCTION	0.07	0.08	33.35	0	08:00	0.08
w29	JUNCTION	0.08	0.09	33.01	0	08:00	0.09
w30	JUNCTION	0.07	0.08	32.82	0	08:00	0.08
w31	JUNCTION	0.07	0.08	32.24	0	07:59	0.08
w32	JUNCTION	0.08	0.09	31.89	0	08:00	0.09
w33	JUNCTION	0.08	0.09	31.71	0	08:00	0.09
w34	JUNCTION	0.08	0.10	31.36	0	08:00	0.10
w35	JUNCTION	0.08	0.09	31.17	0	08:00	0.09
x1	JUNCTION	0.05	0.06	41.52	0	07:20	0.06
x2	JUNCTION	0.06	0.06	40.53	0	07:49	0.06
x3	JUNCTION	0.06	0.06	40.35	0	07:55	0.06
x4	JUNCTION	0.06	0.06	39.82	0	07:54	0.06
x5	JUNCTION	0.06	0.07	39.40	0	07:56	0.07
x6	JUNCTION	0.07	0.08	39.15	0	07:57	0.08
x7	JUNCTION	0.07	0.08	38.97	0	07:59	0.08
x8	JUNCTION	0.07	0.08	38.74	0	07:59	0.08
x9	JUNCTION	0.07	0.08	38.24	0	07:57	0.08
x10	JUNCTION	0.07	0.08	37.92	0	07:56	0.08
x11	JUNCTION	0.08	0.09	37.74	0	07:59	0.09
x12	JUNCTION	0.08	0.09	37.56	0	07:57	0.09
x13	JUNCTION	0.08	0.09	37.38	0	07:59	0.09

x14	JUNCTION	0.08	0.09	37.21	0	07:59	0.09
x15	JUNCTION	0.08	0.09	37.03	0	07:58	0.09
x16	JUNCTION	0.07	0.08	36.84	0	07:59	0.08
x17	JUNCTION	0.07	0.08	36.35	0	07:59	0.08
x18	JUNCTION	0.07	0.09	35.90	0	07:59	0.09
x19	JUNCTION	0.07	0.08	35.56	0	07:59	0.08
x20	JUNCTION	0.07	0.08	35.13	0	08:00	0.08
x21	JUNCTION	0.07	0.08	34.67	0	07:59	0.08
x22	JUNCTION	0.08	0.09	34.06	0	07:59	0.09
x23	JUNCTION	0.08	0.09	33.88	0	07:59	0.09
x24	JUNCTION	0.08	0.10	33.70	0	08:00	0.10
x25	JUNCTION	0.07	0.08	33.51	0	07:57	0.08
x26	JUNCTION	0.07	0.08	32.89	0	07:57	0.08
x27	JUNCTION	0.07	0.08	32.18	0	08:00	0.08
x28	JUNCTION	0.07	0.08	31.12	0	07:58	0.08
x29	JUNCTION	0.07	0.08	29.86	0	07:58	0.08
x30	JUNCTION	0.07	0.08	29.12	0	07:58	0.08
x31	JUNCTION	0.08	0.10	28.38	0	07:59	0.10
x32	JUNCTION	0.08	0.09	28.20	0	07:59	0.09
x33	JUNCTION	0.08	0.09	28.02	0	07:59	0.09
x34	JUNCTION	0.08	0.10	27.84	0	08:00	0.10
x35	JUNCTION	0.09	0.10	27.67	0	08:00	0.10
x36	JUNCTION	0.08	0.09	27.48	0	07:59	0.09
x37	JUNCTION	0.08	0.10	27.31	0	08:00	0.10
x38	JUNCTION	0.08	0.10	27.12	0	08:00	0.10
y1	JUNCTION	0.05	0.06	39.87	0	07:15	0.06
y2	JUNCTION	0.06	0.06	38.87	0	08:00	0.06
y3	JUNCTION	0.06	0.06	38.70	0	07:57	0.06
y4	JUNCTION	0.06	0.06	38.51	0	07:58	0.06
y5	JUNCTION	0.06	0.06	37.36	0	07:58	0.06
y6	JUNCTION	0.06	0.06	34.72	0	07:59	0.06
y7	JUNCTION	0.06	0.06	32.46	0	07:51	0.06
y8	JUNCTION	0.06	0.06	29.49	0	07:58	0.06
y9	JUNCTION	0.06	0.06	26.48	0	07:58	0.06
y10	JUNCTION	0.06	0.06	23.96	0	07:48	0.06
y11	JUNCTION	0.07	0.07	23.34	0	07:56	0.07
aa1	JUNCTION	0.05	0.06	56.93	0	07:15	0.06
aa2	JUNCTION	0.06	0.06	55.93	0	07:33	0.06
aa3	JUNCTION	0.06	0.06	55.76	0	07:36	0.06
aa4	JUNCTION	0.06	0.06	55.56	0	07:37	0.06
aa5	JUNCTION	0.06	0.06	55.17	0	07:38	0.06
aa6	JUNCTION	0.06	0.06	54.26	0	07:41	0.06
bb1	JUNCTION	0.08	0.10	47.08	0	08:00	0.10
bb2	JUNCTION	0.10	0.13	46.11	0	08:00	0.13
bb3	JUNCTION	0.11	0.13	45.93	0	08:00	0.13
bb4	JUNCTION	0.11	0.13	45.75	0	08:00	0.13
bb5	JUNCTION	0.11	0.13	45.57	0	08:00	0.13
bb6	JUNCTION	0.10	0.13	45.39	0	08:00	0.13
bb7	JUNCTION	0.09	0.12	45.19	0	08:00	0.12
bb8	JUNCTION	0.11	0.13	45.03	0	08:00	0.13
bb9	JUNCTION	0.11	0.13	44.85	0	08:00	0.13
bb10	JUNCTION	0.11	0.13	44.67	0	08:00	0.13
bb11	JUNCTION	0.11	0.14	44.49	0	08:00	0.14
bb12	JUNCTION	0.10	0.13	44.30	0	08:00	0.13
bb13	JUNCTION	0.10	0.12	44.12	0	08:00	0.12
bb14	JUNCTION	0.11	0.14	43.96	0	08:00	0.14
bb15	JUNCTION	0.11	0.14	43.78	0	08:00	0.14

bb16	JUNCTION	0.11	0.14	43.60	0	08:00	0.14
bb17	JUNCTION	0.10	0.12	43.40	0	08:00	0.12
cc1	JUNCTION	0.05	0.05	33.05	0	07:11	0.05
cc2	JUNCTION	0.06	0.06	32.06	0	07:42	0.06
cc3	JUNCTION	0.06	0.06	31.88	0	07:43	0.06
cc4	JUNCTION	0.06	0.06	31.06	0	07:44	0.06
cc5	JUNCTION	0.06	0.06	29.81	0	07:50	0.06
cc6	JUNCTION	0.06	0.06	27.39	0	07:47	0.06
cc7	JUNCTION	0.06	0.06	26.37	0	07:51	0.06
cc8	JUNCTION	0.06	0.07	24.84	0	07:55	0.07
cc9	JUNCTION	0.06	0.07	23.51	0	07:57	0.07
cc10	JUNCTION	0.06	0.07	22.89	0	07:59	0.07
cc11	JUNCTION	0.06	0.07	20.67	0	07:47	0.07
cc12	JUNCTION	0.07	0.08	20.30	0	07:59	0.08
dd1	JUNCTION	0.05	0.05	29.70	0	07:10	0.05
dd3	JUNCTION	0.06	0.06	28.71	0	07:04	0.06
dd4	JUNCTION	0.06	0.06	28.53	0	07:15	0.06
dd5	JUNCTION	0.06	0.06	28.17	0	07:15	0.06
ee1	JUNCTION	0.05	0.06	50.51	0	07:30	0.06
ee2	JUNCTION	0.05	0.06	50.09	0	07:31	0.06
STP	OUTFALL	0.00	0.00	20.00	0	00:00	0.00
LMH8	STORAGE	0.00	0.00	23.82	0	00:00	0.00
LMH3	STORAGE	0.00	0.00	30.17	0	00:00	0.00
LMH2	STORAGE	0.00	0.00	3.75	0	00:00	0.00
LMH23	STORAGE	0.00	0.00	12.77	0	00:00	0.00
LMH22	STORAGE	0.00	0.00	13.42	0	00:00	0.00
LMH21	STORAGE	0.00	0.00	24.41	0	00:00	0.00
LMH20	STORAGE	0.00	0.00	25.57	0	00:00	0.00
LMH19	STORAGE	0.00	0.00	23.36	0	00:00	0.00
LMH18	STORAGE	0.00	0.00	27.39	0	00:00	0.00
LMH17	STORAGE	0.00	0.00	20.43	0	00:00	0.00
LMH16	STORAGE	0.00	0.00	22.29	0	00:00	0.00
LMH15	STORAGE	0.00	0.00	22.00	0	00:00	0.00
LMH14	STORAGE	0.00	0.00	27.40	0	00:00	0.00
LMH13	STORAGE	0.00	0.00	19.57	0	00:00	0.00
LMH12	STORAGE	0.00	0.00	19.77	0	00:00	0.00
LMH11	STORAGE	0.00	0.00	36.12	0	00:00	0.00
LMH10	STORAGE	0.00	0.00	29.11	0	00:00	0.00
LMH9	STORAGE	0.00	0.00	36.09	0	00:00	0.00
LMH6	STORAGE	0.00	0.00	22.82	0	00:00	0.00
LMH7	STORAGE	0.00	0.00	26.58	0	00:00	0.00
LMH4	STORAGE	0.00	0.00	42.83	0	00:00	0.00
IPS1	STORAGE	0.00	0.00	22.20	0	00:00	0.00
LMH5	STORAGE	0.00	0.00	45.65	0	00:00	0.00
LMH1	STORAGE	0.00	0.00	51.25	0	00:00	0.00
MPS1	STORAGE	0.00	0.00	18.06	0	00:00	0.00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
a1	JUNCTION	0.10	0.10	0 07:00	0.00419	0.00419	1.488
a2	JUNCTION	0.10	0.20	0 07:12	0.00419	0.00832	0.759
a3	JUNCTION	0.10	0.30	0 07:12	0.00419	0.0124	0.531
a4	JUNCTION	0.10	0.40	0 07:14	0.00419	0.0166	0.405
a5	JUNCTION	0.10	0.50	0 07:15	0.00419	0.0207	0.336
a6	JUNCTION	0.10	0.60	0 07:27	0.00419	0.0248	0.282
a7	JUNCTION	0.10	0.70	0 07:26	0.00419	0.0289	0.227
a8	JUNCTION	0.10	0.80	0 07:25	0.00419	0.0331	0.209
a9	JUNCTION	0.10	0.90	0 07:27	0.00419	0.0372	0.192
a10	JUNCTION	0.10	1.00	0 07:27	0.00419	0.0413	0.242
a11	JUNCTION	0.10	1.10	0 07:27	0.00419	0.0454	0.131
a12	JUNCTION	0.10	1.20	0 07:27	0.00419	0.0495	0.140
a13	JUNCTION	0.10	1.30	0 07:27	0.00419	0.0536	0.140
a14	JUNCTION	0.10	1.40	0 07:59	0.00419	0.0578	0.129
a15	JUNCTION	0.10	1.50	0 07:29	0.00419	0.0619	0.108
a16	JUNCTION	0.10	1.60	0 07:32	0.00419	0.066	0.110
a17	JUNCTION	0.10	1.70	0 07:59	0.00419	0.0701	0.100
a18	JUNCTION	0.10	1.80	0 07:59	0.00419	0.0742	0.105
a19	JUNCTION	0.10	1.90	0 07:28	0.00419	0.0783	0.124
a20	JUNCTION	0.10	2.00	0 07:30	0.00419	0.0824	0.090
a21	JUNCTION	0.10	2.10	0 07:53	0.00419	0.0866	0.097
a22	JUNCTION	0.10	2.20	0 07:33	0.00419	0.0907	0.095
a23	JUNCTION	0.10	2.30	0 07:54	0.00419	0.0948	0.100
a24	JUNCTION	0.10	2.40	0 07:54	0.00419	0.0989	0.074
a25	JUNCTION	0.10	3.10	0 07:54	0.00419	0.128	0.074
a26	JUNCTION	0.10	3.20	0 07:44	0.00419	0.132	0.067
a27	JUNCTION	0.10	3.30	0 07:44	0.00419	0.136	0.057
a28	JUNCTION	0.10	3.40	0 07:44	0.00419	0.14	0.065
a29	JUNCTION	0.10	3.50	0 07:45	0.00419	0.144	0.064
a30	JUNCTION	0.10	3.60	0 07:39	0.00419	0.148	0.084
a31	JUNCTION	0.10	3.70	0 07:45	0.00419	0.152	0.056
a32	JUNCTION	0.10	3.80	0 07:39	0.00419	0.156	0.066
a33	JUNCTION	0.10	15.40	0 08:00	0.00419	0.631	0.039
a34	JUNCTION	0.10	15.50	0 08:00	0.00419	0.635	0.036
a35	JUNCTION	0.10	15.60	0 08:00	0.00419	0.639	0.048
a36	JUNCTION	0.10	16.50	0 08:00	0.00419	0.676	0.044
a37	JUNCTION	0.10	0.80	0 07:08	0.00419	0.033	0.237
a38	JUNCTION	0.10	0.70	0 07:19	0.00419	0.0289	0.263
a39	JUNCTION	0.10	0.60	0 07:18	0.00419	0.0248	0.290
a40	JUNCTION	0.10	0.50	0 07:15	0.00419	0.0207	0.332
a41	JUNCTION	0.10	0.40	0 07:15	0.00419	0.0166	0.403
a42	JUNCTION	0.10	0.30	0 07:13	0.00419	0.0124	0.530
a43	JUNCTION	0.10	0.20	0 07:13	0.00419	0.00832	0.761
a44	JUNCTION	0.10	0.10	0 07:00	0.00419	0.00419	0.000
a45	JUNCTION	0.10	27.50	0 08:00	0.00419	1.13	0.014
a46	JUNCTION	0.10	27.60	0 08:00	0.00419	1.13	0.026
a47	JUNCTION	0.10	27.70	0 08:00	0.00419	1.13	0.029
a48	JUNCTION	0.10	27.80	0 08:00	0.00419	1.14	0.029
a49	JUNCTION	0.10	27.90	0 08:00	0.00419	1.14	0.041
a50	JUNCTION	0.10	28.00	0 08:00	0.00419	1.15	0.027
a51	JUNCTION	0.10	28.10	0 08:00	0.00419	1.15	0.013
a52	JUNCTION	0.10	28.80	0 08:00	0.00419	1.18	0.020

a53	JUNCTION	0.10	28.90	0	08:00	0.00419	1.18	0.021
a54	JUNCTION	0.10	29.00	0	08:00	0.00419	1.19	0.023
a55	JUNCTION	0.10	29.10	0	08:00	0.00419	1.19	0.027
a56	JUNCTION	0.10	29.20	0	08:00	0.00419	1.19	0.040
a57	JUNCTION	0.10	29.30	0	08:00	0.00419	1.2	0.009
a58	JUNCTION	0.10	30.10	0	08:00	0.00419	1.23	0.031
a59	JUNCTION	0.10	30.20	0	08:00	0.00419	1.24	0.023
a60	JUNCTION	0.10	31.50	0	08:00	0.00419	1.29	0.026
a61	JUNCTION	0.10	31.60	0	08:00	0.00419	1.29	0.027
a62	JUNCTION	0.10	31.70	0	08:00	0.00419	1.3	0.027
a63	JUNCTION	0.10	31.80	0	08:00	0.00419	1.3	0.027
a64	JUNCTION	0.10	31.90	0	08:00	0.00419	1.3	0.027
a65	JUNCTION	0.10	32.00	0	08:00	0.00419	1.31	0.027
a66	JUNCTION	0.10	32.10	0	08:00	0.00419	1.31	0.038
a67	JUNCTION	0.10	32.20	0	08:00	0.00419	1.32	0.014
a68	JUNCTION	0.10	33.80	0	08:00	0.00419	1.38	0.024
a69	JUNCTION	0.10	33.90	0	08:00	0.00419	1.39	0.027
a70	JUNCTION	0.10	34.00	0	08:00	0.00419	1.39	0.027
a71	JUNCTION	0.10	34.10	0	08:00	0.00419	1.39	0.027
a72	JUNCTION	0.10	34.20	0	08:00	0.00419	1.4	0.027
a73	JUNCTION	0.10	34.30	0	08:00	0.00419	1.4	0.033
a74	JUNCTION	0.10	34.40	0	08:00	0.00419	1.4	0.017
a75	JUNCTION	0.10	34.50	0	08:00	0.00419	1.41	0.024
a76	JUNCTION	0.10	34.60	0	08:00	0.00419	1.41	0.026
a77	JUNCTION	0.10	34.70	0	08:00	0.00419	1.42	0.037
a78	JUNCTION	0.10	34.80	0	08:00	0.00419	1.42	0.016
a79	JUNCTION	0.10	34.90	0	08:00	0.00419	1.42	0.012
a80	JUNCTION	0.10	35.00	0	08:00	0.00419	1.43	0.019
a81	JUNCTION	0.10	35.10	0	08:00	0.00419	1.43	0.009
a82	JUNCTION	0.10	35.20	0	08:00	0.00419	1.44	0.022
a83	JUNCTION	0.10	35.30	0	08:00	0.00419	1.44	0.015
a84	JUNCTION	0.10	35.40	0	08:00	0.00419	1.44	0.006
a85	JUNCTION	0.10	35.50	0	08:00	0.00419	1.45	0.017
a86	JUNCTION	0.10	35.60	0	08:00	0.00419	1.45	0.025
a87	JUNCTION	0.10	35.70	0	08:00	0.00419	1.46	0.008
a88	JUNCTION	0.10	35.80	0	08:00	0.00419	1.46	0.014
a89	JUNCTION	0.10	35.90	0	08:00	0.00419	1.46	0.017
a90	JUNCTION	0.10	36.00	0	08:00	0.00419	1.47	0.025
a91	JUNCTION	0.10	36.10	0	08:00	0.00419	1.47	0.012
a92	JUNCTION	0.10	36.20	0	08:00	0.00419	1.47	0.049
b1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
b2	JUNCTION	0.10	0.20	0	07:15	0.00419	0.00832	0.809
b3	JUNCTION	0.10	0.30	0	07:53	0.00419	0.0124	0.527
b4	JUNCTION	0.10	0.40	0	07:53	0.00419	0.0166	0.415
b5	JUNCTION	0.10	0.50	0	07:49	0.00419	0.0207	0.340
b6	JUNCTION	0.10	0.60	0	07:49	0.00419	0.0248	0.289
b7	JUNCTION	0.10	0.70	0	07:57	0.00419	0.0289	0.274
b8	JUNCTION	0.10	0.80	0	07:59	0.00419	0.033	0.217
b9	JUNCTION	0.10	0.90	0	07:58	0.00419	0.0372	0.182
b10	JUNCTION	0.10	1.00	0	07:56	0.00419	0.0413	0.177
b11	JUNCTION	0.10	5.50	0	07:54	0.00419	0.226	0.052
b12	JUNCTION	0.10	5.60	0	07:53	0.00419	0.23	0.061
b13	JUNCTION	0.10	5.70	0	07:58	0.00419	0.235	0.054
b14	JUNCTION	0.10	5.80	0	07:54	0.00419	0.239	0.060
b15	JUNCTION	0.10	6.80	0	07:58	0.00419	0.28	0.079
b16	JUNCTION	0.10	6.90	0	07:57	0.00419	0.284	0.031
b17	JUNCTION	0.10	7.00	0	07:57	0.00419	0.288	0.048

b18	JUNCTION	0.10	7.10	0	07:57	0.00419	0.292	0.073
b19	JUNCTION	0.10	7.20	0	07:57	0.00419	0.296	0.000
b20	JUNCTION	0.10	8.10	0	07:59	0.00419	0.333	0.043
b21	JUNCTION	0.10	8.20	0	07:59	0.00419	0.337	0.027
b22	JUNCTION	0.10	8.30	0	07:59	0.00419	0.341	0.043
b23	JUNCTION	0.10	8.40	0	07:59	0.00419	0.345	0.066
b24	JUNCTION	0.10	8.50	0	07:59	0.00419	0.349	0.027
b25	JUNCTION	0.10	9.80	0	07:59	0.00419	0.403	0.026
b26	JUNCTION	0.10	9.90	0	07:59	0.00419	0.407	0.029
b27	JUNCTION	0.10	11.00	0	07:59	0.00419	0.452	0.025
b28	JUNCTION	0.10	11.10	0	08:00	0.00419	0.456	0.037
b29	JUNCTION	0.10	11.20	0	07:58	0.00419	0.46	0.043
b30	JUNCTION	0.10	11.30	0	07:57	0.00419	0.464	0.041
b31	JUNCTION	0.10	12.20	0	07:59	0.00419	0.501	0.044
b32	JUNCTION	0.10	12.30	0	07:59	0.00419	0.505	0.042
b33	JUNCTION	0.10	12.40	0	07:58	0.00419	0.509	0.042
b34	JUNCTION	0.10	12.50	0	07:58	0.00419	0.513	0.041
b35	JUNCTION	0.10	12.60	0	07:59	0.00419	0.517	0.038
b36	JUNCTION	0.10	13.90	0	07:59	0.00419	0.57	0.058
b37	JUNCTION	0.10	14.00	0	07:59	0.00419	0.574	0.045
b38	JUNCTION	0.10	15.00	0	07:59	0.00419	0.615	0.015
b39	JUNCTION	0.10	15.10	0	07:59	0.00419	0.619	0.041
b40	JUNCTION	0.10	15.20	0	08:00	0.00419	0.623	0.017
b41	JUNCTION	0.10	16.20	0	08:00	0.00419	0.665	0.020
b42	JUNCTION	0.10	16.30	0	08:00	0.00419	0.669	0.032
b43	JUNCTION	0.10	16.40	0	07:58	0.00419	0.673	0.037
b44	JUNCTION	0.10	16.50	0	07:59	0.00419	0.677	0.036
b45	JUNCTION	0.10	16.60	0	08:00	0.00419	0.681	0.036
b46	JUNCTION	0.10	16.70	0	07:59	0.00419	0.684	0.049
b47	JUNCTION	0.10	16.80	0	08:00	0.00419	0.688	0.014
b48	JUNCTION	0.10	18.00	0	08:00	0.00419	0.738	0.032
b49	JUNCTION	0.10	18.10	0	08:00	0.00419	0.742	0.021
b50	JUNCTION	0.10	18.20	0	07:59	0.00419	0.746	0.029
b51	JUNCTION	0.10	18.30	0	07:59	0.00419	0.75	0.016
b52	JUNCTION	0.10	18.40	0	07:59	0.00419	0.754	0.024
b53	JUNCTION	0.10	22.20	0	08:00	0.00419	0.91	0.000
b54	JUNCTION	0.10	3.70	0	07:58	0.00419	0.152	0.048
b55	JUNCTION	0.10	3.60	0	07:58	0.00419	0.148	0.066
b56	JUNCTION	0.10	3.50	0	07:53	0.00419	0.144	0.089
b57	JUNCTION	0.10	3.40	0	07:53	0.00419	0.14	0.058
b58	JUNCTION	0.10	3.30	0	07:42	0.00419	0.136	0.070
b59	JUNCTION	0.10	3.20	0	07:57	0.00419	0.132	0.000
b60	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.492
b61	JUNCTION	0.10	0.20	0	07:12	0.00419	0.00832	0.757
b62	JUNCTION	0.10	0.30	0	07:15	0.00419	0.0124	0.519
b63	JUNCTION	0.10	0.40	0	07:17	0.00419	0.0166	0.399
b64	JUNCTION	0.10	0.50	0	07:18	0.00419	0.0207	0.346
b65	JUNCTION	0.10	0.60	0	07:30	0.00419	0.0248	0.268
b66	JUNCTION	0.10	0.70	0	07:30	0.00419	0.0289	0.268
b67	JUNCTION	0.10	0.80	0	07:41	0.00419	0.0331	0.199
b68	JUNCTION	0.10	0.90	0	07:39	0.00419	0.0372	0.215
b69	JUNCTION	0.10	1.00	0	07:43	0.00419	0.0413	0.164
b70	JUNCTION	0.10	1.10	0	07:40	0.00419	0.0454	0.162
b71	JUNCTION	0.10	1.20	0	07:46	0.00419	0.0495	0.162
b72	JUNCTION	0.10	1.30	0	07:57	0.00419	0.0536	0.180
b73	JUNCTION	0.10	1.40	0	07:58	0.00419	0.0577	0.113
b74	JUNCTION	0.10	1.50	0	07:41	0.00419	0.0619	0.113

b75	JUNCTION	0.10	1.60	0	07:41	0.00419	0.066	0.127
c1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
c2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.781
c3	JUNCTION	0.10	0.30	0	07:21	0.00419	0.0124	0.535
c4	JUNCTION	0.10	0.40	0	07:24	0.00419	0.0166	0.388
c5	JUNCTION	0.10	0.50	0	07:24	0.00419	0.0207	0.317
c6	JUNCTION	0.10	0.60	0	07:25	0.00419	0.0248	0.278
c7	JUNCTION	0.10	0.70	0	07:25	0.00419	0.0289	0.251
c8	JUNCTION	0.10	0.80	0	07:26	0.00419	0.0331	0.199
c9	JUNCTION	0.10	0.90	0	07:40	0.00419	0.0372	0.193
c10	JUNCTION	0.10	1.00	0	07:36	0.00419	0.0413	0.183
c11	JUNCTION	0.10	1.10	0	07:51	0.00419	0.0454	0.145
c12	JUNCTION	0.10	1.20	0	07:43	0.00419	0.0495	0.140
c13	JUNCTION	0.10	1.30	0	07:39	0.00419	0.0537	0.150
c14	JUNCTION	0.10	1.40	0	07:55	0.00419	0.0578	0.000
c15	JUNCTION	0.10	1.50	0	07:47	0.00419	0.0619	0.132
d1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
d2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.815
d3	JUNCTION	0.10	0.30	0	07:33	0.00419	0.0124	0.565
d4	JUNCTION	0.10	0.40	0	07:37	0.00419	0.0166	0.452
d5	JUNCTION	0.10	0.50	0	07:49	0.00419	0.0207	0.332
d6	JUNCTION	0.10	0.60	0	07:49	0.00419	0.0248	0.270
d7	JUNCTION	0.10	0.70	0	07:49	0.00419	0.0289	0.225
d8	JUNCTION	0.10	0.80	0	07:59	0.00419	0.033	0.183
d9	JUNCTION	0.10	0.90	0	07:59	0.00419	0.0372	0.192
d10	JUNCTION	0.10	1.00	0	07:46	0.00419	0.0413	0.161
d11	JUNCTION	0.10	1.10	0	07:57	0.00419	0.0454	0.168
e1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
e2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.803
e3	JUNCTION	0.10	0.30	0	07:39	0.00419	0.0124	0.509
e4	JUNCTION	0.10	0.40	0	07:40	0.00419	0.0166	0.403
e5	JUNCTION	0.10	0.50	0	07:40	0.00419	0.0207	0.314
e6	JUNCTION	0.10	0.60	0	07:38	0.00419	0.0248	0.282
e7	JUNCTION	0.10	0.70	0	07:43	0.00419	0.0289	0.225
e8	JUNCTION	0.10	0.80	0	07:45	0.00419	0.0331	0.199
e9	JUNCTION	0.10	0.90	0	07:42	0.00419	0.0372	0.203
f1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
f2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.816
f3	JUNCTION	0.10	0.30	0	07:53	0.00419	0.0124	0.522
f4	JUNCTION	0.10	0.40	0	07:58	0.00419	0.0166	0.393
f5	JUNCTION	0.10	0.50	0	07:47	0.00419	0.0207	0.340
f6	JUNCTION	0.10	0.60	0	07:50	0.00419	0.0248	0.263
f7	JUNCTION	0.10	0.70	0	07:50	0.00419	0.0289	0.233
f8	JUNCTION	0.10	0.80	0	07:51	0.00419	0.0331	0.209
f9	JUNCTION	0.10	0.90	0	07:50	0.00419	0.0372	0.000
g1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	0.000
g2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.814
g3	JUNCTION	0.10	0.30	0	07:07	0.00419	0.0124	0.543
g4	JUNCTION	0.10	0.40	0	07:12	0.00419	0.0166	0.392
g5	JUNCTION	0.10	0.50	0	07:13	0.00419	0.0207	0.320
g6	JUNCTION	0.10	0.60	0	07:13	0.00419	0.0248	0.271
g7	JUNCTION	0.10	0.70	0	07:14	0.00419	0.0289	0.236
g8	JUNCTION	0.10	0.80	0	07:14	0.00419	0.0331	0.211
g9	JUNCTION	0.10	0.90	0	07:15	0.00419	0.0372	0.200
g10	JUNCTION	0.10	1.00	0	07:15	0.00419	0.0413	0.181
g11	JUNCTION	0.10	1.10	0	07:16	0.00419	0.0454	0.148
g12	JUNCTION	0.10	1.20	0	07:16	0.00419	0.0495	0.177

h1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.486
h2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.771
h3	JUNCTION	0.10	0.30	0	07:06	0.00419	0.0124	0.512
h4	JUNCTION	0.10	0.40	0	07:08	0.00419	0.0166	0.392
h5	JUNCTION	0.10	0.50	0	07:09	0.00419	0.0207	0.319
h6	JUNCTION	0.10	0.60	0	07:09	0.00419	0.0248	0.271
h7	JUNCTION	0.10	0.70	0	07:10	0.00419	0.0289	0.237
h8	JUNCTION	0.10	0.80	0	07:11	0.00419	0.0331	0.000
i1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.489
i2	JUNCTION	0.10	0.20	0	07:12	0.00419	0.00832	0.758
i3	JUNCTION	0.10	0.30	0	07:15	0.00419	0.0124	0.531
i4	JUNCTION	0.10	0.40	0	07:16	0.00419	0.0166	0.386
i5	JUNCTION	0.10	0.50	0	07:21	0.00419	0.0207	0.318
i6	JUNCTION	0.10	0.60	0	07:48	0.00419	0.0248	0.278
i7	JUNCTION	0.10	0.70	0	07:20	0.00419	0.0289	0.227
i8	JUNCTION	0.10	0.80	0	07:31	0.00419	0.0331	0.199
i9	JUNCTION	0.10	0.90	0	07:28	0.00419	0.0372	0.182
i10	JUNCTION	0.10	1.00	0	07:17	0.00419	0.0413	0.000
j1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.498
j2	JUNCTION	0.10	0.20	0	07:23	0.00419	0.00832	0.062
j3	JUNCTION	0.10	0.30	0	07:26	0.00419	0.0125	0.828
j4	JUNCTION	0.10	0.40	0	07:29	0.00419	0.0166	0.000
j5	JUNCTION	0.10	0.50	0	07:30	0.00419	0.0207	0.333
j6	JUNCTION	0.10	0.60	0	07:39	0.00419	0.0248	0.255
j7	JUNCTION	0.10	0.70	0	07:29	0.00419	0.029	0.226
j8	JUNCTION	0.10	0.80	0	07:29	0.00419	0.0331	0.202
j9	JUNCTION	0.10	0.90	0	07:31	0.00419	0.0372	0.181
j10	JUNCTION	0.10	1.00	0	07:30	0.00419	0.0413	0.225
j11	JUNCTION	0.10	1.10	0	07:46	0.00419	0.0454	0.183
j12	JUNCTION	0.10	1.20	0	07:39	0.00419	0.0495	0.125
k1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.475
k2	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.754
k3	JUNCTION	0.10	0.30	0	07:10	0.00419	0.0124	0.522
k4	JUNCTION	0.10	0.40	0	07:15	0.00419	0.0166	0.401
k5	JUNCTION	0.10	0.50	0	07:28	0.00419	0.0207	0.343
k6	JUNCTION	0.10	0.60	0	07:20	0.00419	0.0248	0.269
k7	JUNCTION	0.10	0.70	0	07:19	0.00419	0.0289	0.232
k8	JUNCTION	0.10	0.80	0	07:20	0.00419	0.0331	0.233
k9	JUNCTION	0.10	0.90	0	07:32	0.00419	0.0372	0.175
k10	JUNCTION	0.10	1.00	0	07:23	0.00419	0.0413	0.159
k11	JUNCTION	0.10	1.10	0	07:23	0.00419	0.0454	0.163
k12	JUNCTION	0.10	1.20	0	07:23	0.00419	0.0495	0.000
k13	JUNCTION	0.10	1.30	0	07:23	0.00419	0.0537	0.029
k14	JUNCTION	0.10	1.40	0	07:24	0.00419	0.0579	0.196
k15	JUNCTION	0.10	1.50	0	07:33	0.00419	0.062	0.120
k16	JUNCTION	0.10	1.60	0	07:58	0.00419	0.0661	0.123
k17	JUNCTION	0.10	1.70	0	07:57	0.00419	0.0702	0.128
k18	JUNCTION	0.10	1.80	0	07:59	0.00419	0.0743	0.107
k19	JUNCTION	0.10	1.90	0	07:59	0.00419	0.0784	0.096
k20	JUNCTION	0.10	2.00	0	07:57	0.00419	0.0825	0.128
k21	JUNCTION	0.10	2.10	0	07:57	0.00419	0.0866	0.091
k22	JUNCTION	0.10	10.90	0	08:00	0.00419	0.447	0.000
l1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.486
l2	JUNCTION	0.10	0.20	0	07:11	0.00419	0.00832	0.758
l3	JUNCTION	0.10	0.30	0	07:12	0.00419	0.0124	0.508
l4	JUNCTION	0.10	0.40	0	07:12	0.00419	0.0166	0.000
l5	JUNCTION	0.10	0.50	0	07:19	0.00419	0.0207	0.308

l6	JUNCTION	0.10	0.60	0	07:13	0.00419	0.0248	0.266
l7	JUNCTION	0.10	0.70	0	07:14	0.00419	0.029	0.235
l8	JUNCTION	0.10	0.80	0	07:14	0.00419	0.0331	0.000
m1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.487
m2	JUNCTION	0.10	0.20	0	07:11	0.00419	0.00832	0.758
m3	JUNCTION	0.10	0.30	0	07:12	0.00419	0.0124	0.530
m4	JUNCTION	0.10	0.40	0	07:18	0.00419	0.0166	0.431
m5	JUNCTION	0.10	0.50	0	07:29	0.00419	0.0207	0.330
m6	JUNCTION	0.10	0.60	0	07:50	0.00419	0.0248	0.272
m7	JUNCTION	0.10	0.70	0	07:43	0.00419	0.0289	0.239
m8	JUNCTION	0.10	0.80	0	07:31	0.00419	0.0331	0.229
m9	JUNCTION	0.10	0.90	0	07:56	0.00419	0.0372	0.192
m10	JUNCTION	0.10	1.00	0	07:18	0.00419	0.0413	0.182
m11	JUNCTION	0.10	1.10	0	07:55	0.00419	0.0454	0.156
m12	JUNCTION	0.10	1.20	0	07:37	0.00419	0.0495	0.181
m13	JUNCTION	0.10	1.30	0	07:52	0.00419	0.0536	0.134
m14	JUNCTION	0.10	1.40	0	07:46	0.00419	0.0577	0.156
m15	JUNCTION	0.10	1.50	0	07:52	0.00419	0.0618	0.120
m16	JUNCTION	0.10	1.60	0	07:38	0.00419	0.066	0.126
m17	JUNCTION	0.10	1.70	0	07:45	0.00419	0.0701	0.132
m18	JUNCTION	0.10	1.80	0	07:54	0.00419	0.0742	0.101
m19	JUNCTION	0.10	1.90	0	07:56	0.00419	0.0783	0.099
m20	JUNCTION	0.10	2.00	0	07:59	0.00419	0.0824	0.108
m21	JUNCTION	0.10	2.10	0	07:58	0.00419	0.0865	0.113
m22	JUNCTION	0.10	2.20	0	07:58	0.00419	0.0906	0.107
m23	JUNCTION	0.10	2.30	0	07:59	0.00419	0.0947	0.109
m24	JUNCTION	0.10	7.30	0	08:00	0.00419	0.3	0.040
m25	JUNCTION	0.10	7.40	0	08:00	0.00419	0.304	0.000
m26	JUNCTION	0.10	7.50	0	07:59	0.00419	0.308	0.034
m27	JUNCTION	0.10	7.60	0	07:59	0.00419	0.312	0.031
m28	JUNCTION	0.10	7.70	0	07:59	0.00419	0.316	0.025
m29	JUNCTION	0.10	7.80	0	07:59	0.00419	0.32	0.032
m30	JUNCTION	0.10	7.90	0	07:59	0.00419	0.324	0.034
m31	JUNCTION	0.10	8.00	0	08:00	0.00419	0.328	0.035
m32	JUNCTION	0.10	8.10	0	07:59	0.00419	0.332	0.049
m33	JUNCTION	0.10	8.20	0	08:00	0.00419	0.336	0.029
m34	JUNCTION	0.10	8.30	0	08:00	0.00419	0.34	0.053
m35	JUNCTION	0.10	8.40	0	08:00	0.00419	0.344	0.030
m36	JUNCTION	0.10	8.50	0	07:59	0.00419	0.348	0.044
m37	JUNCTION	0.10	8.60	0	08:00	0.00419	0.353	0.045
m38	JUNCTION	0.10	8.70	0	08:00	0.00419	0.357	0.061
o1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.477
o2	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.753
o3	JUNCTION	0.10	0.30	0	07:16	0.00419	0.0124	0.514
o4	JUNCTION	0.10	0.40	0	07:11	0.00419	0.0166	0.389
o5	JUNCTION	0.10	0.50	0	07:11	0.00419	0.0207	0.342
o6	JUNCTION	0.10	0.60	0	07:04	0.00419	0.0248	0.286
o7	JUNCTION	0.10	0.70	0	07:06	0.00419	0.0289	0.266
o8	JUNCTION	0.10	0.80	0	07:12	0.00419	0.0331	0.210
o9	JUNCTION	0.10	0.90	0	07:12	0.00419	0.0372	0.000
p1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
p2	JUNCTION	0.10	0.20	0	07:14	0.00419	0.00832	0.789
p3	JUNCTION	0.10	0.30	0	07:21	0.00419	0.0124	0.528
p4	JUNCTION	0.10	0.40	0	07:25	0.00419	0.0166	0.397
p5	JUNCTION	0.10	0.50	0	07:22	0.00419	0.0207	0.348
p6	JUNCTION	0.10	0.60	0	07:44	0.00419	0.0248	0.307
p7	JUNCTION	0.10	0.70	0	07:06	0.00419	0.0289	0.262

p8	JUNCTION	0.10	0.80	0	07:50	0.00419	0.033	0.208
p9	JUNCTION	0.10	0.90	0	07:47	0.00419	0.0372	0.179
p10	JUNCTION	0.10	1.00	0	07:28	0.00419	0.0413	0.168
p11	JUNCTION	0.10	1.10	0	07:24	0.00419	0.0454	0.164
p12	JUNCTION	0.10	2.80	0	07:47	0.00419	0.115	0.092
p13	JUNCTION	0.10	2.90	0	07:48	0.00419	0.12	0.062
p14	JUNCTION	0.10	3.00	0	07:49	0.00419	0.124	0.059
p15	JUNCTION	0.10	3.10	0	07:43	0.00419	0.128	0.065
p16	JUNCTION	0.10	3.20	0	07:51	0.00419	0.132	0.061
p17	JUNCTION	0.10	3.30	0	07:53	0.00419	0.136	0.066
p18	JUNCTION	0.10	3.40	0	07:59	0.00419	0.14	0.062
p19	JUNCTION	0.10	3.50	0	07:54	0.00419	0.144	0.052
p20	JUNCTION	0.10	3.60	0	07:49	0.00419	0.148	0.061
p21	JUNCTION	0.10	3.70	0	07:59	0.00419	0.152	0.052
p22	JUNCTION	0.10	3.80	0	07:51	0.00419	0.157	0.057
p23	JUNCTION	0.10	3.90	0	07:54	0.00419	0.161	0.061
p24	JUNCTION	0.10	4.00	0	07:49	0.00419	0.165	0.084
p25	JUNCTION	0.10	4.10	0	07:53	0.00419	0.169	0.051
p26	JUNCTION	0.10	4.20	0	07:53	0.00419	0.173	0.042
p27	JUNCTION	0.10	4.30	0	07:54	0.00419	0.177	0.046
p28	JUNCTION	0.10	4.40	0	07:50	0.00419	0.181	0.063
q1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.482
q2	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.778
q3	JUNCTION	0.10	0.30	0	07:21	0.00419	0.0124	0.525
q4	JUNCTION	0.10	0.40	0	07:21	0.00419	0.0166	0.414
q5	JUNCTION	0.10	0.50	0	07:23	0.00419	0.0207	0.322
q6	JUNCTION	0.10	0.60	0	07:23	0.00419	0.0248	0.287
q7	JUNCTION	0.10	0.70	0	07:24	0.00419	0.0289	0.233
q8	JUNCTION	0.10	0.80	0	07:24	0.00419	0.0331	0.219
q9	JUNCTION	0.10	0.90	0	07:25	0.00419	0.0372	0.248
q10	JUNCTION	0.10	1.00	0	07:34	0.00419	0.0413	0.134
q11	JUNCTION	0.10	1.10	0	07:31	0.00419	0.0454	0.170
q12	JUNCTION	0.10	1.20	0	07:39	0.00419	0.0495	0.163
q13	JUNCTION	0.10	1.30	0	07:27	0.00419	0.0536	0.140
q14	JUNCTION	0.10	1.40	0	07:29	0.00419	0.0577	0.118
q15	JUNCTION	0.10	1.50	0	07:31	0.00419	0.0619	0.130
r1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.478
r2	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.754
r3	JUNCTION	0.10	0.30	0	07:12	0.00419	0.0124	0.515
r4	JUNCTION	0.10	0.40	0	07:15	0.00419	0.0166	0.390
r5	JUNCTION	0.10	0.50	0	07:15	0.00419	0.0207	0.326
r6	JUNCTION	0.10	0.60	0	07:20	0.00419	0.0248	0.257
r7	JUNCTION	0.10	0.70	0	07:16	0.00419	0.0289	0.230
r8	JUNCTION	0.10	0.80	0	07:18	0.00419	0.0331	0.231
r9	JUNCTION	0.10	0.90	0	07:32	0.00419	0.0372	0.181
r10	JUNCTION	0.10	1.00	0	07:44	0.00419	0.0413	0.163
r11	JUNCTION	0.10	1.10	0	07:30	0.00419	0.0454	0.152
r12	JUNCTION	0.10	1.20	0	07:20	0.00419	0.0496	0.157
s1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	0.000
s2	JUNCTION	0.10	0.20	0	07:09	0.00419	0.00832	0.794
s3	JUNCTION	0.10	0.30	0	07:23	0.00419	0.0124	0.562
s4	JUNCTION	0.10	0.40	0	07:30	0.00419	0.0166	0.436
s5	JUNCTION	0.10	0.50	0	07:33	0.00419	0.0207	0.360
s6	JUNCTION	0.10	0.60	0	07:33	0.00419	0.0248	0.335
s7	JUNCTION	0.10	0.70	0	07:42	0.00419	0.0289	0.038
t1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.462
t2	JUNCTION	0.10	0.20	0	07:08	0.00419	0.00832	0.752

t3	JUNCTION	0.10	0.30	0	07:11	0.00419	0.0124	0.513
t4	JUNCTION	0.10	0.40	0	07:11	0.00419	0.0166	0.390
t5	JUNCTION	0.10	0.50	0	07:15	0.00419	0.0207	0.328
t6	JUNCTION	0.10	0.60	0	07:15	0.00419	0.0248	0.303
u1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	0.000
u2	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.800
u3	JUNCTION	0.10	0.30	0	07:27	0.00419	0.0124	0.552
u4	JUNCTION	0.10	0.40	0	07:37	0.00419	0.0166	0.400
u5	JUNCTION	0.10	0.50	0	07:34	0.00419	0.0207	0.338
u6	JUNCTION	0.10	0.60	0	07:34	0.00419	0.0248	0.311
u7	JUNCTION	0.10	0.70	0	07:55	0.00419	0.0289	0.257
u8	JUNCTION	0.10	0.80	0	07:59	0.00419	0.033	0.207
u9	JUNCTION	0.10	0.90	0	07:59	0.00419	0.0372	0.191
u10	JUNCTION	0.10	1.00	0	07:57	0.00419	0.0413	0.181
u11	JUNCTION	0.10	1.10	0	07:58	0.00419	0.0454	0.148
u12	JUNCTION	0.10	1.20	0	07:58	0.00419	0.0495	0.141
u13	JUNCTION	0.10	1.30	0	07:56	0.00419	0.0536	0.124
u14	JUNCTION	0.10	1.40	0	07:49	0.00419	0.0578	0.127
u15	JUNCTION	0.10	1.50	0	07:55	0.00419	0.0619	0.108
v1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	0.000
v2	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.758
v3	JUNCTION	0.10	0.30	0	07:11	0.00419	0.0124	0.513
v4	JUNCTION	0.10	0.40	0	07:14	0.00419	0.0166	0.399
v5	JUNCTION	0.10	0.50	0	07:14	0.00419	0.0207	0.307
v6	JUNCTION	0.10	0.60	0	07:14	0.00419	0.0248	0.261
v7	JUNCTION	0.10	0.70	0	07:14	0.00419	0.029	0.232
v8	JUNCTION	0.10	0.80	0	07:15	0.00419	0.0331	0.210
v9	JUNCTION	0.10	0.90	0	07:15	0.00419	0.0372	0.194
v10	JUNCTION	0.10	1.00	0	07:36	0.00419	0.0413	0.162
v11	JUNCTION	0.10	1.10	0	07:06	0.00419	0.0454	0.167
v12	JUNCTION	0.10	1.20	0	07:44	0.00419	0.0496	0.137
v13	JUNCTION	0.10	1.30	0	07:26	0.00419	0.0537	0.136
v14	JUNCTION	0.10	1.40	0	07:29	0.00419	0.0578	0.128
v15	JUNCTION	0.10	1.50	0	07:24	0.00419	0.0619	0.124
v16	JUNCTION	0.10	1.60	0	07:24	0.00419	0.066	0.150
v17	JUNCTION	0.10	1.70	0	07:26	0.00419	0.0701	0.011
v18	JUNCTION	0.10	0.80	0	07:59	0.00419	0.0331	-0.029
v19	JUNCTION	0.10	0.70	0	07:59	0.00419	0.0289	0.000
v20	JUNCTION	0.10	0.60	0	07:59	0.00419	0.0248	0.264
v21	JUNCTION	0.10	0.50	0	07:59	0.00419	0.0207	0.326
v22	JUNCTION	0.10	0.40	0	08:00	0.00419	0.0166	0.404
v23	JUNCTION	0.10	0.30	0	08:00	0.00419	0.0124	0.529
v24	JUNCTION	0.10	0.20	0	07:17	0.00419	0.00832	0.893
v25	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.511
v27	JUNCTION	0.10	2.60	0	08:00	0.00419	0.107	0.000
v28	JUNCTION	0.10	2.70	0	08:00	0.00419	0.111	0.098
v29	JUNCTION	0.10	2.80	0	08:00	0.00419	0.115	0.074
v30	JUNCTION	0.10	2.90	0	08:00	0.00419	0.12	0.066
v31	JUNCTION	0.10	3.00	0	08:00	0.00419	0.124	0.061
v32	JUNCTION	0.10	3.10	0	07:59	0.00419	0.128	0.068
v33	JUNCTION	0.10	3.20	0	08:00	0.00419	0.132	0.078
v34	JUNCTION	0.10	3.30	0	08:00	0.00419	0.136	0.053
v35	JUNCTION	0.10	3.40	0	07:59	0.00419	0.14	0.059
v36	JUNCTION	0.10	3.50	0	08:00	0.00419	0.144	0.074
v37	JUNCTION	0.10	3.60	0	08:00	0.00419	0.148	0.084
v38	JUNCTION	0.10	3.70	0	08:00	0.00419	0.152	0.104
v39	JUNCTION	0.10	3.80	0	08:00	0.00419	0.156	0.059

v40	JUNCTION	0.10	3.90	0	08:00	0.00419	0.161	0.051
v41	JUNCTION	0.10	4.00	0	08:00	0.00419	0.165	0.044
v42	JUNCTION	0.10	4.10	0	08:00	0.00419	0.169	0.050
v43	JUNCTION	0.10	4.20	0	07:59	0.00419	0.173	0.054
v44	JUNCTION	0.10	4.30	0	08:00	0.00419	0.177	0.057
v45	JUNCTION	0.10	4.40	0	08:00	0.00419	0.181	0.082
v46	JUNCTION	0.10	4.50	0	08:00	0.00419	0.185	0.046
v47	JUNCTION	0.10	9.80	0	08:00	0.00419	0.403	0.054
w1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	0.000
w2	JUNCTION	0.10	0.20	0	07:15	0.00419	0.00832	0.815
w3	JUNCTION	0.10	0.30	0	07:34	0.00419	0.0124	0.565
w4	JUNCTION	0.10	0.40	0	07:35	0.00419	0.0166	0.440
w5	JUNCTION	0.10	0.70	0	07:37	0.00419	0.0289	0.346
w6	JUNCTION	0.10	0.80	0	07:57	0.00419	0.033	0.204
w7	JUNCTION	0.10	0.90	0	07:56	0.00419	0.0371	0.208
w8	JUNCTION	0.10	1.00	0	07:58	0.00419	0.0413	0.163
w9	JUNCTION	0.10	1.10	0	07:58	0.00419	0.0454	0.169
w10	JUNCTION	0.10	1.20	0	07:59	0.00419	0.0495	0.137
w11	JUNCTION	0.10	1.30	0	08:00	0.00419	0.0536	0.134
w12	JUNCTION	0.10	1.40	0	07:55	0.00419	0.0577	0.133
w13	JUNCTION	0.10	1.50	0	07:59	0.00419	0.0619	0.127
w14	JUNCTION	0.10	1.60	0	07:59	0.00419	0.066	0.127
w15	JUNCTION	0.10	1.70	0	07:59	0.00419	0.0701	0.104
w16	JUNCTION	0.10	1.80	0	07:59	0.00419	0.0742	0.114
w17	JUNCTION	0.10	1.90	0	07:59	0.00419	0.0783	0.103
w18	JUNCTION	0.10	2.00	0	07:59	0.00419	0.0824	0.091
w19	JUNCTION	0.10	2.10	0	07:59	0.00419	0.0865	0.097
w20	JUNCTION	0.10	2.20	0	07:59	0.00419	0.0906	0.084
w21	JUNCTION	0.10	2.30	0	07:59	0.00419	0.0947	0.086
w22	JUNCTION	0.10	2.40	0	07:59	0.00419	0.0988	0.119
w23	JUNCTION	0.10	2.50	0	08:00	0.00419	0.103	0.080
w24	JUNCTION	0.10	2.60	0	07:59	0.00419	0.107	0.097
w25	JUNCTION	0.10	2.70	0	07:59	0.00419	0.111	0.121
w26	JUNCTION	0.10	2.80	0	08:00	0.00419	0.115	0.068
w27	JUNCTION	0.10	2.90	0	07:59	0.00419	0.119	0.079
w28	JUNCTION	0.10	3.00	0	08:00	0.00419	0.123	0.068
w29	JUNCTION	0.10	3.10	0	07:59	0.00419	0.127	0.100
w30	JUNCTION	0.10	3.20	0	08:00	0.00419	0.132	0.075
w31	JUNCTION	0.10	3.30	0	08:00	0.00419	0.136	0.055
w32	JUNCTION	0.10	3.40	0	07:59	0.00419	0.14	0.072
w33	JUNCTION	0.10	3.50	0	08:00	0.00419	0.144	0.060
w34	JUNCTION	0.10	3.60	0	07:59	0.00419	0.148	0.090
w35	JUNCTION	0.10	3.70	0	08:00	0.00419	0.152	0.057
x1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
x2	JUNCTION	0.10	0.20	0	07:15	0.00419	0.00832	0.814
x3	JUNCTION	0.10	0.30	0	07:50	0.00419	0.0124	0.527
x4	JUNCTION	0.10	0.40	0	07:52	0.00419	0.0166	0.000
x5	JUNCTION	0.10	0.50	0	07:52	0.00419	0.0207	0.332
x6	JUNCTION	0.10	1.70	0	07:56	0.00419	0.0702	0.000
x7	JUNCTION	0.10	1.80	0	07:59	0.00419	0.0742	0.141
x8	JUNCTION	0.10	1.90	0	07:59	0.00419	0.0783	0.097
x9	JUNCTION	0.10	2.00	0	07:59	0.00419	0.0824	0.111
x10	JUNCTION	0.10	2.10	0	07:57	0.00419	0.0865	0.119
x11	JUNCTION	0.10	2.20	0	07:58	0.00419	0.0906	0.117
x12	JUNCTION	0.10	2.30	0	07:59	0.00419	0.0947	0.112
x13	JUNCTION	0.10	2.40	0	07:59	0.00419	0.0988	0.108
x14	JUNCTION	0.10	2.50	0	07:58	0.00419	0.103	0.103

x15	JUNCTION	0.10	2.60	0	07:58	0.00419	0.107	0.127
x16	JUNCTION	0.10	2.70	0	07:58	0.00419	0.111	0.073
x17	JUNCTION	0.10	2.80	0	07:59	0.00419	0.115	0.084
x18	JUNCTION	0.10	2.90	0	07:59	0.00419	0.119	0.000
x19	JUNCTION	0.10	3.00	0	07:59	0.00419	0.123	0.073
x20	JUNCTION	0.10	3.10	0	08:00	0.00419	0.127	0.089
x21	JUNCTION	0.10	3.20	0	07:57	0.00419	0.131	0.062
x22	JUNCTION	0.10	3.30	0	07:59	0.00419	0.136	0.078
x23	JUNCTION	0.10	3.40	0	07:59	0.00419	0.14	0.081
x24	JUNCTION	0.10	3.50	0	08:00	0.00419	0.144	0.102
x25	JUNCTION	0.10	3.60	0	08:00	0.00419	0.148	0.068
x26	JUNCTION	0.10	3.70	0	07:58	0.00419	0.152	0.067
x27	JUNCTION	0.10	3.80	0	07:58	0.00419	0.156	0.060
x28	JUNCTION	0.10	3.90	0	07:58	0.00419	0.16	0.050
x29	JUNCTION	0.10	4.00	0	07:58	0.00419	0.164	0.061
x30	JUNCTION	0.10	4.10	0	07:58	0.00419	0.168	0.058
x31	JUNCTION	0.10	4.20	0	07:58	0.00419	0.172	0.062
x32	JUNCTION	0.10	4.30	0	07:59	0.00419	0.176	0.050
x33	JUNCTION	0.10	4.40	0	07:59	0.00419	0.181	0.046
x34	JUNCTION	0.10	4.50	0	08:00	0.00419	0.185	0.049
x35	JUNCTION	0.10	4.60	0	08:00	0.00419	0.189	0.079
x36	JUNCTION	0.10	4.70	0	08:00	0.00419	0.193	0.043
x37	JUNCTION	0.10	4.80	0	07:59	0.00419	0.197	0.059
x38	JUNCTION	0.10	4.90	0	08:00	0.00419	0.201	0.000
y1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
y2	JUNCTION	0.10	0.20	0	07:15	0.00419	0.00832	0.814
y3	JUNCTION	0.10	0.30	0	07:33	0.00419	0.0124	0.577
y4	JUNCTION	0.10	0.40	0	07:58	0.00419	0.0166	0.405
y5	JUNCTION	0.10	0.50	0	07:58	0.00419	0.0207	0.311
y6	JUNCTION	0.10	0.60	0	07:47	0.00419	0.0248	0.267
y7	JUNCTION	0.10	0.70	0	07:58	0.00419	0.0289	0.230
y8	JUNCTION	0.10	0.80	0	07:48	0.00419	0.0331	0.203
y9	JUNCTION	0.10	0.90	0	07:58	0.00419	0.0372	0.184
y10	JUNCTION	0.10	1.00	0	07:45	0.00419	0.0413	0.163
y11	JUNCTION	0.10	1.10	0	07:45	0.00419	0.0454	0.167
aa1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.494
aa2	JUNCTION	0.10	0.20	0	07:15	0.00419	0.00832	0.815
aa3	JUNCTION	0.10	0.30	0	07:33	0.00419	0.0124	0.550
aa4	JUNCTION	0.10	0.40	0	07:37	0.00419	0.0166	0.392
aa5	JUNCTION	0.10	0.50	0	07:37	0.00419	0.0207	0.331
aa6	JUNCTION	0.10	0.60	0	07:37	0.00419	0.0248	0.263
bb1	JUNCTION	0.10	9.90	0	08:00	0.00419	0.407	0.000
bb2	JUNCTION	0.10	10.00	0	08:00	0.00419	0.411	0.042
bb3	JUNCTION	0.10	10.10	0	08:00	0.00419	0.415	0.046
bb4	JUNCTION	0.10	10.20	0	08:00	0.00419	0.419	0.046
bb5	JUNCTION	0.10	10.30	0	08:00	0.00419	0.423	0.072
bb6	JUNCTION	0.10	10.40	0	08:00	0.00419	0.427	0.024
bb7	JUNCTION	0.10	10.50	0	08:00	0.00419	0.431	0.022
bb8	JUNCTION	0.10	10.60	0	08:00	0.00419	0.435	0.037
bb9	JUNCTION	0.10	10.70	0	08:00	0.00419	0.439	0.044
bb10	JUNCTION	0.10	10.80	0	08:00	0.00419	0.443	0.044
bb11	JUNCTION	0.10	10.90	0	08:00	0.00419	0.447	0.058
bb12	JUNCTION	0.10	11.00	0	08:00	0.00419	0.451	0.023
bb13	JUNCTION	0.10	11.10	0	08:00	0.00419	0.455	0.026
bb14	JUNCTION	0.10	11.20	0	08:00	0.00419	0.459	0.037
bb15	JUNCTION	0.10	11.30	0	08:00	0.00419	0.463	0.043
bb16	JUNCTION	0.10	11.40	0	08:00	0.00419	0.467	0.056

bb17	JUNCTION	0.10	11.50	0	08:00	0.00419	0.471	0.030
cc1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.480
cc2	JUNCTION	0.10	0.20	0	07:11	0.00419	0.00832	0.804
cc3	JUNCTION	0.10	0.30	0	07:42	0.00419	0.0124	0.519
cc4	JUNCTION	0.10	0.40	0	07:43	0.00419	0.0166	0.384
cc5	JUNCTION	0.10	0.50	0	07:51	0.00419	0.0207	0.308
cc6	JUNCTION	0.10	1.00	0	07:44	0.00419	0.0413	0.162
cc7	JUNCTION	0.10	1.10	0	07:46	0.00419	0.0455	0.153
cc8	JUNCTION	0.10	1.20	0	07:44	0.00419	0.0496	0.148
cc9	JUNCTION	0.10	1.30	0	07:41	0.00419	0.0537	0.164
cc10	JUNCTION	0.10	1.40	0	07:57	0.00419	0.0578	0.118
cc11	JUNCTION	0.10	1.50	0	07:45	0.00419	0.0619	0.113
cc12	JUNCTION	0.10	1.60	0	07:47	0.00419	0.066	0.123
dd1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.466
dd3	JUNCTION	0.10	0.20	0	07:10	0.00419	0.00832	0.815
dd4	JUNCTION	0.10	0.30	0	07:05	0.00419	0.0124	0.505
dd5	JUNCTION	0.10	0.40	0	07:15	0.00419	0.0166	0.397
ee1	JUNCTION	0.10	0.10	0	07:00	0.00419	0.00419	1.515
ee2	JUNCTION	0.10	0.20	0	07:30	0.00419	0.00832	0.753
STP	OUTFALL	0.00	58.40	0	08:00	0	2.38	0.000
LMH8	STORAGE	0.00	10.90	0	08:00	0	0.447	0.000
LMH3	STORAGE	0.00	9.80	0	08:00	0	0.403	0.000
LMH2	STORAGE	0.00	1.60	0	07:50	0	0.0659	0.000
LMH23	STORAGE	0.00	1.50	0	07:46	0	0.0618	0.000
LMH22	STORAGE	0.00	1.10	0	07:59	0	0.0453	0.000
LMH21	STORAGE	0.00	0.90	0	07:42	0	0.0371	0.000
LMH20	STORAGE	0.00	0.90	0	07:51	0	0.0371	0.000
LMH19	STORAGE	0.00	1.20	0	07:17	0	0.0494	0.000
LMH18	STORAGE	0.00	0.80	0	07:12	0	0.033	0.000
LMH17	STORAGE	0.00	1.00	0	07:21	0	0.0412	0.000
LMH16	STORAGE	0.00	1.20	0	07:39	0	0.0495	0.000
LMH15	STORAGE	0.00	0.80	0	07:18	0	0.033	0.000
LMH14	STORAGE	0.00	0.90	0	07:13	0	0.0371	0.000
LMH13	STORAGE	0.00	4.40	0	07:51	0	0.181	0.000
LMH12	STORAGE	0.00	1.60	0	07:48	0	0.066	0.000
LMH11	STORAGE	0.00	1.50	0	07:47	0	0.0618	0.000
LMH10	STORAGE	0.00	1.20	0	07:26	0	0.0495	0.000
LMH9	STORAGE	0.00	0.60	0	07:25	0	0.0247	0.000
LMH6	STORAGE	0.00	1.10	0	07:56	0	0.0454	0.000
LMH7	STORAGE	0.00	4.90	0	08:00	0	0.201	0.000
LMH4	STORAGE	0.00	11.50	0	08:00	0	0.471	0.000
IPS1	STORAGE	0.00	22.20	0	08:00	0	0.91	0.000
LMH5	STORAGE	0.00	16.50	0	08:00	0	0.676	0.000
LMH1	STORAGE	0.00	2.50	0	08:00	0	0.103	0.000
MPS1	STORAGE	0.00	58.40	0	08:00	0	2.38	0.000

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
LMH8	0.000	0	0	0	0.000	0	0 00:00	10.90
LMH3	0.000	0	0	0	0.000	0	0 00:00	9.80
LMH2	0.000	0	0	0	0.000	0	0 00:00	1.60
LMH23	0.000	0	0	0	0.000	0	0 00:00	1.50
LMH22	0.000	0	0	0	0.000	0	0 00:00	1.10
LMH21	0.000	0	0	0	0.000	0	0 00:00	0.90
LMH20	0.000	0	0	0	0.000	0	0 00:00	0.90
LMH19	0.000	0	0	0	0.000	0	0 00:00	1.20
LMH18	0.000	0	0	0	0.000	0	0 00:00	0.80
LMH17	0.000	0	0	0	0.000	0	0 00:00	1.00
LMH16	0.000	0	0	0	0.000	0	0 00:00	1.20
LMH15	0.000	0	0	0	0.000	0	0 00:00	0.80
LMH14	0.000	0	0	0	0.000	0	0 00:00	0.90
LMH13	0.000	0	0	0	0.000	0	0 00:00	4.40
LMH12	0.000	0	0	0	0.000	0	0 00:00	1.60
LMH11	0.000	0	0	0	0.000	0	0 00:00	1.50
LMH10	0.000	0	0	0	0.000	0	0 00:00	1.20
LMH9	0.000	0	0	0	0.000	0	0 00:00	0.60
LMH6	0.000	0	0	0	0.000	0	0 00:00	1.10
LMH7	0.000	0	0	0	0.000	0	0 00:00	4.90
LMH4	0.000	0	0	0	0.000	0	0 00:00	11.50
IPS1	0.000	0	0	0	0.000	0	0 00:00	22.20
LMH5	0.000	0	0	0	0.000	0	0 00:00	16.50
LMH1	0.000	0	0	0	0.000	0	0 00:00	2.50
MPS1	0.000	0	0	0	0.000	0	0 00:00	58.40

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
STP	99.63	30.62	58.40	2.384
System	99.63	30.62	58.40	2.384

Link Flow Summary

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Max |Veloc| m/sec	Max Full Flow	/Max/ Full Depth
C435	CONDUIT	1.00	0 07:58	0.97	0.01	0.07
C436	CONDUIT	1.10	0 07:59	1.00	0.01	0.07
C437	CONDUIT	1.20	0 08:00	1.15	0.01	0.07
C438	CONDUIT	1.30	0 07:55	0.81	0.01	0.09
C439	CONDUIT	1.40	0 07:59	0.64	0.03	0.12
C440	CONDUIT	1.50	0 07:59	0.62	0.03	0.12
C441	CONDUIT	1.60	0 07:59	0.64	0.03	0.13
C442	CONDUIT	1.70	0 07:59	0.70	0.03	0.12
C443	CONDUIT	1.80	0 07:59	0.68	0.04	0.13
C444	CONDUIT	1.90	0 07:59	0.91	0.03	0.11
C445	CONDUIT	2.00	0 07:59	0.96	0.02	0.11
C446	CONDUIT	2.10	0 07:59	0.93	0.03	0.12
C447	CONDUIT	2.20	0 07:59	0.74	0.03	0.14
C448	CONDUIT	2.30	0 07:59	0.59	0.05	0.17
C449	CONDUIT	2.40	0 08:00	0.60	0.06	0.18
C450	CONDUIT	2.50	0 07:59	0.65	0.05	0.17
C451	CONDUIT	2.60	0 07:59	0.58	0.07	0.19
C452	CONDUIT	2.70	0 08:00	0.61	0.07	0.19
C453	CONDUIT	2.80	0 07:59	0.74	0.05	0.17
C454	CONDUIT	2.90	0 08:00	0.72	0.06	0.18
C455	CONDUIT	3.00	0 07:59	0.69	0.06	0.19
C456	CONDUIT	3.10	0 08:00	0.63	0.08	0.20
C457	CONDUIT	3.20	0 08:00	0.97	0.05	0.15
C458	CONDUIT	3.30	0 07:59	0.90	0.03	0.16
C459	CONDUIT	3.40	0 08:00	0.73	0.08	0.19
C460	CONDUIT	3.50	0 07:59	0.73	0.07	0.20
C461	CONDUIT	3.60	0 08:00	0.66	0.10	0.22
C462	CONDUIT	3.70	0 08:00	0.63	0.06	0.23
C558	CONDUIT	4.50	0 08:00	0.67	0.10	0.25
C559	CONDUIT	4.40	0 08:00	0.70	0.12	0.24
C560	CONDUIT	4.30	0 08:00	0.83	0.06	0.21
C561	CONDUIT	4.20	0 08:00	1.23	0.04	0.16
C562	CONDUIT	4.10	0 07:59	1.61	0.03	0.13
C563	CONDUIT	4.00	0 08:00	2.08	0.02	0.11
C564	CONDUIT	3.90	0 08:00	2.05	0.02	0.11
C565	CONDUIT	3.80	0 08:00	1.39	0.04	0.13
C566	CONDUIT	3.70	0 08:00	0.67	0.10	0.22
C567	CONDUIT	3.60	0 08:00	0.63	0.10	0.22
C568	CONDUIT	3.50	0 08:00	0.63	0.10	0.22
C569	CONDUIT	3.40	0 08:00	0.71	0.06	0.20
C570	CONDUIT	3.30	0 07:59	1.12	0.02	0.14
C571	CONDUIT	3.20	0 08:00	1.22	0.04	0.13
C572	CONDUIT	3.10	0 08:00	1.21	0.03	0.13
C573	CONDUIT	3.00	0 07:59	1.37	0.02	0.12
C574	CONDUIT	2.90	0 08:00	1.43	0.02	0.11
C575	CONDUIT	2.80	0 08:00	0.83	0.05	0.15
C576	CONDUIT	2.70	0 08:00	0.78	0.05	0.16
C577	CONDUIT	2.60	0 08:00	0.74	0.05	0.16
C517	CONDUIT	0.10	0 07:15	0.25	0.00	0.04
C518	CONDUIT	0.20	0 07:33	0.27	0.01	0.06
C519	CONDUIT	0.30	0 07:37	0.37	0.01	0.06

C520	CONDUIT	0.40	0	07:37	0.59	0.00	0.05
C521	CONDUIT	0.50	0	07:37	0.66	0.01	0.06
C522	CONDUIT	0.60	0	07:38	0.36	0.01	0.10
C25	CONDUIT	3.10	0	07:44	1.04	0.04	0.14
C26	CONDUIT	3.20	0	07:44	1.23	0.04	0.13
C27	CONDUIT	3.30	0	07:44	1.25	0.03	0.13
C28	CONDUIT	3.40	0	07:45	1.22	0.04	0.14
C29	CONDUIT	3.50	0	07:39	0.97	0.04	0.16
C30	CONDUIT	3.60	0	07:45	0.84	0.07	0.18
C31	CONDUIT	3.70	0	07:39	0.80	0.06	0.19
C32	CONDUIT	3.80	0	07:39	0.43	0.10	0.33
C33	CONDUIT	15.40	0	08:00	0.92	0.22	0.35
C34	CONDUIT	15.50	0	08:00	0.90	0.22	0.36
C35	CONDUIT	15.60	0	08:00	0.94	0.23	0.35
C43	CONDUIT	0.80	0	07:21	0.25	0.02	0.23
C42	CONDUIT	0.70	0	07:08	0.50	0.01	0.09
C41	CONDUIT	0.60	0	07:19	0.47	0.01	0.08
C40	CONDUIT	0.50	0	07:18	0.49	0.01	0.07
C39	CONDUIT	0.40	0	07:15	0.55	0.00	0.05
C38	CONDUIT	0.30	0	07:15	0.52	0.00	0.05
C37	CONDUIT	0.20	0	07:13	0.44	0.00	0.04
C36	CONDUIT	0.10	0	07:13	0.31	0.00	0.03
C44	CONDUIT	27.50	0	08:00	1.02	0.18	0.35
C45	CONDUIT	27.60	0	08:00	0.98	0.22	0.37
C46	CONDUIT	27.70	0	08:00	0.98	0.22	0.37
C47	CONDUIT	27.80	0	08:00	0.97	0.22	0.37
C48	CONDUIT	27.90	0	08:00	1.07	0.22	0.35
C49	CONDUIT	28.00	0	08:00	1.30	0.17	0.30
C50	CONDUIT	28.10	0	08:00	1.75	0.11	0.24
C51	CONDUIT	28.80	0	08:00	1.69	0.11	0.25
C52	CONDUIT	28.90	0	08:00	1.33	0.14	0.30
C53	CONDUIT	29.00	0	08:00	1.06	0.20	0.36
C54	CONDUIT	29.10	0	08:00	0.98	0.23	0.38
C55	CONDUIT	29.20	0	08:00	1.08	0.23	0.35
C56	CONDUIT	29.30	0	08:00	1.14	0.12	0.34
C57	CONDUIT	30.10	0	08:00	1.03	0.21	0.38
C58	CONDUIT	30.20	0	08:00	0.98	0.24	0.39
C59	CONDUIT	31.50	0	08:00	1.00	0.25	0.40
C60	CONDUIT	31.60	0	08:00	1.00	0.25	0.40
C61	CONDUIT	31.70	0	08:00	1.00	0.25	0.40
C62	CONDUIT	31.80	0	08:00	1.00	0.26	0.40
C63	CONDUIT	31.90	0	08:00	1.00	0.26	0.40
C64	CONDUIT	32.00	0	08:00	1.00	0.26	0.40
C65	CONDUIT	32.10	0	08:00	1.04	0.26	0.39
C66	CONDUIT	32.20	0	08:00	1.02	0.22	0.40
C67	CONDUIT	33.80	0	08:00	1.01	0.27	0.42
C68	CONDUIT	33.90	0	08:00	1.01	0.27	0.42
C69	CONDUIT	34.00	0	08:00	1.01	0.27	0.42
C70	CONDUIT	34.10	0	08:00	1.01	0.27	0.42
C71	CONDUIT	34.20	0	08:00	1.01	0.27	0.42
C72	CONDUIT	34.30	0	08:00	1.04	0.28	0.41
C73	CONDUIT	34.40	0	08:00	1.04	0.24	0.41
C92	CONDUIT	0.10	0	07:15	0.26	0.00	0.04
C93	CONDUIT	0.20	0	07:53	0.29	0.01	0.05
C94	CONDUIT	0.30	0	07:53	0.42	0.00	0.05
C95	CONDUIT	0.40	0	07:49	0.47	0.01	0.06
C96	CONDUIT	0.50	0	07:49	0.51	0.01	0.07

C97	CONDUIT	0.60	0 07:57	0.54	0.01	0.07
C98	CONDUIT	0.70	0 07:59	0.59	0.01	0.08
C99	CONDUIT	0.80	0 07:58	0.75	0.01	0.07
C100	CONDUIT	0.90	0 07:56	0.84	0.01	0.07
C101	CONDUIT	1.00	0 07:51	0.39	0.01	0.13
C102	CONDUIT	5.50	0 07:53	0.96	0.08	0.23
C103	CONDUIT	5.60	0 07:58	0.82	0.13	0.26
C104	CONDUIT	5.70	0 07:54	0.78	0.13	0.27
C105	CONDUIT	5.80	0 07:58	0.68	0.16	0.30
C106	CONDUIT	6.80	0 07:57	0.78	0.19	0.30
C107	CONDUIT	6.90	0 07:57	0.88	0.10	0.28
C108	CONDUIT	7.00	0 07:57	0.75	0.19	0.32
C109	CONDUIT	7.10	0 07:57	0.79	0.19	0.31
C110	CONDUIT	7.20	0 07:59	0.89	0.11	0.29
C111	CONDUIT	8.10	0 07:59	0.90	0.19	0.31
C112	CONDUIT	8.20	0 07:59	0.91	0.12	0.31
C113	CONDUIT	8.30	0 07:59	0.78	0.23	0.35
C114	CONDUIT	8.40	0 07:59	0.82	0.23	0.34
C115	CONDUIT	8.50	0 07:59	0.90	0.16	0.32
C116	CONDUIT	9.80	0 07:59	0.95	0.20	0.34
C117	CONDUIT	9.90	0 07:59	0.94	0.20	0.35
C118	CONDUIT	11.00	0 08:00	0.92	0.20	0.38
C119	CONDUIT	11.10	0 07:58	0.83	0.30	0.42
C120	CONDUIT	11.20	0 07:57	0.83	0.31	0.42
C121	CONDUIT	11.30	0 07:57	0.81	0.31	0.43
C122	CONDUIT	12.20	0 07:59	0.85	0.33	0.44
C123	CONDUIT	12.30	0 07:58	0.85	0.34	0.44
C124	CONDUIT	12.40	0 07:58	0.85	0.34	0.44
C125	CONDUIT	12.50	0 07:59	0.85	0.34	0.45
C126	CONDUIT	12.60	0 07:59	0.82	0.34	0.46
C127	CONDUIT	13.90	0 07:59	0.88	0.38	0.47
C128	CONDUIT	14.00	0 07:59	0.97	0.36	0.44
C129	CONDUIT	15.00	0 07:59	1.04	0.09	0.32
C130	CONDUIT	15.10	0 08:00	0.94	0.23	0.34
C131	CONDUIT	15.20	0 08:00	1.02	0.16	0.33
C132	CONDUIT	16.20	0 08:00	0.96	0.18	0.35
C133	CONDUIT	16.30	0 07:58	0.89	0.25	0.38
C134	CONDUIT	16.40	0 07:59	0.89	0.25	0.38
C135	CONDUIT	16.50	0 08:00	0.89	0.25	0.38
C136	CONDUIT	16.60	0 07:59	0.89	0.25	0.38
C137	CONDUIT	16.70	0 08:00	0.96	0.25	0.36
C138	CONDUIT	16.80	0 08:00	1.10	0.09	0.33
C139	CONDUIT	18.00	0 08:00	1.08	0.23	0.35
C140	CONDUIT	18.10	0 07:59	1.62	0.13	0.26
C141	CONDUIT	18.20	0 07:59	1.74	0.13	0.25
C142	CONDUIT	18.30	0 07:59	1.73	0.11	0.25
C143	CONDUIT	18.40	0 08:00	1.21	0.15	0.33
C147	CONDUIT	3.50	0 07:58	0.66	0.10	0.21
C146	CONDUIT	3.40	0 07:53	0.71	0.06	0.20
C145	CONDUIT	3.30	0 07:53	0.78	0.07	0.18
C144	CONDUIT	3.20	0 07:42	1.03	0.02	0.15
C150	CONDUIT	0.10	0 07:12	0.37	0.00	0.03
C151	CONDUIT	0.20	0 07:15	0.54	0.00	0.03
C152	CONDUIT	0.30	0 07:17	0.59	0.00	0.04
C153	CONDUIT	0.40	0 07:18	0.56	0.00	0.05
C156	CONDUIT	0.70	0 07:41	0.42	0.02	0.10
C157	CONDUIT	0.80	0 07:39	0.73	0.01	0.07

C158	CONDUIT	0.90	0	07:43	0.61	0.02	0.09
C159	CONDUIT	1.00	0	07:40	0.85	0.01	0.08
C160	CONDUIT	1.10	0	07:46	0.66	0.01	0.10
C161	CONDUIT	1.20	0	07:57	0.57	0.02	0.11
C162	CONDUIT	1.30	0	07:58	0.59	0.03	0.12
C163	CONDUIT	1.40	0	07:41	1.70	0.01	0.06
C164	CONDUIT	1.50	0	07:41	0.94	0.01	0.09
C166	CONDUIT	0.10	0	07:14	0.31	0.00	0.03
C167	CONDUIT	0.20	0	07:21	0.36	0.00	0.05
C168	CONDUIT	0.30	0	07:24	0.45	0.01	0.05
C169	CONDUIT	0.40	0	07:24	0.76	0.00	0.04
C170	CONDUIT	0.50	0	07:25	0.67	0.00	0.06
C171	CONDUIT	0.60	0	07:25	0.56	0.01	0.07
C172	CONDUIT	0.70	0	07:26	0.47	0.01	0.09
C173	CONDUIT	0.80	0	07:40	0.45	0.02	0.10
C174	CONDUIT	0.90	0	07:36	0.47	0.02	0.11
C175	CONDUIT	1.00	0	07:51	0.46	0.03	0.11
C176	CONDUIT	1.10	0	07:43	1.38	0.01	0.06
C177	CONDUIT	1.20	0	07:39	0.84	0.01	0.09
C178	CONDUIT	1.30	0	07:55	0.63	0.03	0.11
C181	CONDUIT	0.10	0	07:14	0.25	0.00	0.04
C182	CONDUIT	0.20	0	07:33	0.25	0.01	0.06
C183	CONDUIT	0.30	0	07:37	0.30	0.01	0.07
C184	CONDUIT	0.40	0	07:49	0.35	0.01	0.07
C185	CONDUIT	0.50	0	07:49	0.67	0.01	0.06
C186	CONDUIT	0.60	0	07:49	0.92	0.00	0.05
C187	CONDUIT	0.70	0	07:59	1.13	0.00	0.05
C188	CONDUIT	0.80	0	07:59	1.29	0.00	0.05
C189	CONDUIT	0.90	0	07:46	1.28	0.00	0.05
C192	CONDUIT	0.10	0	07:14	0.29	0.00	0.04
C193	CONDUIT	0.20	0	07:39	0.35	0.00	0.05
C194	CONDUIT	0.30	0	07:40	0.56	0.00	0.04
C195	CONDUIT	0.40	0	07:40	0.56	0.01	0.05
C196	CONDUIT	0.50	0	07:38	0.56	0.00	0.06
C197	CONDUIT	0.60	0	07:43	0.50	0.01	0.08
C198	CONDUIT	0.70	0	07:45	1.10	0.00	0.05
C199	CONDUIT	0.80	0	07:42	0.74	0.00	0.07
C179	CONDUIT	1.40	0	07:47	0.65	0.02	0.11
C190	CONDUIT	1.00	0	07:57	0.78	0.01	0.08
C201	CONDUIT	0.10	0	07:14	0.26	0.00	0.04
C202	CONDUIT	0.20	0	07:53	0.29	0.01	0.05
C203	CONDUIT	0.30	0	07:58	0.49	0.00	0.05
C204	CONDUIT	0.40	0	07:47	0.58	0.00	0.05
C205	CONDUIT	0.50	0	07:50	0.63	0.01	0.06
C206	CONDUIT	0.60	0	07:50	0.78	0.01	0.06
C207	CONDUIT	0.70	0	07:51	0.88	0.01	0.06
C208	CONDUIT	0.80	0	07:50	0.64	0.01	0.08
C210	CONDUIT	0.10	0	07:14	0.25	0.00	0.04
C211	CONDUIT	0.20	0	07:07	0.28	0.01	0.05
C212	CONDUIT	0.30	0	07:12	0.40	0.01	0.06
C213	CONDUIT	0.40	0	07:13	0.68	0.00	0.05
C214	CONDUIT	0.50	0	07:13	0.74	0.00	0.05
C215	CONDUIT	0.60	0	07:14	0.79	0.01	0.06
C216	CONDUIT	0.70	0	07:14	0.82	0.01	0.06
C217	CONDUIT	0.80	0	07:15	0.81	0.01	0.07
C218	CONDUIT	0.90	0	07:15	0.83	0.01	0.07
C219	CONDUIT	1.00	0	07:16	0.91	0.01	0.07

C220	CONDUIT	1.10	0	07:16	0.70	0.01	0.09
C222	CONDUIT	0.10	0	07:14	0.34	0.00	0.03
C223	CONDUIT	0.20	0	07:06	0.46	0.00	0.04
C224	CONDUIT	0.30	0	07:08	0.64	0.00	0.04
C225	CONDUIT	0.40	0	07:09	0.73	0.00	0.05
C226	CONDUIT	0.50	0	07:09	0.77	0.00	0.05
C227	CONDUIT	0.60	0	07:10	0.76	0.01	0.06
C228	CONDUIT	0.70	0	07:11	0.60	0.01	0.08
C230	CONDUIT	0.10	0	07:12	0.35	0.00	0.03
C231	CONDUIT	0.20	0	07:15	0.43	0.00	0.04
C232	CONDUIT	0.30	0	07:16	0.50	0.00	0.05
C233	CONDUIT	0.40	0	07:21	0.73	0.00	0.04
C234	CONDUIT	0.50	0	07:48	0.77	0.00	0.05
C235	CONDUIT	0.60	0	07:20	0.89	0.01	0.05
C236	CONDUIT	0.70	0	07:31	1.03	0.01	0.05
C237	CONDUIT	0.80	0	07:28	1.15	0.01	0.05
C238	CONDUIT	0.90	0	07:17	0.77	0.01	0.08
C248	CONDUIT	0.10	0	07:23	0.42	0.00	0.03
C249	CONDUIT	0.30	0	07:29	0.65	0.00	0.04
C250	CONDUIT	0.40	0	07:30	0.64	0.00	0.05
C251	CONDUIT	0.50	0	07:39	0.56	0.01	0.06
C252	CONDUIT	0.60	0	07:29	1.17	0.00	0.04
C253	CONDUIT	0.70	0	07:29	1.00	0.00	0.05
C254	CONDUIT	0.80	0	07:31	0.90	0.01	0.06
C255	CONDUIT	0.90	0	07:30	0.61	0.01	0.09
C256	CONDUIT	1.00	0	07:46	0.49	0.02	0.11
C257	CONDUIT	1.10	0	07:39	0.55	0.02	0.11
C240	CONDUIT	0.10	0	07:11	0.37	0.00	0.03
C241	CONDUIT	0.20	0	07:12	0.58	0.00	0.03
C242	CONDUIT	0.30	0	07:12	0.80	0.00	0.04
C243	CONDUIT	0.40	0	07:19	0.95	0.00	0.04
C244	CONDUIT	0.50	0	07:13	0.98	0.00	0.04
C245	CONDUIT	0.60	0	07:14	0.78	0.00	0.06
C246	CONDUIT	0.70	0	07:14	0.58	0.01	0.08
C319	CONDUIT	0.10	0	07:10	0.44	0.00	0.02
C320	CONDUIT	0.20	0	07:16	0.58	0.00	0.03
C321	CONDUIT	0.30	0	07:11	0.64	0.00	0.04
C322	CONDUIT	0.40	0	07:11	0.46	0.00	0.06
C323	CONDUIT	0.50	0	07:04	0.36	0.01	0.09
C324	CONDUIT	0.60	0	07:06	0.38	0.02	0.09
C325	CONDUIT	0.70	0	07:12	0.42	0.02	0.10
C326	CONDUIT	0.80	0	07:12	0.54	0.01	0.09
C328	CONDUIT	0.10	0	07:14	0.27	0.00	0.04
C329	CONDUIT	0.20	0	07:21	0.32	0.00	0.05
C330	CONDUIT	0.30	0	07:25	0.43	0.01	0.05
C331	CONDUIT	0.40	0	07:22	0.42	0.01	0.07
C332	CONDUIT	0.50	0	07:44	0.41	0.01	0.08
C333	CONDUIT	0.60	0	07:06	0.48	0.01	0.08
C334	CONDUIT	0.70	0	07:50	0.54	0.01	0.08
C335	CONDUIT	0.80	0	07:47	0.67	0.01	0.08
C336	CONDUIT	0.90	0	07:28	0.84	0.01	0.07
C337	CONDUIT	1.00	0	07:24	0.56	0.01	0.10
C338	CONDUIT	1.10	0	07:25	0.40	0.03	0.14
C540	CONDUIT	0.10	0	07:11	0.28	0.00	0.04
C541	CONDUIT	0.20	0	07:42	0.29	0.01	0.05
C542	CONDUIT	0.30	0	07:43	0.65	0.00	0.04
C543	CONDUIT	0.40	0	07:51	0.93	0.00	0.04

C544	CONDUIT	0.50	0	07:43	0.78	0.00	0.05
C545	CONDUIT	1.00	0	07:46	1.04	0.01	0.07
C546	CONDUIT	1.10	0	07:44	0.96	0.01	0.07
C547	CONDUIT	1.20	0	07:41	0.82	0.01	0.09
C548	CONDUIT	1.30	0	07:57	0.77	0.02	0.10
C549	CONDUIT	1.40	0	07:45	1.13	0.01	0.08
C550	CONDUIT	1.50	0	07:47	0.80	0.01	0.10
C552	CONDUIT	0.10	0	07:10	0.29	0.00	0.04
C553	CONDUIT	0.20	0	07:05	0.28	0.01	0.05
C554	CONDUIT	0.30	0	07:15	0.41	0.01	0.05
C555	CONDUIT	0.40	0	07:15	0.53	0.01	0.06
C339	CONDUIT	2.80	0	07:48	0.88	0.05	0.15
C340	CONDUIT	2.90	0	07:49	1.23	0.03	0.12
C341	CONDUIT	3.00	0	07:43	1.19	0.03	0.13
C342	CONDUIT	3.10	0	07:51	1.11	0.04	0.14
C343	CONDUIT	3.20	0	07:53	1.39	0.03	0.12
C344	CONDUIT	3.30	0	07:59	1.40	0.03	0.12
C345	CONDUIT	3.40	0	07:54	1.43	0.03	0.12
C346	CONDUIT	3.50	0	07:49	1.28	0.03	0.14
C347	CONDUIT	3.60	0	07:59	1.20	0.04	0.14
C348	CONDUIT	3.70	0	07:51	1.26	0.04	0.14
C349	CONDUIT	3.80	0	07:54	1.22	0.04	0.15
C350	CONDUIT	3.90	0	07:49	0.90	0.05	0.18
C351	CONDUIT	4.00	0	07:53	0.76	0.09	0.21
C352	CONDUIT	4.10	0	07:53	1.20	0.05	0.16
C353	CONDUIT	4.20	0	07:54	1.68	0.02	0.13
C354	CONDUIT	4.30	0	07:50	1.06	0.04	0.18
C74	CONDUIT	34.50	0	08:00	1.01	0.28	0.42
C75	CONDUIT	34.60	0	08:00	1.02	0.28	0.42
C76	CONDUIT	34.70	0	08:00	1.12	0.28	0.39
C77	CONDUIT	34.80	0	08:00	2.35	0.10	0.23
C78	CONDUIT	34.90	0	08:00	2.47	0.09	0.22
C79	CONDUIT	35.00	0	08:00	2.65	0.09	0.21
C80	CONDUIT	35.10	0	08:00	2.56	0.07	0.22
C81	CONDUIT	35.20	0	08:00	2.29	0.11	0.24
C82	CONDUIT	35.30	0	08:00	2.83	0.08	0.20
C83	CONDUIT	35.40	0	08:00	2.79	0.05	0.21
C84	CONDUIT	35.50	0	08:00	1.65	0.15	0.30
C85	CONDUIT	35.60	0	08:00	1.60	0.16	0.31
C86	CONDUIT	35.70	0	08:00	1.86	0.11	0.28
C87	CONDUIT	35.80	0	08:00	1.93	0.13	0.27
C88	CONDUIT	35.90	0	08:00	1.71	0.14	0.30
C89	CONDUIT	36.00	0	08:00	1.38	0.18	0.35
C90	CONDUIT	36.10	0	08:00	1.13	0.16	0.40
C356	CONDUIT	0.10	0	07:10	0.34	0.00	0.03
C357	CONDUIT	0.20	0	07:21	0.37	0.00	0.04
C358	CONDUIT	0.30	0	07:21	0.38	0.00	0.06
C359	CONDUIT	0.40	0	07:23	0.40	0.01	0.07
C360	CONDUIT	0.50	0	07:23	0.45	0.01	0.07
C361	CONDUIT	0.60	0	07:24	0.44	0.01	0.08
C362	CONDUIT	0.70	0	07:24	0.68	0.01	0.07
C363	CONDUIT	0.80	0	07:25	0.63	0.01	0.08
C364	CONDUIT	0.90	0	07:34	0.62	0.02	0.09
C365	CONDUIT	1.00	0	07:31	0.70	0.01	0.09
C366	CONDUIT	1.10	0	07:39	0.76	0.01	0.09
C367	CONDUIT	1.20	0	07:27	0.82	0.02	0.09
C368	CONDUIT	1.30	0	07:29	0.97	0.01	0.08

C369	CONDUIT	1.40	0	07:31	0.84	0.01	0.10
C371	CONDUIT	0.10	0	07:10	0.43	0.00	0.03
C372	CONDUIT	0.20	0	07:12	0.59	0.00	0.03
C373	CONDUIT	0.30	0	07:15	0.69	0.00	0.04
C374	CONDUIT	0.40	0	07:15	0.70	0.00	0.05
C375	CONDUIT	0.50	0	07:20	0.76	0.00	0.05
C376	CONDUIT	0.60	0	07:16	0.92	0.00	0.05
C377	CONDUIT	0.70	0	07:18	0.69	0.01	0.07
C378	CONDUIT	0.80	0	07:32	0.68	0.01	0.08
C379	CONDUIT	0.90	0	07:44	0.90	0.01	0.07
C380	CONDUIT	1.00	0	07:30	0.94	0.01	0.07
C381	CONDUIT	1.10	0	07:20	0.71	0.01	0.09
C388	CONDUIT	0.60	0	07:42	0.40	0.02	0.09
C387	CONDUIT	0.50	0	07:33	0.35	0.01	0.09
C386	CONDUIT	0.40	0	07:33	0.33	0.01	0.08
C385	CONDUIT	0.30	0	07:30	0.30	0.01	0.07
C384	CONDUIT	0.20	0	07:23	0.26	0.01	0.06
C383	CONDUIT	0.10	0	07:09	0.27	0.00	0.04
C390	CONDUIT	0.10	0	07:08	0.49	0.00	0.02
C391	CONDUIT	0.20	0	07:11	0.60	0.00	0.03
C392	CONDUIT	0.30	0	07:11	0.71	0.00	0.04
C393	CONDUIT	0.40	0	07:15	0.59	0.00	0.05
C394	CONDUIT	0.50	0	07:15	0.49	0.01	0.07
C259	CONDUIT	0.10	0	07:10	0.43	0.00	0.03
C260	CONDUIT	0.20	0	07:10	0.53	0.00	0.04
C261	CONDUIT	0.30	0	07:15	0.57	0.00	0.04
C262	CONDUIT	0.40	0	07:28	0.52	0.00	0.06
C263	CONDUIT	0.50	0	07:20	0.53	0.01	0.07
C266	CONDUIT	0.80	0	07:32	0.48	0.02	0.10
C267	CONDUIT	0.90	0	07:23	1.29	0.00	0.05
C268	CONDUIT	1.00	0	07:23	1.27	0.01	0.06
C269	CONDUIT	1.10	0	07:23	1.33	0.01	0.06
C272	CONDUIT	1.40	0	07:33	0.72	0.01	0.11
C273	CONDUIT	1.50	0	07:58	0.52	0.04	0.14
C274	CONDUIT	1.60	0	07:57	0.54	0.04	0.14
C275	CONDUIT	1.70	0	07:59	0.54	0.05	0.15
C276	CONDUIT	1.80	0	07:59	0.66	0.04	0.13
C277	CONDUIT	1.90	0	07:57	0.61	0.03	0.15
C278	CONDUIT	2.00	0	07:57	0.56	0.05	0.16
C279	CONDUIT	2.10	0	07:29	0.37	0.05	0.25
C316	CONDUIT	8.60	0	08:00	0.63	0.23	0.42
C315	CONDUIT	8.50	0	08:00	0.82	0.23	0.34
C314	CONDUIT	8.40	0	07:59	0.96	0.14	0.30
C313	CONDUIT	8.30	0	08:00	1.10	0.15	0.27
C312	CONDUIT	8.20	0	08:00	1.20	0.11	0.25
C311	CONDUIT	8.10	0	08:00	1.28	0.12	0.24
C310	CONDUIT	8.00	0	07:59	1.43	0.08	0.22
C309	CONDUIT	7.90	0	08:00	1.73	0.07	0.19
C308	CONDUIT	7.80	0	07:59	1.81	0.06	0.18
C307	CONDUIT	7.70	0	07:59	2.20	0.04	0.16
C306	CONDUIT	7.60	0	07:59	2.34	0.05	0.15
C305	CONDUIT	7.50	0	07:59	1.98	0.06	0.17
C304	CONDUIT	7.40	0	07:59	1.05	0.14	0.26
C463	CONDUIT	0.10	0	07:15	0.26	0.00	0.04
C464	CONDUIT	0.20	0	07:50	0.29	0.01	0.05
C469	CONDUIT	1.80	0	07:59	0.59	0.04	0.15
C470	CONDUIT	1.90	0	07:59	0.74	0.03	0.13

C471	CONDUIT	2.00	0	07:57	0.61	0.04	0.15
C472	CONDUIT	2.10	0	07:58	0.55	0.06	0.17
C473	CONDUIT	2.20	0	07:59	0.56	0.06	0.17
C474	CONDUIT	2.30	0	07:59	0.56	0.06	0.18
C475	CONDUIT	2.40	0	07:58	0.57	0.07	0.18
C476	CONDUIT	2.50	0	07:58	0.57	0.07	0.19
C479	CONDUIT	2.80	0	07:59	0.80	0.05	0.16
C482	CONDUIT	3.10	0	07:57	0.88	0.05	0.16
C483	CONDUIT	3.20	0	07:59	0.77	0.05	0.18
C484	CONDUIT	3.30	0	07:59	0.62	0.09	0.21
C485	CONDUIT	3.40	0	08:00	0.62	0.09	0.22
C486	CONDUIT	3.50	0	08:00	0.66	0.10	0.21
C487	CONDUIT	3.60	0	07:58	1.02	0.05	0.16
C488	CONDUIT	3.70	0	07:58	1.08	0.05	0.16
C489	CONDUIT	3.80	0	07:58	1.27	0.04	0.14
C490	CONDUIT	3.90	0	07:58	1.22	0.04	0.15
C491	CONDUIT	4.00	0	07:58	1.13	0.05	0.16
C492	CONDUIT	4.10	0	07:58	0.92	0.05	0.19
C493	CONDUIT	4.20	0	07:59	0.80	0.09	0.21
C494	CONDUIT	4.30	0	07:59	0.89	0.07	0.20
C495	CONDUIT	4.40	0	08:00	0.84	0.07	0.21
C496	CONDUIT	4.50	0	08:00	0.71	0.10	0.24
C498	CONDUIT	4.70	0	07:59	0.83	0.08	0.22
C499	CONDUIT	4.80	0	08:00	0.80	0.11	0.23
C501	CONDUIT	0.10	0	07:15	0.25	0.00	0.04
C502	CONDUIT	0.20	0	07:33	0.25	0.01	0.06
C503	CONDUIT	0.30	0	07:58	0.32	0.01	0.06
C504	CONDUIT	0.40	0	07:58	0.67	0.00	0.05
C505	CONDUIT	0.50	0	07:47	0.87	0.00	0.05
C506	CONDUIT	0.60	0	07:58	0.96	0.00	0.05
C507	CONDUIT	0.70	0	07:48	1.07	0.00	0.05
C508	CONDUIT	0.80	0	07:58	1.09	0.01	0.05
C509	CONDUIT	0.90	0	07:45	1.04	0.01	0.06
C510	CONDUIT	1.00	0	07:45	0.73	0.01	0.08
C409	CONDUIT	1.40	0	07:55	1.50	0.01	0.06
C408	CONDUIT	1.30	0	07:49	1.46	0.01	0.06
C407	CONDUIT	1.20	0	07:56	1.34	0.01	0.06
C406	CONDUIT	1.10	0	07:58	1.10	0.01	0.07
C405	CONDUIT	1.00	0	07:58	0.98	0.01	0.07
C404	CONDUIT	0.90	0	07:57	0.70	0.01	0.08
C403	CONDUIT	0.80	0	07:59	0.64	0.01	0.08
C402	CONDUIT	0.70	0	07:59	0.51	0.01	0.08
C401	CONDUIT	0.60	0	07:55	0.40	0.02	0.09
C400	CONDUIT	0.50	0	07:34	0.36	0.01	0.09
C399	CONDUIT	0.40	0	07:34	0.40	0.01	0.07
C398	CONDUIT	0.30	0	07:37	0.35	0.01	0.06
C397	CONDUIT	0.20	0	07:27	0.27	0.01	0.06
C396	CONDUIT	0.10	0	07:10	0.26	0.00	0.04
C556	CONDUIT	0.10	0	07:30	0.31	0.00	0.03
C557	CONDUIT	0.20	0	07:30	0.26	0.00	0.07
C431	CONDUIT	0.40	0	07:37	0.28	0.01	0.09
C430	CONDUIT	0.30	0	07:35	0.29	0.01	0.07
C429	CONDUIT	0.20	0	07:34	0.25	0.01	0.06
C428	CONDUIT	0.10	0	07:15	0.25	0.00	0.04
C280	CONDUIT	0.10	0	07:11	0.37	0.00	0.03
C281	CONDUIT	0.20	0	07:12	0.43	0.00	0.04
C282	CONDUIT	0.30	0	07:18	0.38	0.00	0.06

C283	CONDUIT	0.40	0	07:29	0.36	0.01	0.07
C284	CONDUIT	0.50	0	07:50	0.42	0.01	0.08
C285	CONDUIT	0.60	0	07:43	0.52	0.01	0.07
C286	CONDUIT	0.70	0	07:31	0.44	0.01	0.09
C538	CONDUIT	11.40	0	08:00	0.89	0.31	0.40
C537	CONDUIT	11.30	0	08:00	0.83	0.31	0.42
C536	CONDUIT	11.20	0	08:00	0.83	0.31	0.42
C535	CONDUIT	11.10	0	08:00	0.91	0.21	0.39
C534	CONDUIT	11.00	0	08:00	1.00	0.21	0.36
C533	CONDUIT	10.90	0	08:00	0.88	0.30	0.39
C532	CONDUIT	10.80	0	08:00	0.82	0.29	0.41
C531	CONDUIT	10.70	0	08:00	0.82	0.29	0.41
C530	CONDUIT	10.60	0	08:00	0.82	0.29	0.40
C529	CONDUIT	10.50	0	08:00	0.95	0.16	0.36
C528	CONDUIT	10.40	0	08:00	0.97	0.24	0.35
C527	CONDUIT	10.30	0	08:00	0.85	0.28	0.39
C526	CONDUIT	10.20	0	08:00	0.81	0.28	0.40
C525	CONDUIT	10.10	0	08:00	0.81	0.28	0.39
C524	CONDUIT	10.00	0	08:00	0.81	0.27	0.39
C523	CONDUIT	9.90	0	08:00	1.11	0.11	0.31
C578	CONDUIT	0.10	0	07:17	0.12	0.00	0.07
C579	CONDUIT	0.20	0	08:00	0.16	0.02	0.08
C580	CONDUIT	0.30	0	08:00	0.48	0.00	0.05
C581	CONDUIT	0.40	0	07:59	0.55	0.01	0.05
C582	CONDUIT	0.50	0	07:59	0.65	0.01	0.06
C583	CONDUIT	0.60	0	07:59	0.85	0.01	0.05
C426	CONDUIT	1.60	0	07:26	0.61	0.04	0.13
C425	CONDUIT	1.50	0	07:24	0.71	0.02	0.11
C424	CONDUIT	1.40	0	07:24	0.98	0.01	0.09
C423	CONDUIT	1.30	0	07:29	1.05	0.01	0.08
C422	CONDUIT	1.20	0	07:26	1.06	0.01	0.07
C421	CONDUIT	1.10	0	07:44	0.47	0.03	0.12
C420	CONDUIT	1.00	0	07:06	0.45	0.03	0.12
C419	CONDUIT	0.90	0	07:36	0.43	0.02	0.11
C418	CONDUIT	0.80	0	07:15	0.48	0.01	0.10
C417	CONDUIT	0.70	0	07:15	0.64	0.01	0.07
C415	CONDUIT	0.50	0	07:14	1.14	0.00	0.04
C416	CONDUIT	0.60	0	07:14	0.89	0.00	0.05
C414	CONDUIT	0.40	0	07:14	0.78	0.00	0.04
C413	CONDUIT	0.30	0	07:14	0.65	0.00	0.04
C412	CONDUIT	0.20	0	07:11	0.50	0.00	0.04
C411	CONDUIT	0.10	0	07:10	0.36	0.00	0.03
C1	CONDUIT	0.10	0	07:12	0.33	0.00	0.03
C2	CONDUIT	0.20	0	07:12	0.44	0.00	0.04
C3	CONDUIT	0.30	0	07:14	0.52	0.00	0.05
C4	CONDUIT	0.40	0	07:15	0.49	0.00	0.06
C5	CONDUIT	0.50	0	07:27	0.47	0.01	0.07
C6	CONDUIT	0.60	0	07:26	0.67	0.01	0.06
C7	CONDUIT	0.70	0	07:25	0.87	0.01	0.06
C8	CONDUIT	0.80	0	07:27	0.80	0.01	0.07
C9	CONDUIT	0.90	0	07:27	0.69	0.01	0.08
C10	CONDUIT	1.00	0	07:27	0.65	0.02	0.09
C11	CONDUIT	1.10	0	07:27	0.72	0.02	0.09
C12	CONDUIT	1.20	0	07:27	0.74	0.01	0.09
C13	CONDUIT	1.30	0	07:59	0.72	0.02	0.10
C14	CONDUIT	1.40	0	07:29	1.11	0.01	0.08
C15	CONDUIT	1.50	0	07:32	1.21	0.01	0.08

C16	CONDUIT	1.60	0	07:59	1.01	0.02	0.09
C17	CONDUIT	1.70	0	07:59	1.11	0.02	0.09
C18	CONDUIT	1.80	0	07:28	0.88	0.02	0.11
C19	CONDUIT	1.90	0	07:30	0.77	0.03	0.13
C20	CONDUIT	2.00	0	07:53	0.99	0.02	0.11
C21	CONDUIT	2.10	0	07:33	1.00	0.03	0.11
C22	CONDUIT	2.20	0	07:54	0.98	0.03	0.12
C23	CONDUIT	2.30	0	07:54	1.01	0.03	0.12
C24	CONDUIT	2.40	0	07:33	0.91	0.02	0.13
C434	CONDUIT	0.90	0	07:58	0.62	0.02	0.09
C433	CONDUIT	0.80	0	07:56	0.67	0.01	0.08
C432	CONDUIT	0.70	0	07:57	0.39	0.02	0.10
C148	CONDUIT	3.60	0	07:58	1.26	0.04	0.14
C149	CONDUIT	3.70	0	07:44	0.49	0.04	0.31
C154	CONDUIT	0.50	0	07:30	0.59	0.01	0.06
C155	CONDUIT	0.60	0	07:30	0.50	0.01	0.08
C264	CONDUIT	0.60	0	07:19	0.65	0.01	0.06
C265	CONDUIT	0.70	0	07:20	0.54	0.01	0.08
C165	CONDUIT	1.60	0	07:50	0.71	0.03	0.12
C180	CONDUIT	1.50	0	07:46	0.67	0.03	0.12
C191	CONDUIT	1.10	0	07:59	0.61	0.02	0.10
C200	CONDUIT	0.90	0	07:42	0.58	0.02	0.09
C209	CONDUIT	0.90	0	07:51	0.54	0.02	0.10
C221	CONDUIT	1.20	0	07:17	0.55	0.03	0.12
C229	CONDUIT	0.80	0	07:12	0.56	0.02	0.09
C239	CONDUIT	1.00	0	07:21	0.60	0.02	0.10
C258	CONDUIT	1.20	0	07:39	0.63	0.02	0.11
C247	CONDUIT	0.80	0	07:18	0.55	0.02	0.09
C327	CONDUIT	0.90	0	07:13	0.58	0.02	0.09
C355	CONDUIT	4.40	0	07:51	0.89	0.08	0.20
C287	CONDUIT	0.80	0	07:56	0.41	0.02	0.11
C288	CONDUIT	0.90	0	07:18	0.43	0.02	0.11
C289	CONDUIT	1.00	0	07:55	0.46	0.03	0.11
C290	CONDUIT	1.10	0	07:37	0.59	0.02	0.10
C291	CONDUIT	1.20	0	07:52	0.54	0.03	0.12
C292	CONDUIT	1.30	0	07:46	0.70	0.02	0.10
C293	CONDUIT	1.40	0	07:52	0.71	0.02	0.11
C294	CONDUIT	1.50	0	07:38	0.72	0.02	0.11
C295	CONDUIT	1.60	0	07:45	0.58	0.03	0.14
C296	CONDUIT	1.70	0	07:54	0.54	0.05	0.15
C297	CONDUIT	1.80	0	07:56	0.66	0.04	0.13
C298	CONDUIT	1.90	0	07:59	0.61	0.04	0.15
C299	CONDUIT	2.00	0	07:58	0.54	0.05	0.17
C300	CONDUIT	2.10	0	07:58	0.55	0.06	0.17
C301	CONDUIT	2.20	0	07:59	0.57	0.06	0.17
C302	CONDUIT	2.30	0	07:42	0.44	0.06	0.22
C303	CONDUIT	7.30	0	08:00	0.98	0.13	0.27
C317	CONDUIT	8.70	0	08:00	0.60	0.40	0.45
C318	CONDUIT	10.90	0	08:00	1.12	0.21	0.33
C410	CONDUIT	1.50	0	07:53	0.43	0.01	0.18
C465	CONDUIT	0.30	0	07:52	0.41	0.00	0.05
C466	CONDUIT	0.40	0	07:52	0.40	0.01	0.07
C467	CONDUIT	0.50	0	07:50	0.25	0.01	0.11
C468	CONDUIT	1.70	0	07:59	0.55	0.04	0.15
C480	CONDUIT	2.90	0	07:59	0.79	0.06	0.17
C481	CONDUIT	3.00	0	08:00	0.84	0.05	0.16
C497	CONDUIT	4.60	0	08:00	0.71	0.13	0.25

C477	CONDUIT	2.60	0	07:58	0.60	0.07	0.18
C478	CONDUIT	2.70	0	07:59	0.85	0.04	0.15
C551	CONDUIT	1.60	0	07:48	0.69	0.03	0.12
C370	CONDUIT	1.50	0	07:47	0.67	0.03	0.12
C382	CONDUIT	1.20	0	07:26	0.63	0.02	0.11
C395	CONDUIT	0.60	0	07:25	0.51	0.01	0.08
C511	CONDUIT	1.10	0	07:56	0.61	0.02	0.10
C500	CONDUIT	4.90	0	08:00	0.92	0.09	0.21
C539	CONDUIT	11.50	0	08:00	1.14	0.22	0.34
C588	CONDUIT	22.20	0	08:00	1.32	0.23	0.35
C587	CONDUIT	16.50	0	08:00	1.20	0.20	0.31
C389	CONDUIT	0.70	0	07:41	0.14	0.01	0.44
C270	CONDUIT	1.20	0	07:23	1.20	0.01	0.07
C271	CONDUIT	1.30	0	07:24	0.29	0.01	0.19
C585	CONDUIT	0.80	0	08:00	0.92	0.01	0.06
C586	CONDUIT	9.80	0	08:00	1.20	0.18	0.29
C584	CONDUIT	0.70	0	07:59	0.97	0.01	0.05
C91	CONDUIT	36.20	0	08:00	1.10	0.32	0.41
C248-1	CONDUIT	0.20	0	07:26	0.14	0.00	0.16
C427	CONDUIT	1.70	0	07:39	1.73	0.02	0.07
PL5	PUMP	16.50	0	08:00	0.82		
PL24	PUMP	22.20	0	08:00	0.89		
PL2	PUMP	1.60	0	07:50	0.80		
PL22	PUMP	1.10	0	07:59	0.55		
PL23	PUMP	1.50	0	07:46	0.75		
PL21	PUMP	0.90	0	07:42	0.45		
PL20	PUMP	0.90	0	07:51	0.45		
PL19	PUMP	1.20	0	07:17	0.60		
PL18	PUMP	0.80	0	07:12	0.40		
PL17	PUMP	1.00	0	07:21	0.50		
PL15	PUMP	0.80	0	07:18	0.40		
PL14	PUMP	0.90	0	07:13	0.45		
PL12	PUMP	1.60	0	07:48	0.80		
PL13	PUMP	4.40	0	07:51	0.88		
PL11	PUMP	1.50	0	07:47	0.75		
PL9	PUMP	0.60	0	07:25	0.30		
PL10	PUMP	1.20	0	07:26	0.60		
PL8	PUMP	10.90	0	08:00	0.91		
PL4	PUMP	11.50	0	08:00	0.96		
PL1	PUMP	2.50	0	08:00	0.50		
PL3	PUMP	9.80	0	08:00	0.82		
PL6	PUMP	1.10	0	07:56	0.55		
PL7	PUMP	4.90	0	08:00	0.98		
PL25	PUMP	58.40	0	08:00	0.97		
PL16	PUMP	1.20	0	07:39	0.60		

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Crit	Inlet Ctrl Ltd
C435	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C436	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C437	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.22	0.00
C438	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C439	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C440	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.17	0.00
C441	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C442	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.22	0.00
C443	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C444	1.00	0.00	0.00	0.00	0.00	0.31	0.00	0.69	0.00	0.00
C445	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.08	0.00
C446	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C447	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.22	0.00
C448	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.12	0.00
C449	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C450	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C451	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C452	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C453	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C454	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C455	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C456	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C457	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C458	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C459	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C460	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C461	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C462	1.00	0.00	0.00	0.00	0.10	0.90	0.00	0.00	0.97	0.00
C558	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.45	0.00
C559	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C560	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C561	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C562	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C563	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C564	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C565	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C566	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C567	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C568	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C569	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C570	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C571	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C572	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.17	0.00
C573	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C574	1.00	0.00	0.00	0.00	0.00	0.19	0.00	0.80	0.01	0.00
C575	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C576	1.00	0.00	0.00	0.00	0.00	0.90	0.00	0.10	0.01	0.00
C577	1.00	0.00	0.00	0.00	0.00	0.91	0.00	0.09	0.02	0.00
C517	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C518	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00

C519	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.90	0.00	0.00
C520	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C521	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.94	0.00	0.00
C522	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C25	1.00	0.00	0.00	0.00	0.00	0.02	0.00	0.98	0.00	0.00
C26	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C27	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C28	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.08	0.00
C29	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C30	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C31	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C32	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.96	0.00
C33	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C34	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C35	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C43	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
C42	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.46	0.00
C41	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C40	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C39	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C38	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C37	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C36	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C44	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C45	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C46	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C47	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C48	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C49	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C50	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C51	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C52	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C53	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C54	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C55	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C56	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C57	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C58	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.00
C59	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C60	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C61	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C62	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C63	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C64	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C65	1.00	0.00	0.00	0.00	0.00	0.86	0.00	0.13	0.00	0.00
C66	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.02	0.00
C67	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C68	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C69	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C70	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C71	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C72	1.00	0.00	0.00	0.00	0.00	0.90	0.00	0.10	0.00	0.00
C73	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C92	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C93	1.00	0.00	0.00	0.00	0.09	0.33	0.00	0.57	0.00	0.00
C94	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C95	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00

C96	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C97	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C98	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.94	0.00	0.00
C99	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C100	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C101	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
C102	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C103	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C104	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.08	0.00
C105	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.13	0.00
C106	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C107	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C108	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C109	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C110	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.14	0.00
C111	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C112	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C113	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C114	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C115	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.00
C116	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C117	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C118	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C119	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C120	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C121	1.00	0.00	0.00	0.00	0.04	0.95	0.00	0.00	0.00	0.00
C122	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C123	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C124	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C125	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C126	1.00	0.00	0.00	0.00	0.07	0.93	0.00	0.00	0.01	0.00
C127	1.00	0.00	0.00	0.00	0.00	0.98	0.00	0.01	0.00	0.00
C128	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C129	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.08	0.00
C130	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C131	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C132	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C133	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C134	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C135	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C136	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C137	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C138	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C139	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C140	1.00	0.00	0.00	0.00	0.00	0.94	0.00	0.06	0.00	0.00
C141	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C142	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C143	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.49	0.00
C147	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C146	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.17	0.00
C145	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.94	0.00	0.00
C144	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C150	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C151	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C152	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C153	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C156	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

C157	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C158	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C159	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C160	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C161	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.50	0.00
C162	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C163	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C164	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C166	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C167	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C168	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C169	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C170	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C171	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C172	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C173	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C174	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C175	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C176	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C177	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C178	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C181	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C182	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C183	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C184	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C185	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.94	0.00	0.00
C186	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C187	1.00	0.00	0.00	0.00	0.00	0.94	0.00	0.05	0.01	0.00
C188	1.00	0.00	0.00	0.00	0.00	0.02	0.00	0.97	0.00	0.00
C189	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C192	1.00	0.00	0.00	0.00	0.09	0.90	0.00	0.00	0.97	0.00
C193	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.90	0.00	0.00
C194	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C195	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C196	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C197	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C198	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.09	0.00
C199	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C179	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C190	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C201	1.00	0.00	0.00	0.00	0.98	0.01	0.00	0.00	0.97	0.00
C202	1.00	0.00	0.00	0.00	0.06	0.36	0.00	0.58	0.00	0.00
C203	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C204	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C205	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C206	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C207	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C208	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C210	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
C211	1.00	0.00	0.00	0.00	0.94	0.05	0.00	0.00	0.90	0.00
C212	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C213	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C214	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C215	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C216	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C217	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C218	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00

C219	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C220	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C222	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C223	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.18	0.00
C224	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C225	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C226	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C227	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C228	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C230	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C231	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C232	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C233	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C234	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C235	1.00	0.00	0.00	0.00	0.00	0.94	0.00	0.05	0.00	0.00
C236	1.00	0.00	0.00	0.00	0.00	0.94	0.00	0.05	0.00	0.00
C237	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C238	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C248	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C249	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C250	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C251	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C252	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C253	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C254	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.47	0.00
C255	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C256	1.00	0.00	0.00	0.00	0.00	0.98	0.00	0.02	0.00	0.00
C257	1.00	0.00	0.00	0.00	0.00	0.33	0.00	0.66	0.00	0.00
C240	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C241	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C242	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C243	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C244	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C245	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C246	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C319	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C320	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C321	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C322	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C323	1.00	0.00	0.00	0.00	0.69	0.31	0.00	0.00	0.91	0.00
C324	1.00	0.00	0.00	0.00	0.46	0.53	0.00	0.00	0.90	0.00
C325	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C326	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.21	0.00
C328	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.97	0.00
C329	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.96	0.00
C330	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C331	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C332	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.00
C333	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.15	0.00
C334	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C335	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C336	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C337	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C338	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C540	1.00	0.00	0.00	0.00	0.47	0.53	0.00	0.00	0.97	0.00
C541	1.00	0.00	0.00	0.00	0.00	0.13	0.00	0.87	0.00	0.00
C542	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00

C543	1.00	0.00	0.00	0.00	0.00	0.94	0.00	0.06	0.13	0.00
C544	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C545	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C546	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C547	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C548	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C549	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C550	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C552	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.97	0.00
C553	1.00	0.00	0.00	0.00	0.94	0.06	0.00	0.00	0.74	0.00
C554	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.90	0.00	0.00
C555	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C339	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C340	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C341	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C342	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C343	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C344	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C345	1.00	0.00	0.00	0.00	0.00	0.82	0.00	0.17	0.00	0.00
C346	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.18	0.00
C347	1.00	0.00	0.00	0.00	0.00	0.33	0.00	0.67	0.00	0.00
C348	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C349	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.21	0.00
C350	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C351	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C352	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C353	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C354	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C74	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C75	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C76	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C77	1.00	0.00	0.00	0.00	0.00	0.87	0.00	0.13	0.01	0.00
C78	1.00	0.00	0.00	0.00	0.00	0.98	0.00	0.02	0.01	0.00
C79	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C80	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.52	0.00
C81	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C82	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C83	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C84	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.10	0.00
C85	1.00	0.00	0.00	0.00	0.00	0.15	0.00	0.84	0.00	0.00
C86	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C87	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C88	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C89	1.00	0.00	0.00	0.00	0.00	0.90	0.00	0.10	0.00	0.00
C90	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.02	0.00
C356	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C357	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C358	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C359	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C360	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C361	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C362	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C363	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C364	1.00	0.00	0.00	0.00	0.00	0.07	0.00	0.92	0.00	0.00
C365	1.00	0.00	0.00	0.00	0.00	0.17	0.00	0.83	0.00	0.00
C366	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.12	0.00
C367	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

C368	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C369	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C371	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C372	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C373	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C374	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C375	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C376	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C377	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C378	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C379	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C380	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C381	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C388	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C387	1.00	0.00	0.00	0.00	0.84	0.16	0.00	0.00	0.95	0.00
C386	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.96	0.00
C385	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C384	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C383	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.97	0.00
C390	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C391	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C392	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C393	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C394	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C259	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C260	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C261	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C262	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C263	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C266	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C267	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.51	0.00
C268	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C269	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C272	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.98	0.00
C273	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C274	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.76	0.00
C275	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C276	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C277	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.51	0.00
C278	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C279	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.96	0.00
C316	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C315	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C314	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C313	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C312	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.76	0.00
C311	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C310	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C309	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C308	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C307	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C306	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C305	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C304	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C463	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
C464	1.00	0.00	0.00	0.00	0.09	0.33	0.00	0.57	0.00	0.00
C469	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

C470	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C471	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C472	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C473	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C474	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C475	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C476	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C479	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.44	0.00
C482	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C483	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C484	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C485	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C486	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C487	1.00	0.00	0.00	0.00	0.00	0.90	0.00	0.10	0.00	0.00
C488	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C489	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C490	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C491	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00
C492	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C493	1.00	0.00	0.00	0.00	0.00	0.23	0.00	0.76	0.00	0.00
C494	1.00	0.00	0.00	0.00	0.00	0.83	0.00	0.17	0.00	0.00
C495	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C496	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.09	0.00
C498	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C499	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C501	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C502	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C503	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.90	0.00	0.00
C504	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C505	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C506	1.00	0.00	0.00	0.00	0.00	0.94	0.00	0.05	0.01	0.00
C507	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C508	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C509	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C510	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C409	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C408	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C407	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C406	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C405	1.00	0.00	0.00	0.00	0.00	0.24	0.00	0.75	0.00	0.00
C404	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C403	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C402	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C401	1.00	0.00	0.00	0.00	0.06	0.03	0.00	0.91	0.00	0.00
C400	1.00	0.00	0.00	0.00	0.43	0.57	0.00	0.00	0.96	0.00
C399	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C398	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.90	0.00	0.00
C397	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C396	1.00	0.00	0.00	0.00	0.43	0.57	0.00	0.00	0.97	0.00
C556	1.00	0.00	0.00	0.00	0.00	0.75	0.00	0.25	0.00	0.00
C557	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C431	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C430	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C429	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C428	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C280	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C281	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00

C282	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C283	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.96	0.00
C284	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C285	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.92	0.00
C286	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C538	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C537	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C536	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C535	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C534	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C533	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C532	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C531	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C530	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C529	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.10	0.00
C528	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C527	1.00	0.00	0.00	0.00	0.00	0.54	0.00	0.46	0.00	0.00
C526	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C525	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C524	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C523	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C578	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C579	1.00	0.00	0.00	0.00	0.41	0.00	0.00	0.58	0.00	0.00
C580	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C581	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C582	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.94	0.00	0.00
C583	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C426	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C425	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C424	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C423	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.13	0.00
C422	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C421	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C420	1.00	0.00	0.00	0.00	0.09	0.90	0.00	0.00	0.14	0.00
C419	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.13	0.00
C418	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C417	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C415	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C416	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C414	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C413	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C412	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C411	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C4	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C8	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C9	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.83	0.00	0.17	0.01	0.00
C11	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C13	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

C15	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C16	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C17	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.84	0.00
C18	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C19	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C20	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.08	0.00
C21	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.11	0.00
C22	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.12	0.00
C23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C24	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C434	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C433	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C432	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C148	1.00	0.00	0.00	0.00	0.00	0.41	0.00	0.59	0.00	0.00
C149	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C154	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.00	0.00
C155	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C264	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.09	0.00
C265	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C165	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C180	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C191	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C200	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C209	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C221	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C229	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C239	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C258	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C247	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C327	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C355	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C287	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.15	0.00
C288	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.19	0.00
C289	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C290	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C291	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C292	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C293	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C294	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.96	0.00
C295	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C296	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C297	1.00	0.00	0.00	0.00	0.00	0.58	0.00	0.42	0.00	0.00
C298	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.51	0.00
C299	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C300	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C301	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C302	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C303	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C317	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.01	0.00
C318	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C410	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
C465	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C466	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.97	0.00
C467	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C468	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.00
C480	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C481	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01	0.00	0.00

C497	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C477	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C478	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.02	0.00
C551	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C370	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C382	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C395	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C511	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C500	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C539	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C588	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C587	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C389	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C270	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00
C271	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C585	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C586	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C584	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C91	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C248-1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C427	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

Conduit Surcharge Summary

No conduits were surcharged.

Pumping Summary

Pump	Percent Utilized	Min Number of Start-Ups	Avg Flow LPS	Max Flow LPS	Total Flow LPS	Power Volume 10^6 ltr	% Time Off Usage Kw-hr	Pump Curve Low	Pump Curve High
PL5	96.35	1	0.00	8.68	16.50	0.676	8.81	0.0	100.0
PL24	96.41	1	0.00	11.68	22.20	0.910	10.25	0.0	100.0
PL2	96.42	1	0.00	0.84	1.60	0.066	5.20	0.0	100.0
PL22	96.44	1	0.00	0.58	1.10	0.045	2.17	0.0	100.0
PL23	96.38	1	0.00	0.79	1.50	0.062	3.36	0.0	100.0
PL21	96.42	1	0.00	0.48	0.90	0.037	0.80	0.0	100.0
PL20	96.38	1	0.00	0.48	0.90	0.037	0.73	0.0	100.0
PL19	96.36	1	0.00	0.63	1.20	0.049	1.32	0.0	100.0
PL18	96.39	1	0.00	0.42	0.80	0.033	0.60	0.0	100.0
PL17	96.42	1	0.00	0.53	1.00	0.041	1.61	0.0	100.0
PL15	96.41	1	0.00	0.42	0.80	0.033	1.26	0.0	100.0
PL14	96.35	1	0.00	0.48	0.90	0.037	0.97	0.0	100.0
PL12	96.41	1	0.00	0.84	1.60	0.066	2.68	0.0	100.0
PL13	96.40	1	0.00	2.32	4.40	0.181	9.20	0.0	100.0
PL11	96.41	1	0.00	0.79	1.50	0.062	1.42	0.0	100.0
PL9	96.39	1	0.00	0.32	0.60	0.025	0.83	0.0	100.0
PL10	96.41	1	0.00	0.63	1.20	0.049	2.28	0.0	100.0
PL8	96.52	1	0.00	5.73	10.90	0.447	32.39	0.0	100.0
PL4	96.33	1	0.00	6.05	11.50	0.471	5.12	0.0	100.0
PL1	99.18	19	0.00	1.32	2.50	0.103	1.29	0.0	100.0
PL3	96.44	1	0.00	5.16	9.80	0.403	18.53	0.0	100.0
PL6	96.42	1	0.00	0.58	1.10	0.045	2.02	0.0	100.0
PL7	96.35	1	0.00	2.58	4.90	0.201	8.34	0.0	100.0
PL25	96.46	1	0.00	30.62	58.40	2.384	12.57	0.0	100.0
PL16	96.40	1	0.00	0.63	1.20	0.049	1.73	0.0	100.0

DETAILED ESTIMATE

General Abstract		
Sewerage System in Zone-I of Neyyattinkara Municipality Area, Thiruvananthapuram		
Sl No	Heading Description	Amount
1	**APPENDIX- A :- Design,Construction and Commissioning of 2.5 MLD Sewerage Treatment Plant near Vempanikkara pond in Zone-I of Neyyattinkara Municipality**	96161596.00
2	**APPENDIX- B :- Construction of Sewerage collection Well Grit Chamber and allied works in Zone-I of Neyyattinkara Municipality**	41139624.00
3	**APPENDIX-C :- Construction of Lift Manhole in Zone-I of Neyyattinkara Municipality**	17461313.00
4	**APPENDIX-D :- Supplying,Laying, Jointing, Testing and Commissioning of HDPE PE-100/PN-8 pipe for Sewer Network in Zone-I of Neyyattinkara Municipality and Construction of Manhole Chamber**	196244405.00
5	**APPENDIX-E :- Supplying,Laying,Testing and Commissioning of 250mm & 200mm DI K9 Sewer Pumping main from MPS to STP & 150mm DI K9 from IPS to MPS in Zone-I of Neyyattinkara Municipality**	81565624.00
6	**APPENDIX- F :- Construction of House service connections,SCADA & Automation,Installation of Pump Sets,Installation of Solar Power Plant,DG sets, etc in Zone-I of Neyyattinkara Municipality**	134011972.00
7	**APPENDIX- G :- Provisional Sums (i.e. Statutory payments for Electricity Connection,Power line extension, Road crossing, Utility shifting,IEC activities and Inspection vehicle etc**	2500000.00
8	**APPENDIX- H : - Operation, Maintenance and Management Services for 10 years**	218041009.00
9	**APPENDIX- I :- Centage (10% of Total Appedix - A to H)**	78712554.00
10	**APPENDIX- K :- GST Payments(18% of Total Appendix - A to H)**	141682598.00
11	**APPENDIX- J :-DPR Preparation Charge (2.5% of Total Appendix - A to G)**	14227113.00
	Total	**1021747808.00**
	Lumpsum for round off	**52192.00**
	GRAND TOTAL Rs	**1021800000.00**
	Rounded Grand Total Rs 1,02,18,00,000	
	Rupees One Hundred Two Crore Eighteen Lakh Only	

GENERAL ABSTRACT

Others-Swatch Bharath Mission-Urban 2.0-
Design,Construction and Commissioning of 2.5 MLD Sewerage Treatment Plant near Vempanikkara pond in Zone-I of Neyyattinkara Municipality-Design,Construction and Commissioning of 2.5 MLD Sewerage Treatment Plant
near Vempanikkara pond in Zone-I of Neyyattinkara Municipality-DPR Preparation Work

Sl No	Head Description		Amount
1	Site Clearing and Levelling the site		336485.00
2	Oil and Grease Trap		942884.61
3	Receiving Chamber		343920.46
4	Grit Separator and Screen Channels		1841731.76
5	Equalization Tank		3884218.86
6	Dilution Tank for Co-Treatment		1347872.31
7	Moving Bed Biofilm Reactor Tank-BOD Removal		3916202.00
8	Moving Bed Biofilm Reactor Tank-Nitrification		5580846.87
9	Moving Bed Biofilm Reactor Tank-Post Anoxic De-Nitrification		3156884.45
10	Moving Bed Biofilm Reactor Tank-Chamber after De-Nitrification		2990797.24
11	Moving Bed Bio film Reactor Chamber after De-Nitrification		1390828.07
12	Secondary Clarifier with Plate Settler		2157099.52
13	Sludge Sump		465229.86
14	Sludge Thickner		790266.70
15	Chlorine Contact Tank		1103778.54
16	Filter Feed Tank		759492.80
17	Treated Water Tank		1424062.50
18	Land Scaping		405098.20
19	Pile Foundation		8900948.66
20	Compound Wall and Gate		8083773.04
21	Internal Roads,Walkways & Storm Water Drain		4104406.23
22	Building for STP		5001999.75
23	Mechanical Items		29871875.34
24	Electrical and Instrumentation works		7360892.88
	Total Estimation PAC		96161595.65
C	**Extra Charges**		
C.001	Provision for GST		
	96161595.65	0.00%	0.00
	Grand Total		0.00

Sl No	Head Description	Amount
	Round off	0.00
	Rounded Total(Rs)	96161595.65
	Rupees Nine Crore Sixty One Lakh Sixty One Thousand Five Hundred and Ninety Five	

DRAFT
PRICE
e-PLATFORM FOR THE MANAGEMENT OF PUBLIC WORKS

ABSTRACT ESTIMATE

Others-Swatch Bharath Mission-Urban 2.0-
Design,Construction and Commissioning of 2.5 MLD Sewerage Treatment Plant near Vempanikkara pond in Zone-I of Neyyattinkara Municipality-Design,Construction and Commissioning of 2.5 MLD Sewerage Treatment Plant
near Vempanikkara pond in Zone-I of Neyyattinkara Municipality-DPR Preparation Work

Sl No	Specification	Quantity	Rate	Amount
1	**Site Clearing and Levelling the site**			
1.001	2.31			
	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared			
	Net Total	2530.000sqm	@14.75/sqm	37317.50
1.002	2.33.2			
	Felling trees of the girth (measured at a height of 1 m above ground level) including cutting of trunks and branches, removing the roots and stacking of serviceable material and disposal of unserviceable material.Beyound 60 cm girth up to and including 120 cm girth			
	Net Total	150.000each	@1994.45/each	299167.50
			Heading Total(Rs)	336485.00
2	**Oil and Grease Trap**			
2.001	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	77.601cum	@214.03/cum	16608.94
2.002	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	3.475cum	@7211.14/cum	25058.71
2.003	OD37282/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc in recommended proportions as per IS: 9103			

Sl No	Specification	Quantity	Rate	Amount
	to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	26.039cum	@11602.87/cum	302127.13
2.004	5.37.1			
	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of 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 the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All wiork upto plinth level			
	Net Total	2.847cum	@9886.00/cum	28145.44
2.005	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	3409.800kilogram	@98.30/kilogram	335183.34
2.006	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 .			
	Net Total	9794.100kg	@1.34/kg	13124.09
2.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	8.540sqm	@335.31/sqm	2863.55
2.008	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	124.850sqm	@717.20/sqm	89542.42
2.009	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	54.160sqm	@815.75/sqm	44181.02
2.010	2.25			

Sl No	Specification	Quantity	Rate	Amount
	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	45.160cum	@258.56/cum	11676.57
2.011	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	56.275sqm	@570.26/sqm	32091.38
2.012	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	13.525sqm	@439.54/sqm	5944.78
2.013	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	82.785sqm	@401.22/sqm	33215.00
2.014	19.18.1			
	Supplying and fixing C.I with out frame for manholes:455 x 610 mm rectangular C.I cover (light duty) the weight of the cover to be no less than 23 kg			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	2.000each	@1561.12/each	3122.24
			Heading Total(Rs)	942884.61
3	**Receiving Chamber**			
3.001	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	21.996cum	@214.03/cum	4707.80
3.002	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	3.211cum	@7211.14/cum	23154.97
3.003	OD56966/2022-2023			
	Providing and laying in position ready mixed M-30 grade concrete for reinforced cement concrete work, using Sulphate Resistant Cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work, including pumping of R.M.C. from transit mixer to site of laying , , excluding the cost of centering, shuttering finishing and reinforcement, including cost of 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 the Engineer - in - charge. (Note :- Cement content considered in this item is @ 340 kg/cum. Excess/less cement used as per design mix is payable/ recoverable separately). All works above plinth level upto floor V leve			
	Net Total	9.024cum	@13397.35/cum	120897.69
3.004	5.37.1			
	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of 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 the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All wiork upto plinth level			
	Net Total	1.267cum	@9886.00/cum	12525.56
3.005	5.22.6			
	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing			

Sl No	Specification	Quantity	Rate	Amount
	in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more			
	Net Total	1209.820kilogram	@98.30/kilogram	118925.31
3.006	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 .			
	Net Total	3486.950kg	@1.34/kg	4672.51
3.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	2.670sqm	@335.31/sqm	895.28
3.008	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	42.150sqm	@717.20/sqm	30229.98
3.009	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	3.375sqm	@815.75/sqm	2753.16
3.010	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	17.450sqm	@570.26/sqm	9951.04
3.011	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the			

Sl No	Specification	Quantity	Rate	Amount
	same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	1.875sqm	@439.54/sqm	824.14
3.012	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	19.869sqm	@401.22/sqm	7971.84
3.013	19.18.1			
	Supplying and fixing C.I with out frame for manholes:455 x 610 mm rectangular C.I cover (light duty) the weight of the cover to be no less than 23 kg			
	Net Total	2.000each	@1561.12/each	3122.24
3.014	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	10.270cum	@258.56/cum	2655.41
3.015	OD37070/2022-2023			
	od349637/2021_2022 :Providing and fixing uPVC pipes & fittings includings jointing of pipes with one step uPVC solvent cement , testing of joints complete as per direction of Engineer in Charge. 110mm dia 6Kgf/cm²- for vent pipe			
	Net Total	0.450metre	@1407.84/metre	633.53
			Heading Total(Rs)	343920.46
4	**Grit Separator and Screen Channels**			
4.001	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	158.541cum	@214.03/cum	33932.53
4.002	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	14.247cum	@7211.14/cum	102737.11

Sl No	Specification	Quantity	Rate	Amount
4.003	OD57764/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	57.678cum	@11147.74/cum	642979.35
4.004	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	6921.600kilogram	@98.30/kilogram	680393.28
4.005	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 .			
	Net Total	19611.200kg	@1.34/kg	26279.01
4.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	18.480sqm	@335.31/sqm	6196.53
4.007	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	216.040sqm	@717.20/sqm	154943.89
4.008	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	41.970sqm	@815.75/sqm	34237.03
4.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per			

Sl No	Specification	Quantity	Rate	Amount
	DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	103.460sqm	@570.26/sqm	58999.10
4.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	33.090sqm	@439.54/sqm	14544.38
4.011	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	169.100sqm	@401.22/sqm	67846.30
4.012	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	49.260cum	@258.56/cum	12736.67
4.013	19.18.1			
	Supplying and fixing C.I with out frame for manholes:455 x 610 mm rectangular C.I cover (light duty) the weight of the cover to be no less than 23 kg			
	Net Total	3.000each	@1561.12/each	4683.36
4.014	OD37089/2022-2023			
	od349637/2021_2022 :Providing and fixing uPVC pipes & fittings includings jointing of pipes with one step uPVC solvent cement , testing of joints complete as per direction of Engineer in Charge. 110mm dia 6Kgf/cm²- for vent pipe			
	Net Total	1.000metre	@1223.22/metre	1223.22

Sl No	Specification	Quantity	Rate	Amount
			Heading Total(Rs)	1841731.76
5	**Equalization Tank**			
5.001	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	621.575cum	@214.03/cum	133035.70
5.002	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	19.838cum	@7211.14/cum	143054.60
5.003	OD58527/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	127.003cum	@11147.74/cum	1415796.42
5.004	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	15240.360kilogram	@98.30/kilogram	1498127.39
5.005	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 .			
	Net Total	43181.020kg	@1.34/kg	57862.57
5.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	20.700sqm	@335.31/sqm	6940.92
5.007	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	337.840sqm	@717.20/sqm	242298.85

Sl No	Specification	Quantity	Rate	Amount
5.008	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	103.180sqm	@815.75/sqm	84169.09
5.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	164.000sqm	@570.26/sqm	93522.64
5.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	100.000sqm	@439.54/sqm	43954.00
5.011	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	363.730sqm	@401.22/sqm	145935.75
5.012	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			

Sl No	Specification	Quantity	Rate	Amount
	layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.			
	Net Total	64.730cum	@258.56/cum	16736.59
5.013	19.18.1			
	Supplying and fixing C.I with out frame for manholes:455 x 610 mm rectangular C.I cover (light duty) the weight of the cover to be no less than 23 kg			
	Net Total	1.000each	@1561.12/each	1561.12
5.014	OD37108/2022-2023			
	od349637/2021_2022 :Providing and fixing uPVC pipes & fittings includings jointing of pipes with one step uPVC solvent cement , testing of joints complete as per direction of Engineer in Charge. 110mm dia 6Kgf/cm²- for vent pipe			
	Net Total	1.000metre	@1223.22/metre	1223.22
			Heading Total(Rs)	3884218.86
6	**Dilution Tank for Co-Treatment**			
6.001	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	156.750cum	@214.03/cum	33549.20
6.002	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	6.188cum	@7211.14/cum	44622.53
6.003	OD58558/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	44.383cum	@11147.74/cum	494770.14
6.004	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	5325.960kilogram	@98.30/kilogram	523541.87

Sl No	Specification	Quantity	Rate	Amount
6.005	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 .			
	Net Total	15090.220kg	@1.34/kg	20220.89
6.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	11.700sqm	@335.31/sqm	3923.13
6.007	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	142.040sqm	@717.20/sqm	101871.09
6.008	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	25.680sqm	@815.75/sqm	20948.46
6.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	67.000sqm	@570.26/sqm	38207.42
6.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The			

Sl No	Specification	Quantity	Rate	Amount
	crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	24.000sqm	@439.54/sqm	10548.96
6.011	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	114.730sqm	@401.22/sqm	46031.97
6.012	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	25.740cum	@258.56/cum	6655.33
6.013	19.18.1			
	Supplying and fixing C.I with out frame for manholes:455 x 610 mm rectangular C.I cover (light duty) the weight of the cover to be no less than 23 kg			
	Net Total	1.000each	@1561.12/each	1561.12
6.014	OD37127/2022-2023			
	od349637/2021_2022 :Providing and fixing uPVC pipes & fittings includings jointing of pipes with one step uPVC solvent cement , testing of joints complete as per direction of Engineer in Charge. 110mm dia 6Kgf/cm²- for vent pipe			
	Net Total	1.000metre	@1420.20/metre	1420.20
			Heading Total(Rs)	1347872.31
7	**Moving Bed Biofilm Reactor Tank-BOD Removal**			
7.001	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	164.025cum	@214.03/cum	35106.27
7.002	7.11			
	Extra for coursed rubble masonry with hard stone (first or second sort) curved on plan for a mean radius not exceeding 6 m			
	Net Total	164.025cum	@1030.35/cum	169003.16
7.003	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)			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	24.604cum	@7211.14/cum	177422.89
7.004	OD58454/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	124.304cum	@11147.74/cum	1385708.67
7.005	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	14916.480kilogram	@98.30/kilogram	1466289.98
7.006	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 .			
	Net Total	55768.500kg	@1.34/kg	74729.79
7.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	18.900sqm	@335.31/sqm	6337.36
7.008	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	403.440sqm	@717.20/sqm	289347.17
7.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the			

Sl No	Specification	Quantity	Rate	Amount
	engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	196.800sqm	@570.26/sqm	112227.17
7.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	144.000sqm	@439.54/sqm	63293.76
7.011	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	340.800sqm	@401.22/sqm	136735.78
			Heading Total(Rs)	3916202.00
8	**Moving Bed Biofilm Reactor Tank-Nitrification**			
8.001	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	127.400cum	@214.03/cum	27267.42
8.002	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	127.400cum	@7204.75/cum	917885.15
8.003	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)			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	127.400cum	@7211.14/cum	918699.24
8.004	OD58467/2022-2023			
	:Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	131.576cum	@11147.74/cum	1466775.04
8.005	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	15789.120kilogram	@98.30/kilogram	1552070.50
8.006	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 .			
	Net Total	44735.840kg	@1.34/kg	59946.03
8.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	19.600sqm	@335.31/sqm	6572.08
8.008	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	419.840sqm	@717.20/sqm	301109.25
8.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The			

Sl No	Specification	Quantity	Rate	Amount
	crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	205.000sqm	@570.26/sqm	116903.30
8.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	156.250sqm	@439.54/sqm	68678.13
8.011	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	361.250sqm	@401.22/sqm	144940.73
			Heading Total(Rs)	5580846.87
9	**Moving Bed Biofilm Reactor Tank-Post Anoxic De-Nitrification**			
9.001	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	58.663cum	@214.03/cum	12555.64
9.002	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	58.663cum	@7204.75/cum	422652.25
9.003	4.1.6			
	Providing and laying in position cement concrete of specified grade excluding the			

Sl No	Specification	Quantity	Rate	Amount
	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	13.538cum	@7211.14/cum	97624.41
9.004	OD58497/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	84.958cum	@11147.74/cum	947089.69
9.005	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	10194.960kilogram	@98.30/kilogram	1002164.57
9.006	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 .			
	Net Total	28885.720kg	@1.34/kg	38706.86
9.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	13.300sqm	@335.31/sqm	4459.62
9.008	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	419.840sqm	@717.20/sqm	301109.25
9.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline			

Sl No	Specification	Quantity	Rate	Amount
	slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	205.000sqm	@570.26/sqm	116903.30
9.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	156.250sqm	@439.54/sqm	68678.13
9.011	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	361.250sqm	@401.22/sqm	144940.73
			Heading Total(Rs)	3156884.45
10	**Moving Bed Biofilm Reactor Tank-Chamber after De-Nitrification**			
10.001	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	58.663cum	@214.03/cum	12555.64
10.002	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	58.663cum	@7204.75/cum	422652.25
10.003	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			

Sl No	Specification	Quantity	Rate	Amount
	coarse sand : 6 graded stone aggregate 40 mm nominal size)			
	Net Total	13.538cum	@7211.14/cum	97624.41
10.004	OD37156/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc 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.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	84.958cum	@11602.87/cum	985756.63
10.005	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	10194.960kilogram	@98.30/kilogram	1002164.57
10.006	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 .			
	Net Total	28885.720kg	@1.34/kg	38706.86
10.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	13.300sqm	@335.31/sqm	4459.62
10.008	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	280.120sqm	@717.20/sqm	200902.06
10.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per			

Sl No	Specification	Quantity	Rate	Amount
	DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	209.600sqm	@570.26/sqm	119526.50
10.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	64.000sqm	@439.54/sqm	28130.56
10.011	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	195.200sqm	@401.22/sqm	78318.14
			Heading Total(Rs)	2990797.24
11	**Moving Bed Bio film Reactor Chamber after De-Nitrification**			
11.001	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	19.013cum	@214.03/cum	4069.35
11.002	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	19.013cum	@7204.75/cum	136983.91
11.003	4.1.6			

Sl No	Specification	Quantity	Rate	Amount
	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	6.338cum	@7211.14/cum	45704.21
11.004	OD37161/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc 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.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	40.864cum	@11602.87/cum	474139.68
11.005	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	4903.680kilogram	@98.30/kilogram	482031.74
11.006	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 .			
	Net Total	13893.760kg	@1.34/kg	18617.64
11.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	11.700sqm	@335.31/sqm	3923.13
11.008	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	173.840sqm	@717.20/sqm	124678.05
11.009	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material			

Sl No	Specification	Quantity	Rate	Amount
	shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	82.000sqm	@570.26/sqm	46761.32
11.010	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	25.000sqm	@439.54/sqm	10988.50
11.011	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	107.000sqm	@401.22/sqm	42930.54
			Heading Total(Rs)	1390828.07
12	**Secondary Clarifier with Plate Settler**			
12.001	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	39.968cum	@214.03/cum	8554.35
12.002	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	7.994cum	@7211.14/cum	57645.85

Sl No	Specification	Quantity	Rate	Amount
12.003	OD37169/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc 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.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	78.854cum	@11602.87/cum	914932.71
12.004	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	9462.480kilogram	@98.30/kilogram	930161.78
12.005	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 .			
	Net Total	26810.360kg	@1.34/kg	35925.88
12.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	37.460sqm	@335.31/sqm	12560.71
12.007	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	150.500sqm	@570.26/sqm	85824.13
12.008	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	25.000sqm	@439.54/sqm	10988.50
12.009	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	250.500sqm	@401.22/sqm	100505.61
			Heading Total(Rs)	2157099.52
13	**Sludge Sump**			
13.001	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	57.330cum	@214.03/cum	12270.34
13.002	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	2.646cum	@7211.14/cum	19080.68
13.003	OD37192/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc in recommended proportions as per IS: 9103 to accelerate, retard setting of			

Sl No	Specification	Quantity	Rate	Amount
	concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	14.927cum	@11602.87/cum	173196.04
13.004	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	1791.120kilogram	@98.30/kilogram	176067.10
13.005	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 .			
	Net Total	1791.240kg	@1.34/kg	2400.26
13.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	5.040sqm	@335.31/sqm	1689.96
13.007	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	64.325sqm	@717.20/sqm	46133.89
13.008	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	29.295sqm	@570.26/sqm	16705.77
13.009	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement,			

Sl No	Specification	Quantity	Rate	Amount
	water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	7.100sqm	@439.54/sqm	3120.73
13.010	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	36.302sqm	@401.22/sqm	14565.09
			Heading Total(Rs)	465229.86
14	**Sludge Thickner**			
14.001	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	99.225cum	@214.03/cum	21237.13
14.002	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	5.954cum	@7211.14/cum	42935.13
14.003	OD37205/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc 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.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	26.380cum	@11602.87/cum	306083.71
14.004	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	3165.600kilo gram	@98.30/kilogram	311178.48
14.005	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 .			
	Net Total	8969.200kg	@1.34/kg	12018.73
14.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	8.820sqm	@335.31/sqm	2957.43
14.007	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	83.250sqm	@717.20/sqm	59706.90
14.008	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	39.250sqm	@570.26/sqm	22382.71
14.009	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material			

Sl No	Specification	Quantity	Rate	Amount
	shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	19.650sqm	@439.54/sqm	8636.96
14.010	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	7.800sqm	@401.22/sqm	3129.52
			Heading Total(Rs)	790266.70
15	**Chlorine Contact Tank**			
15.001	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	132.192cum	@214.03/cum	28293.05
15.002	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	7.776cum	@7211.14/cum	56073.82
15.003	OD37219/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc 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.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	35.910cum	@11602.87/cum	416659.06
15.004	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			

Sl No	Specification	Quantity	Rate	Amount
	bars of grade Fe-500D or more			
	Net Total	4309.200kilogram	@98.30/kilogram	423594.36
15.005	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 .			
	Net Total	4309.200kg	@1.34/kg	5774.33
15.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	10.080sqm	@335.31/sqm	3379.92
15.007	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	118.440sqm	@717.20/sqm	84945.17
15.008	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	56.400sqm	@570.26/sqm	32162.66
15.009	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work			

Sl No	Specification	Quantity	Rate	Amount
	shall be carried out all complete as per specification and the direction of the engineerin- charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	36.000sqm	@439.54/sqm	15823.44
15.010	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	92.400sqm	@401.22/sqm	37072.73
			Heading Total(Rs)	1103778.54
16	**Filter Feed Tank**			
16.001	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	87.444cum	@214.03/cum	18715.64
16.002	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	5.582cum	@7211.14/cum	40252.58
16.003	OD37223/2022-2023			
	od324363/2021_2022 :Providing and laying in position machine batched and machine mixed design mix M-30 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,water proofing etc 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.All works upto Floor Five level (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately)			
	Net Total	23.501cum	@11602.87/cum	272679.05
16.004	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	2820.120kilogram	@98.30/kilogram	277217.80
16.005	4.12			

Sl No	Specification	Quantity	Rate	Amount
	Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .			
	Net Total	7990.340kg	@1.34/kg	10707.06
16.006	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	7.320sqm	@335.31/sqm	2454.47
16.007	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	98.700sqm	@717.20/sqm	70787.64
16.008	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	47.000sqm	@570.26/sqm	26802.22
16.009	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	25.000sqm	@439.54/sqm	10988.50

Sl No	Specification	Quantity	Rate	Amount
16.010	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	72.000sqm	@401.22/sqm	28887.84
			Heading Total(Rs)	759492.80
17	**Treated Water Tank**			
17.001	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	221.880cum	@214.03/cum	47488.98
17.002	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	11.094cum	@7211.14/cum	80000.39
17.003	OD37236/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	44.276cum	@11147.74/cum	493577.34
17.004	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	5313.120kilogram	@98.30/kilogram	522279.70
17.005	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 .			
	Net Total	15053.840kg	@1.34/kg	20172.15
17.006	5.9.1			

Sl No	Specification	Quantity	Rate	Amount
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	10.320sqm	@335.31/sqm	3460.40
17.007	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	176.700sqm	@717.20/sqm	126729.24
17.008	22.23.1			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For vertical surface two coats @0.70 kg per sqm			
	Net Total	85.500sqm	@570.26/sqm	48757.23
17.009	22.23.2			
	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.			
	Net Total	56.250sqm	@439.54/sqm	24724.13
17.010	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	141.750sqm	@401.22/sqm	56872.94

Sl No	Specification	Quantity	Rate	Amount
			Heading Total(Rs)	1424062.50
18	**Land Scaping**			
18.001	30.2.1			
	Trenching in ordinary soil up to a depth of 60 cm including removal and stacking of serviceable materials and then disposing of surplus soil, by spreading and neatly levelling within a lead of 50 m and making up the trenched area to proper levels by filling with earth or earth mixed with sludge or / and manure before and after flooding trench with water (excluding cost of imported earth, sludge or manure).			
	Net Total	250.000cum	@94.00/cum	23500.00
18.002	30.2.2			
	Supplying and stacking of good earth at site including royalty and carriage upto 5 k.m. lead complete (earth measured in stacks will be reduced by 20% for payment).			
	Net Total	150.000cum	@569.59/cum	85438.50
18.003	30.2.3			
	Supplying and stacking sludge at site including royalty and carriage upto 5 k.m. lead complete (sludge measured in stacks will be reduced by 8% for payment).			
	Net Total	150.000cum	@319.37/cum	47905.50
18.004	30.2.8			
	Spreading of sludge, dump manure and/or good earth in required thickness as per direction of officer-in-charge (cost of sludge, dump manure and/ or good earth to be paid separately).			
	Net Total	250.000cum	@63.16/cum	15790.00
18.005	30.2.9			
	Mixing earth and sludge or manure in the required proportion specified or directed by the Officer-in-charge			
	Net Total	250.000cum	@43.94/cum	10985.00
18.006	30.2.14.4			
	Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) :Holes 45 cm dia, and 45 cm deep			
	Net Total	300.000holes	@23.57/holes	7071.00
18.007	30.2.16			
	Providing and fixing M.S. flat iron tree guard 60 cm dia and 2 m high, above ground consisting 4 nos 25 x 6 mm, 2.25 m long and 8 nos 25 x 3 mm 2 m long verticals M.S. flats, riveted to 3 nos 25 x 6 mm M.S. flat iron rings in two halves, fixing together at site with required six numbers of 8 mm dia and 30 mm long bolts, including painting two coats with synthetic enamel paint of approved brand and manufacture over a coat of primer. One name plate of 1 mm thick M.S. sheet of size 250x100 mm shall be welded to the tree guard near the middle height and lettered CPWD / PWD/ any other approved name. The tree guard shall be suitably fixed to the			

Sl No	Specification	Quantity	Rate	Amount
	ground by embedding four legs of tree guard in pits of suitable dia and to a depth of 25 cm, refilling the pits with soil and ramming, complete in all respect as per satisfaction and direction of Officer-in-charge.			
	Net Total	30.000tree guard	@5667.62/tree guard	170028.60
18.008	OD37241/2022-2023			
	od323391/2021_2022 :Supply and stacking of Lagerstroemia flosreginae plant of height 150-165 cm.in big poly bag of size 25 cm as per direction of the officer-in-charge.			
	Net Total	50.000no	@203.61/no	10180.50
18.009	OD37242/2022-2023			
	od323392/2021_2022 :Supply and stacking of Plumeria acutifolia plant of height 150-165 cm. with 3-4 branches in big size HDPE bag as per direction of the officer-in-charge			
	Net Total	60.000no	@339.34/no	20360.40
18.010	OD37244/2022-2023			
	od323393/2021_2022 :Supply and stacking of Ficus benjamina (green) plant of height 120-135 cm. with 6-8 branches and lush green foliage in g. bags of size 25 cm as per direction of the officer-in-charge.			
	Net Total	30.000no	@169.67/no	5090.10
18.011	OD37245/2022-2023			
	od323394/2021_2022 :Supply and stacking of Delonix regia (Gulmohar) plant of height 150-165 cm. in big poly bags of size 25 cm as per direction of the officer-in-charge			
	Net Total	30.000no	@101.81/no	3054.30
18.012	OD37246/2022-2023			
	od323395/2021_2022 :Supply and stacking of Azadirachta indica (Neem) plant of height 120130cm in big polybag of size 25 cm as per direction of the officer-in-charge.			
	Net Total	30.000no	@101.81/no	3054.30
18.013	30.2.57.1			
	Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unsaverieable material?s as per direction of officer in charge (excluding cast of plant & water)Cost of plantation per trees plants (for 100 nos.=427.45/100)			
	Net Total	300.000no	@8.80/no	2640.00
			Heading Total(Rs)	405098.20
19	**Pile Foundation**			
19.001	20.2A.1			
	Boring, providing and installation bored cast-in-situ reinforced cement concrete piles of garde M-25 of specified diameter and length below pile cap, to carry a safe working load not less			

Sl No	Specification	Quantity	Rate	Amount
	than specified, excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. by Crawler mounted, telescopic boom hydraulic pilling Rig all complete, including removal of excavated earth with all its lifts and leads (length of pile for payment shall be measured up to bottom of pile cap). Note: Truck Mounted rotary/TMR/Tube well boring machine shall not be used.600 mm dia piles			
	Net Total	625.000metre	@4973.93/metre	3108706.25
19.002	20.2A.2			
	750 mm dia piles			
	Net Total	625.000metre	@7201.63/metre	4501018.75
19.003	20.6.2.1			
	Vertical load testing of piles in accordance with IS 2911(Part IV) including installation of loading platform and preparation of pile head or construction of test cap and dismantling of test cap after test etc. complete as per specification & the direction of engineer -in-Charge. Single pile above 50 tonne and upto 100 tonne capacityInitial test			
	Net Total	8.000per test	@70869.50/per test	566956.00
19.004	20.7.2.1			
	Cyclic vertical load testing of pile in accordance with IS Code of practice IS : 2911 (part IV) including preparation of pile head etc for. Group of two pilesUpto 50 tonne capacity each			
	Net Total	8.000per test	@46458.90/per test	371671.20
19.005	20.8.2			
	Lateral load testing of single pile in accordance with IS Code of practice IS : 2911 (Part IV) for determining safe allowable lateral load on pile:Above 50 tonne and upto 100 tonne capacity pile.			
	Net Total	8.000per test	@37167.12/per test	297336.96
19.006	20.9			
	Integrity testing of pile using Low Strain / Sonic Integrity Test/ Sonic Echo Test method in accordance with IS 14893 including surface preparation of pile top by removing soil, mud, dust & chipping lean concrete lumps etc. and use of computerised equipment and high skill trained personal for conducting the test & submission of results, all complete as per direction of Engineer-in-charge. Note:- The inclusion of the above item in the schedule of work shall be judiciously decided by the technical sanctioning authority, keeping in view the quality control, type of soil strata & importance of the project.			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	50.000per test	@1105.19/per test	55259.50
			Heading Total(Rs)	8900948.66
20	**Compound Wall and Gate**			
20.001	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	108.000cum	@214.03/cum	23115.24
20.002	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	18.000cum	@6814.88/cum	122667.84
20.003	5.13			
	Providing, hoisting and fixing up to floor five level precast reinforced cement concrete in small lintels not exceeding 1.5 m clear span up to floor five level, including the cost of required centering, shuttering but excluding the cost of reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (Zone - III) : 3 graded stone aggregate 20 mm nominal size)			
	Net Total	160.000cum	@14671.73/cum	2347476.80
20.004	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	800.000sqm	@717.20/sqm	573760.00
20.005	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	12800.000kilogram	@98.30/kilogram	1258240.00
20.006	50.6.5.2			
	Hollow block masonry using pre cast blocks (Factory made) of size 40x20x15cm or nearest available size confirming to IS 2185 part 1 of 1979 for super structure up to floor two level with thickness 15cm in: CM 1:6 (1 cement : 6 coarse sand) etc complete			
	Net Total	61.140cum	@6005.43/cum	367171.99
20.007	13.1.1			
	12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)			
	Net Total	892.250sqm	@314.11/sqm	280264.65
20.008	13.43.1			

Sl No	Specification	Quantity	Rate	Amount
	Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer			
	Net Total	892.250sqm	@70.66/sqm	63046.39
20.009	13.83.2			
	Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile including applying additional coats wherever required to achieve even shade and colour.Two coats			
	Net Total	892.250sqm	@134.10/sqm	119650.73
20.010	10.25.2			
	Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works			
	Net Total	300.000kg	@154.18/kg	46254.00
20.011	16.3.9			
	Supplying and stacking at site.Good earth			
	Net Total	5060.000cum	@569.59/cum	2882125.40
			Heading Total(Rs)	8083773.04
21	**Internal Roads,Walkways & Storm Water Drain**			
21.001	16.1			
	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.			
	Net Total	1500.000sqm	@184.52/sqm	276780.00
21.002	100.41.39			
	Supply, stacking, spreading and consolidating of Quarry Muck in the trench of pipe line, including carriage, loading, unloading & stacking up to any lead.			
	Net Total	300.000cum	@547.87/cum	164361.00
21.003	16.91.2			
	Providing and laying factory made chamfered edge Cement Concrete paver blocks in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge.80 mm thick C.C. paver block of M-30 grade with approved color design and pattern.			
	Net Total	1000.000sqm	@1121.78/sqm	1121780.00
21.004	16.91.1			

Sl No	Specification	Quantity	Rate	Amount
	Providing and laying factory made chamfered edge Cement Concrete paver blocks in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge.60mm thick cement concrete paver block of M-35 grade with approved colour, design & pattern.			
	Net Total	200.000sqm	@1041.47/sqm	208294.00
21.005	16.59.1			
	Manufacturing, supplying and fixing retro reflective sign boards made up of 2 mm thick aluminium sheet, face to be fully covered with high intensity encapsulated type heat activated retro reflective sheeting conforming to type - IV of ASTM-D 4956-01 in blue and silver white or other colour combination including subject matter, message (bi-lingual), symbols and borders etc. as per IRC: 67- 2001, pasted on substrate by an adhesive backing which shall be activated by applying heat and pressure conforming to class-2 of ASTM-D-4956-01 and fixing the same with suitable sized aluminium alloy rivets @ 20 cm c/c to back support frame of M.S. angle iron of size 25x25x3 mm along with theft resistant measures, mounted and fixed with 2 Nos M.S. angles of size 35x35x5 mm to a vertical post made up to M.S. Tee section ISMT 50x50x6 mm welded with base plate of size 100x100x 5 mm at the bottom end and including making holes in pipes, angles flats, providing & fixing M.S. message plate of required size, steel work to be painted with two or more coats of synthetic enamel paint of required shade and of approved brand & manufacture over priming coat of zinc chromate yellow primer (vertical MS-Tee support to be painted in black and white colours). Backside of aluminium sheet to be painted with two or more coats of epoxy paint over and including appropriate priming coat including all leads and lifts etc. complete as per drawing , specification and direction of Engineer-in-Charge.Mandatory / Regulatory sign boards of 900 mm diametre with support length of 3750 mm			
	Net Total	3.000each	@7059.64/each	21178.92
21.006	16.59.2			
	Manufacturing, supplying and fixing retro reflective sign boards made up of 2 mm thick aluminium sheet, face to be fully covered with high intensity encapsulated type heat activated retro reflective sheeting conforming to type - IV of ASTM-D 4956-01 in blue and silver white or other colour combination including subject matter, message (bi-lingual), symbols and borders etc. as per IRC: 67- 2001, pasted on substrate by an adhesive backing which shall be activated by applying heat and pressure conforming to class-2 of ASTM-D-4956-01 and fixing the same with suitable sized aluminium alloy rivets @ 20 cm c/c to back support frame of M.S. angle iron of size 25x25x3 mm along with theft resistant measures, mounted and fixed with 2 Nos M.S. angles of size 35x35x5 mm to a vertical post made up to M.S. Tee section ISMT 50x50x6 mm welded with base plate of size 100x100x 5 mm at the bottom end and including making holes in pipes, angles flats, providing & fixing M.S. message plate of required size, steel work to be painted with two or more coats of synthetic enamel paint of required shade and of approved brand & manufacture over priming coat of zinc chromate yellow primer (vertical MS-Tee support to be painted in black and white colours). Backside of aluminium sheet to be painted with two or more coats of epoxy paint over and including appropriate			

Sl No	Specification	Quantity	Rate	Amount
	priming coat including all leads and lifts etc. complete as per drawing , specification and direction of Engineer-in-Charge.Cautionary / warning sign boards of equilateral triangular shape having each side of 900 mm with support length of 3650 mm			
	Net Total	3.000each	@5337.39/each	16012.17
21.007	16.63			
	Providing, laying and making kerb channel 30 cm wide and 50 mm thick with cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75 mm bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including finishing the top smooth etc. complete and as per direction Engineer - in-Charge.			
	Net Total	42.000sqm	@568.53/sqm	23878.26
21.008	16.69			
	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement : 3 coarse sand) , including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5 mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (Precast C.C. kerb stone shall be approved by Engineer-in-Charge)			
	Net Total	8.400cum	@9859.49/cum	82819.72
21.009	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	90.000cum	@296.98/cum	26728.20
21.010	5.37.1			
	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of 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 the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All wiork upto plinth level			
	Net Total	45.000cum	@9886.00/cum	444870.00
21.011	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			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	3600.000kilogram	@98.30/kilogram	353880.00
21.012	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 .			
	Net Total	3600.000kg	@1.34/kg	4824.00
21.013	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	500.000sqm	@717.20/sqm	358600.00
21.014	OD58984/2022-2023			
	Facility for Recycling Purpose			
	Net Total	1.000L.S	@500199.98/L.S	500199.98
21.015	OD37269/2022-2023			
	od323386/2021_2022 :Laboratory equipment's & Furniture for 5 MLD Sewage Treatment Plant			
	Net Total	1.000L.S	@500199.98/L.S	500199.98
			Heading Total(Rs)	4104406.23
22	**Building for STP**			
22.001	OD65961/2022-2023			
	Building for STP			
	Net Total	1.000no	@5001999.75/no	5001999.75
			Heading Total(Rs)	5001999.75
23	**Mechanical Items**			
23.001	OD206866/2022-2023			
	Piping, initial channel arrangements, bypass arrangements, steel ladder, framework and fire fighting arrangements			
	Net Total	1.000each	@349999.99/each	349999.99
23.002	OD207530/2022-2023			
	Supply and installation of Centrifuge			
	Net Total	1.000each	@200000.00/each	200000.00
23.003	OD206873/2022-2023			
	Mechanical arrangement for oil and grease trap			
	Net Total	1.000each	@25000.00/each	25000.00
23.004	OD206893/2022-2023			
	Odour control unit for co-treatment unit and STP			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	2.000each	@30000.00/each	60000.00
23.005	OD206906/2022-2023			
	Hypo Dosing System			
	Net Total	2.000each	@30000.00/each	60000.00
23.006	OD207085/2022-2023			
	Alum and Lime Dosing System			
	Net Total	2.000each	@25000.00/each	50000.00
23.007	OD207089/2022-2023			
	Carbon Filter			
	Net Total	1.000each	@1583332.49/each	1583332.49
23.008	OD207092/2022-2023			
	Pressure Sand Filter			
	Net Total	3.000each	@1527777.52/each	4583332.56
23.009	OD207094/2022-2023			
	Electromagnetic Flow meter,pressure and quality sensors			
	Net Total	4.000each	@48642.86/each	194571.44
23.010	OD207098/2022-2023			
	Tube settler media			
	Net Total	1.000each	@66964.28/each	66964.28
23.011	OD207099/2022-2023			
	Air Grid Pipe Supply and installation of air pipes			
	Net Total	4.000each	@44642.86/each	178571.44
23.012	OD207100/2022-2023			
	Bubble Diffuser for MBBR			
	Net Total	4.000each	@31250.00/each	125000.00
23.013	OD207105/2022-2023			
	Air Blower Supply,erection, testing and commissioning of twin lobe air blower(Power of motor 56 HP)			
	Net Total	3.000each	@840000.01/each	2520000.03
23.014	OD207143/2022-2023			
	MBBR media			
	Net Total	420.500sqm	@24553.58/sqm	10324780.39
23.015	OD207163/2022-2023			
	Bar Screen-fine-			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	47.000each	@15000.00/each	705000.00
23.016	OD207167/2022-2023			
	bar screen-Coarse			
	Net Total	25.000each	@15000.00/each	375000.00
23.017	OD207169/2022-2023			
	Up to 10 to 20Hp, Head up to 20m As per KWA/HO/SP-333/2014 Dtd.18-03-2016 of The Managing Director			
	Net Total	130.000HP (Horse power)	@22798.00/HP (Horse power)	2963740.00
23.018	OD207172/2022-2023			
	Up to 10HP, Head up to 20m As per KWA/HO/SP-333/2014 Dtd.18-03-2016 of The Managing Director			
	Net Total	4.000HP (Horse power)	@27406.80/HP (Horse power)	109627.20
23.019	OD207176/2022-2023			
	Provision for mechanical arrangements for flushing, cleaning manholes and collection of septage			
	Net Total	1.000L.S	@4000000.00/L.S	4000000.00
23.020	OD207180/2022-2023			
	Filter feed pump - Supply, Installation, Commissioning, testing and trial run of submersible filtered water handling type pump, with specified discharge and head and of reputed make.			
	Net Total	2.000each	@422026.56/each	844053.12
23.021	OD207182/2022-2023			
	Raw Effluent Transfer pump - Supply, Installation, Commissioning, testing and trial run of submersible sewage handling type pump, with specified discharge and head and of reputed make.			
	Net Total	2.000each	@276451.20/each	552902.40
	Heading Total(Rs)			29871875.34
24	**Electrical and Instrumentation works**			
24.001	OD207184/2022-2023			
	Interconnecting piping system			
	Net Total	1.000each	@200892.87/each	200892.87
24.002	OD207186/2022-2023			

Sl No	Specification	Quantity	Rate	Amount
	ELECTRICAL & INSTRUMENTATION			
	Net Total	1.000each	@625000.00/each	625000.00
24.003	OD207189/2022-2023			
	Supply, installation and commissioning of diesel generator			
	Net Total	5.000each	@120000.00/each	600000.00
24.004	OD207206/2022-2023			
	Supply and installation of accessories for electrical connection and control units for lifting stations and collection wells including foundations			
	Net Total	25.000each	@75000.00/each	1875000.00
24.005	OD209604/2022-2023			
	Supply,installation and commissioning of solar units for collection wells			
	Net Total	2.000each	@50000.00/each	100000.00
24.006	OD207208/2022-2023			
	Supply, installation and commissioning of solar units for lifting stations			
	Net Total	23.000each	@20000.00/each	460000.00
24.007	OD207212/2022-2023			
	Supply, installation and commissioning of solar units for STP			
	Net Total	1.000each	@1000000.00/each	1000000.00
24.008	OD207473/2022-2023			
	Transformer unit of 500 KVA			
	Net Total	1.000each	@2500000.01/each	2500000.01
	Heading Total(Rs)			7360892.88
	Total Estimation PAC			96161595.65
26	**Extra Charges**			
25.001	Provision for GST			
	96161595.65		0.00%	0.00
	Grand Total			0.00
	Round off			0.00
	Rounded Total(Rs)			96161595.65
	Rupees Nine Crore Sixty One Lakh Sixty One Thousand Five Hundred and Ninety Five			

GENERAL ABSTRACT

Others-Swatch Bharath Mission-Urban 2.0:-Construction of Sewage collection Well Grit Chamber and allied works in Zone-I of Neyyattinkara Municipality-Construction of Sewage collection Well Grit Chamber and allied works in

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Neyyattinkara Municipality-General Civil Work

Sl No	Head Description		Amount
1	CONSTRUCTION OF WELL-2 nos		10431003.29
2	GRIT CHAMBER- 2 nos		3648262.31
3	Construction of Valve Chamber,Cable duct,Toilet- 2 nos		3645572.26
4	Interconnection of grit chamber with well- 2 nos		1769940.21
5	Sewrage Pump House above the Well- 2 nos		14955646.61
6	Materials and unforeseen-2 nos		3029339.38
7	Compound Wall and Gate-2 nos		3659859.73
	Total Estimation PAC		41139623.79
C	**Extra Charges**		
C.001	Provision for GST		
	41139623.79	0.00%	0.00
	Grand Total		0.00
	Round off		0.00
	Rounded Total(Rs)		41139623.79
	Rupees Four Crore Eleven Lakh Thirty Nine Thousand Six Hundred and Twenty Three		

ABSTRACT ESTIMATE

Others-Swatch Bharath Mission-Urban 2.0:-Construction of Sewage collection Well Grit Chamber and allied works in Zone-I of Neyyattinkara Municipality-Construction of Sewage collection Well Grit Chamber and allied works in

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Neyyattinkara Municipality-General Civil Work

Sl No	Specification	Quantity	Rate	Amount
1	**CONSTRUCTION OF WELL-2 nos**			
1.001	50.2.33.7			
	Cutting branches of trees overhanging above any structures of girth between 90cm to 120cm including stacking of serviceable materials and disposal of unserviceable material, cost of labour, hire charges of rope and pully etc without making any damages to nearby structures etc complete.			
	Net Total	50.000each	@750.26/each	37513.00
1.002	2.1.1			
	Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5m in width as well as 10 sqm on plan including disposal of excavated earth up to 50 m and lift up to 1.5 m, disposed soil to be levelled and neatly dressed:All Kinds of soil			
	Net Total	809.400sqm	@108.96/sqm	88192.22
1.003	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	432.000cum	@296.98/cum	128295.36
1.004	OD44336/2022-2023			
	:Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas(exceeding 30cm in depth,150cm in width as well as 10 sqm on plan) including disposal of excavated earth, disposed earth to be levelled and neatly dressed for Manhole 2nd depth 1.5m to 3m			
	Net Total	288.000cum	@320.40/cum	92275.20
1.005	OD44335/2022-2023			
	:Fabricating MS Kerb of size using 8 mm thick MS plate including cost ms plate and 10mm dia anger bar welded to the kerb and conveyance charges of MS plate,all fabrication charges, charges of painting outer side of the steel work with two or more coat deluxe multi surface paint to give an even shade over an under			

Sl No	Specification	Quantity	Rate	Amount
	coat of primer erection tying anger bar with reinforcement placing in position etc complete:			
	Net Total	46.058metre	@6449.45/metre	297048.77
1.006	OD44368/2022-2023			
	:Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	284.216cum	@11147.74/cum	3168366.07
1.007	100.3.7.2			
	Earthwork in open well excavation (above water) for wells of diameter above 6.0m and up to 9.0m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 1.50m to 3.0m including neat banking.			
	Net Total	50.240cum	@496.86/cum	24962.25
1.008	OD85424/2022-2023			
	Sinking wells (third depth) 7.00 m 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 to 4.5m (vide KWA SoR KW.5.4)			
	Net Total	3.000metre	@42741.47/metre	128224.41
1.009	OD44561/2022-2023			
	Sinking wells (4th depth) 7.00 m 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 4.5 to 6.0m (vide KWA SoR KW.5.4)			
	Net Total	3.000metre	@45464.85/metre	136394.55
1.010	OD44860/2022-2023			
	Sinking wells (5th depth) 7.00 m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the			

Sl No	Specification	Quantity	Rate	Amount
	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 to 7.5m (vide KWA SoR KW.5.4)			
	Net Total	3.000metre	@48188.22/metre	144564.66
1.011	OD44864/2022-2023			
	Sinking wells (6th depth) 7.00 m 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 7.5 to 9m (vide KWA SoR KW.5.4)			
	Net Total	3.000metre	@50911.60/metre	152734.80
1.012	OD44866/2022-2023			
	Sinking wells (7th depth) 7.00 m 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 9 to 10.5m (vide KWA SoR KW.5.4)			
	Net Total	0.400metre	@53634.18/metre	21453.67
1.013	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	51.049cum	@6814.88/cum	347892.81
1.014	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 (zone-III) : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	18.835cum	@7990.85/cum	150507.66
1.015	4.15			
	Extra for laying concrete in or under water and or liquid mud including cost of pumping or bailing out water and removing slush etc. complete. Note for item No. 4.15 : - The quantity will be calculated by multiplying the depth measured from the sub-soil water level upto centre of gravity of concrete under sub-soil water level with quantity of concrete in cum executed under the sub-soil water. The depth of centre of gravity shall be reconed correct to 0.10 m 0.05 m or more shall be taken as 0.10 m and less than 0.05 m ignored.			
	Net Total	136.448cum	@935.37/cum	127629.37

Sl No	Specification	Quantity	Rate	Amount
1.016	5.22.4			
	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHot rolled deformed bars			
	Net Total	27000.000kilogram	@98.30/kilogram	2654100.00
1.017	5.3			
	Reinforced cement concrete work in beams, suspended floors, roofs, having slope up to 15⁰ landings, balconies, shelves, chajjas, lintels, bands, plain window sills, staircases and spiral stair cases up to floor five level excluding the cost of centering, shuttering, finishing and reinforcement, with1:1.5:3 (1 cement : 1.5 coarse sand (Zone III) : 3 graded stone aggregate 20 mm nominal size).			
	Net Total	11.492cum	@11492.91/cum	132076.52
1.018	OD44878/2022-2023			
	Centering and shuttering including strutting propping etc and removal of form etc. Well Steining for circular works			
	Net Total	907.306sqm	@348.02/sqm	315760.63
1.019	5.9.5			
	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers			
	Net Total	13.300sqm	@649.80/sqm	8642.34
1.020	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	54.385sqm	@815.75/sqm	44364.56
1.021	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	180.000each	@545.03/each	98105.40
1.022	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	0.951cum	@10954.02/cum	10417.27

Sl No	Specification	Quantity	Rate	Amount
1.023	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	14.280sqm	@335.31/sqm	4788.23
1.024	14.72			
	Providing and fixing double scaffolding system (cup lock type) on the exterior side, upto seven story hight made with 40 mm dia. M.S. tube 1.5 m centre to centre, horizontal & vertical tubes joining with cup & lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staricase system in the scaffolding for working platform etc. and maintaining it in a serviceable condition for the required duration as approved and removing it there after. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc wherever required for inspection of work at required location with essential safety features for the workmen etc. complete as per directions and approval of Engineer- in Charge. The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding. Note:- This item to be used for maintenance work judicially, necessary deduction for scaffolding in the existing item to be done .			
	Net Total	307.720sqm	@303.64/sqm	93436.10
1.025	5.1.3			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	1.404cum	@8588.50/cum	12058.25
1.026	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	642.368sqm	@401.22/sqm	257730.89
1.027	100.98.1016			
	Engaging Mason (for ornamental stone work) Ist class.			
	Net Total	40.000no	@1162.26/no	46490.40
1.028	13.52.2			
	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 concrete work			
	Net Total	404.432sqm	@222.94/sqm	90164.07
1.029	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	670.797cum	@258.56/cum	173441.27
1.030	OD44955/2022-2023			

Sl No	Specification	Quantity	Rate	Amount
	Conveying disposing the excess earth and debries etc.by lorry up to 5Km s			
	Net Total	250.000cum	@141.28/cum	35320.00
1.031	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	7161.600Kwh	@36.93/Kwh	264477.89
1.032	100.7.2			
	Bailing out water with engine and pump set above 5HP up to 10HP including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	7161.600Kwh	@18.48/Kwh	132346.37
1.033	100.98.1008			
	Engaging Coolie.			
	Net Total	140.000no	@878.79/no	123030.60
1.034	OD45007/2022-2023			
	Fabricating MS Base plate using 12 mm thick MS plate including cost and conveyance charges of MS plate,all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc complete.			
	Net Total	4.000no	@2783.16/no	11132.64
1.035	OD45357/2022-2023			
	Supplying fabricating fixing I section for column no: B Size ISMB 250X125X12mm, Length- 5.20m, Supporting section ISLB 100X50X10mm 1m long, welded with MS plate size 300x300x12mm and 150x150mmx2nos with necessary ss fasteners priming coat etc.			
	Net Total	2.000no	@27675.06/no	55350.12
1.036	OD45269/2022-2023			
	Supplying fabricating fixing I section for column no:A with ISMB250X125X12mm of 4.00m long welded with MS plate size 400X400X12mm 2nos and fixing to the RCC priming coating finishing etc as specified desighn.. 			
	Net Total	2.000no	@20745.12/no	41490.24
1.037	OD45349/2022-2023			
	Supplying fabricating fixing Girder over the column with ISMB 250X125X12mm and 10m long , MS Plate for end close 12mm size 250x250mm . Providing movable Chain pulley through the flange of the Girder and capable to carry 3tonne with 10m chain necessary flanges			

Sl No	Specification	Quantity	Rate	Amount
	fastening with the column structure with weld and bolt nut end closer with 12mm plate prime coat etc complete			
	Net Total	2.000no	@47215.33/no	94430.66
1.038	OD45340/2022-2023			
	Providing structural steel work for providing roof over the girder to prevent the corrosion with tubular sections 60x40x3.6mm,40x40x3.2mm, 50x25x3.2mm and 25x25x2.6mm welded each other and placed and welded over the I section necessary prime coat etc.. complete as specified design			
	Net Total	3.000metre	@63260.10/metre	189780.30
1.039	50.12.2.4			
	Providing & fixing Poly carbonate multi wall plain sheet 6 mm thick as approved by the Engineer in charge and should be supplied in a single length of 12m or as decide by the Engineer in charge. The sheets shall be fixed using self drilling/self tapping screw of size (5.5x55mm) with EPDM seal complete upto any pitch in horizontal/vertical curved surfaces, but excluding the cost of purlins, rafters, trusses, and including cutting to size and shapes where ever required.			
	Net Total	50.600sqm	@856.75/sqm	43351.55
1.040	OD45321/2022-2023			
	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge,(for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.).			
	Net Total	75.100sqm	@5606.42/sqm	421042.14
1.041	13.46.1			
	Finishing walls with Acrylic Smooth exterior paint of required shade:New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)			
	Net Total	72.309sqm	@193.88/sqm	14019.27
1.042	13.62.1			
	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade:Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture .			
	Net Total	84.400sqm	@208.54/sqm	17600.78
			Heading Total(Rs)	10431003.2

Sl No	Specification	Quantity	Rate	Amount
				9
2	**GRIT CHAMBER- 2 nos**			
2.001	100.98.1000			
	Engaging Bandhani.			
	Net Total	50.000no	@971.71/no	48585.50
2.002	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.			
	Net Total	120.000metre	@96.32/metre	11558.40
2.003	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	195.000cum	@296.98/cum	57911.10
2.004	OD44998/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 1.50m but not exceeding 3.00m			
	Net Total	195.000cum	@403.35/cum	78653.25
2.005	OD45010/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 3.00m but not exceeding 4.50m			
	Net Total	195.000cum	@509.75/cum	99401.25
2.006	OD45023/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 4.50m but not exceeding 6.00m			
	Net Total	195.000cum	@616.12/cum	120143.40
2.007	OD45033/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in			

Sl No	Specification	Quantity	Rate	Amount
	foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 9.00m but not exceeding 10.50m			
	Net Total	39.000cum	@935.27/cum	36475.53
2.008	100.6.1			
	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.			
	Net Total	468.000sqm	@749.09/sqm	350574.12
2.009	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	20.128cum	@6814.88/cum	137169.90
2.010	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 (zone-III) : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	11.016cum	@7990.85/cum	88027.20
2.011	OD45058/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	46.380cum	@11147.74/cum	517032.18
2.012	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	40.960sqm	@335.31/sqm	13734.30
2.013	5.9.2			

Sl No	Specification	Quantity	Rate	Amount
	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	575.460sqm	@717.20/sqm	412719.91
2.014	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	9200.000kilogram	@98.30/kilogram	904360.00
2.015	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	120.000each	@545.03/each	65403.60
2.016	13.9.1			
	Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.12 mm cement plaster			
	Net Total	505.850sqm	@412.14/sqm	208481.02
2.017	100.98.1016			
	Engaging Mason (for ornamental stone work) Ist class.			
	Net Total	20.000no	@1162.26/no	23245.20
2.018	13.52.2			
	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 concrete work			
	Net Total	319.761sqm	@222.94/sqm	71287.52
2.019	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	3580.800Kwh	@36.93/Kwh	132238.94
2.020	100.7.2			
	Bailing out water with engine and pump set above 5HP up to 10HP including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	1790.400Kwh	@18.48/Kwh	33086.59

Sl No	Specification	Quantity	Rate	Amount
2.021	100.98.1008			
	Engaging Coolie.			
	Net Total	60.000no	@878.79/no	52727.40
2.022	100.52.S.1			
	Sub Data for providing Earth filled cement bags including cutting of the Earth, filling, conveying and placing in position.			
	Net Total	20.000each	@93.47/each	1869.40
2.023	OD45146/2022-2023			
	Structural steel work in single section for providing girder over the grit chamber with 80mm dia 4mm thick ms circular section fixing on the rcc column and providing necessary arrangements for fixing pully foe ease of De- silting , 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	4.000no	@7204.59/no	28818.36
2.024	OD45149/2022-2023			
	Providing grating size 2.45x0.95m to the Grit chamber ,with fabrication MS Flat size 50x8mm thick with 50mm c/c and connected 12mm dia MS Bar across the flat and welded bend necessery angle ease to place and removal etc. and painting with approved anti fungal paint prime coat placing etc			
	Net Total	4.000no	@23302.40/no	93209.60
2.025	100.31.2.11			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required, will be paid separately): 500mm diameter, Class II.			
	Net Total	8.000no	@7693.58/no	61548.64
			Heading Total(Rs)	3648262.31
3	**Construction of Valve Chamber,Cable duct,Toilet- 2 nos**			
3.001	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	99.990cum	@296.98/cum	29695.03
3.002	OD45151/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 1.50m but not exceeding 3.00m			
	Net Total	26.000cum	@403.35/cum	10487.10

Sl No	Specification	Quantity	Rate	Amount
3.003	2.17.1			
	Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5 m			
	Net Total	69.000sqm	@162.98/sqm	11245.62
3.004	2.17.2			
	Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m			
	Net Total	36.800sqm	@191.30/sqm	7039.84
3.005	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	8.704cum	@6814.88/cum	59316.72
3.006	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	13.589cum	@9085.13/cum	123457.83
3.007	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	2.103cum	@10954.02/cum	23036.30
3.008	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	15.700sqm	@335.31/sqm	5264.37
3.009	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	172.140sqm	@717.20/sqm	123458.81
3.010	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	13.360sqm	@815.75/sqm	10898.42
3.011	5.22.4			

Sl No	Specification	Quantity	Rate	Amount
	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHot rolled deformed bars			
	Net Total	2800.000kilogram	@98.30/kilogram	275240.00
3.012	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	18.000each	@545.03/each	9810.54
3.013	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	316.262sqm	@401.22/sqm	126890.64
3.014	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	16.032cum	@7204.75/cum	115506.55
3.015	50.6.1.2			
	Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.			
	Net Total	16.240cum	@6602.11/cum	107218.27
3.016	4.2.3			
	Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts,buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor, etc. up to floor five level, excluding the cost of centering, shuttering and finishing:1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	11.716cum	@10069.47/cum	117973.91
3.017	11.36			
	Providing and fixing I st quality ceramic glazed wall tiles conforming to IS : 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer -in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar			

Sl No	Specification	Quantity	Rate	Amount
	1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3 kg per sqm, including pointing in white cement mixed with pigment of matching shade complete.			
	Net Total	71.500sqm	@1212.74/sqm	86710.91
3.018	11.40			
	Providing and laying rectified Glazed Ceramic floor tiles of size 300x300 mm or more (thickness to be specified by the manufacturer) of Ist quality conforming to IS: 15622 of approved make in all colours, shades, except white, Ivory, Grey Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand) including pointing the joints with white cement and matching pigments etc., complete.			
	Net Total	6.160sqm	@1378.00/sqm	8488.48
3.019	11.41.2			
	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete.Size of Tile 600 x 600 mm.			
	Net Total	58.500sqm	@1766.29/sqm	103327.97
3.020	17.1.1			
	Providing and fixing water closet squatting pan (Indian type W.C. pan) with 100 mm Sand Cast Iron P or S trap, 10 litter low level white P.V.C.flushing cistern, including flush pipe, manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever require:White Vitreous china Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests			
	Net Total	2.000each	@6381.62/each	12763.24
3.021	17.7.3			
	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require:White Vitreous China Wash basin size 550x400 mm with a pair of 15 mm C.P. brass pillar taps			
	Net Total	2.000each	@3351.07/each	6702.14
3.022	50.18.8.2.1			
	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work,including cutting chased and making good the wall etc. 20 mm pipe 12 Kgf/cm2			
	Net Total	10.000metre	@409.54/metre	4095.40
3.023	50.18.8.8.1			
	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chases and making good the wall etc. 75 mm pipe 6 Kgf/cm2			
	Net Total	4.000metre	@622.90/metre	2491.60

Sl No	Specification	Quantity	Rate	Amount
3.024	50.18.8.9.1			
	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chased and making good the wall etc. 110 mm pipe 6kgf/cm2			
	Net Total	4.000metre	@722.90/metre	2891.60
3.025	50.18.9.4.1			
	Providing and fixing PVC pipes includings jointing of pipes with one step PVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge.32 mm dia 10.Kgf/cm2			
	Net Total	50.000metre	@238.73/metre	11936.50
3.026	50.18.9.5.1			
	Providing and fixing PVC pipes includings jointing of pipes with one step PVC solvent cement, trenching refilling & testing of joints complete as per direction of Engineer in Charge 40 mm dia 10Kgf/cm2			
	Net Total	100.000metre	@275.79/metre	27579.00
3.027	50.18.9.8.1			
	Providing and fixing PVC pipes includings jointing of pipes with one step PVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. 75 mm dia 6 Kgf/ cm2			
	Net Total	10.000metre	@360.37/metre	3603.70
3.028	50.18.9.9.1			
	Providing and fixing PVC pipes includings jointing of pipes with one step PVC solvent cement, trenching, refilling & testing of Joints complete as per direction of engineer in charge.110 mm dia 6Kgf/cm2			
	Net Total	60.000metre	@526.18/metre	31570.80
3.029	50.18.9.13.1			
	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 25 mm dia 12 Kgf/ cm2- External work- exposed on wall			
	Net Total	10.000metre	@293.25/metre	2932.50
3.030	50.18.9.14.1			
	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 32 mm dia 10 Kgf/cm2 - External work- Exposed on wall			
	Net Total	10.000metre	@327.16/metre	3271.60
3.031	50.18.9.15.1			
	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 40 mm dia 10Kgf/cm2- External work- Exposed on wall			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	20.000metre	@417.19/metre	8343.80
3.032	50.18.9.17.1			
	Providing and fixing PVC pipes including fixing the pipe with clamps/ clip at 1.00 m spacing . This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 63 mm dia 6 Kgf/cm2 - External work - Exposed on wall			
	Net Total	6.000metre	@268.31/metre	1609.86
3.033	50.18.9.19.1			
	Providing and fixing PVC pipes including fixing the pipe with clamps/ clips/ at 1.00 m spacing . This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 110 mm dia 6 Kgf/cm2 - External work- Exposed on wall			
	Net Total	10.000metre	@381.73/metre	3817.30
3.034	50.18.9.20.1			
	Providing and fixing PVC moulded fittings/ accessories for Rigid PVC pipes, including jointing with PVC solvent cement - 63 mm dia Elbow			
	Net Total	4.000no	@72.92/no	291.68
3.035	50.18.9.20.3			
	Providing and fixing PVC moulded fittings /accessories for Rigid PVC pipes, including jointing with PVC solvent cement - 63 mm dia Door Elbow			
	Net Total	2.000no	@80.47/no	160.94
3.036	50.18.9.22.6			
	Providing and fixing PVC moulded fittings/accessories for Rigid PVC pipes, including jointing with PVC solvent cement - 110x110x110 mm dia Door tee			
	Net Total	2.000no	@187.59/no	375.18
3.037	50.18.9.22.8			
	Providing and fixing PVC moulded fittings /accessories for Rigid PVC pipes, including jointing with PVC solvent cement -110 mm dia Vent cowl			
	Net Total	2.000no	@123.89/no	247.78
3.038	50.18.9.22.9			
	Providing and fixing PVC moulded fittings/ accessories for Rigid PVC pipes, including jointing with PVC solvent cement -110 mm dia offset			
	Net Total	4.000no	@164.54/no	658.16
3.039	18.48			
	Providing and placing on terrace (at all floor levels) polyethylene water storage tank :ISI 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.			
	Net Total	4000.000Litre	@10.37/Litre	41480.00
3.040	50.17.1.3			
	Supplying and fixing CP Towel rod 60cm or nearest available length including cost of			

Sl No	Specification	Quantity	Rate	Amount
	materials and labour charges etc complete as per the direction of site Engineer-in-charge.			
	Net Total	2.000no	@128.25/no	256.50
3.041	50.17.1.4			
	Supplying and fixing CP Health faucet good quality including cost of materials and labour charges etc. complete as per the direction of site engineer-in-charge.			
	Net Total	2.000no	@758.13/no	1516.26
3.042	18.50.1			
	Providing and fixing C.P brass long nose bib cock of approved quality conforming to IS standards and weighing not less than 810 gms.15 mm nominal bore			
	Net Total	2.000each	@728.39/each	1456.78
3.043	18.64			
	Providing and fixing PTMT swivelling shower, 15 mm nominal bore, weighing not less than 40 gms.			
	Net Total	2.000no	@131.54/no	263.08
3.044	18.17.1			
	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :25 mm nominal bore			
	Net Total	10.000each	@585.21/each	5852.10
3.045	18.18.1			
	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete:15 mm nominal bore			
	Net Total	2.000each	@398.69/each	797.38
3.046	18.21.2.1			
	Providing and fixing uplasticised PVC connection pipe with brass unions: 45 cm length15 mm nominal bore			
	Net Total	2.000each	@97.71/each	195.42
3.047	18.52.1			
	Providing and fixing C.P brass stop cock (concealed) of standard design and of approved make conforming to IS: 893115 mm nominal bore			
	Net Total	2.000each	@713.64/each	1427.28
3.048	18.53.1			
	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS: 893115 mm nominal bore			
	Net Total	2.000each	@626.21/each	1252.42
3.049	18.58.2.1			
	Providing and fixing PTMT grating of approved quality and colour. Rectangular type with openable circular lid150 mm nominal size square 100 mm diameter of the inner hinged round grating			
	Net Total	2.000each	@198.94/each	397.88

Sl No	Specification	Quantity	Rate	Amount
3.050	19.30.1.1			
	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			
	Net Total	6.000each	@6978.87/each	41873.22
3.051	14.43			
	Removing white or colour wash by scrapping and sand papering and preparing the surface smooth including necessary repairs to scratches etc. complete.			
	Net Total	1320.120sqm	@16.75/sqm	22112.01
3.052	14.67.1			
	Finishing walls with Premium Acrylic Smooth exterior paint with Silicone additives of required shade:Old work (Two or more coats applied @ 1.43 ltr/10 sqm) over existing cement paint surface			
	Net Total	1061.340sqm	@115.06/sqm	122117.78
3.053	14.53.1			
	Wall painting with plastic emulsion paint of approved brand and manufacture to give an even shade:One or more coats on old work			
	Net Total	224.220sqm	@99.65/sqm	22343.52
3.054	14.54.1			
	Painting with synthetic enamel paint of approved brand and manufacture of required colour to an give even shade:One or more coats on old work			
	Net Total	50.640sqm	@94.11/sqm	4765.73
3.055	13.47.1			
	Finishing walls with Premium Acrylic Smooth exterior paint with Silicone additives of required shade:New work (Two or more coats applied @ 1.43 ltr/ 10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm)			
	Net Total	146.650sqm	@189.70/sqm	27819.51
3.056	13.51.2			
	Painting with silicon & acrylic emulsion based water thinnable sealer of approved brand and manufacture on wet or patchy portion of plastered surfaces:Two coats			
	Net Total	49.700sqm	@151.87/sqm	7547.94
3.057	13.62.1			
	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade:Two or more coats on new work over an under coat of			

Sl No	Specification	Quantity	Rate	Amount
	suitable shade with ordinary paint of approved brand and manufacture .			
	Net Total	199.557sqm	@208.54/sqm	41615.62
3.058	OD45156/2022-2023			
	Providing steel gate size 5mx1.8 with Steel work in built up tubular with Outer Frame size 80x40x3.20mm,Vertical member size 32x32x2.60mm necessary hinges provided for fixing boundary wall locking access and tower bolt etc (3part) (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc.complete as specified design			
	Net Total	2.000no	@47829.63/no	95659.26
3.059	OD45159/2022-2023			
	Fabricating and providing steel fencing over the boundary wall with Vertical member size 16mm square rod,Horizontal member 3nos size 12mm square rod,Sharpen arrow size 50x50mm with 4mm ms plate welded over the vertical member fixing over the boundary wall prime coat etc.. complete			
	Net Total	260.000metre	@1221.22/metre	317517.20
3.060	OD45161/2022-2023			
	Providing steel grating over the cable duct , required size and length with size 25x25x2.6mm rectangular section length-0.55m for cross bar and size 50x25x3.2mm rectangular section to fixing cross bar welded each other as specified design finished prime coat and placing etc.			
	Net Total	26.000metre	@3709.29/metre	96441.54
3.061	9.120.2			
	Providing and fixing factory made panel PVC door shutter consisting of frame made out of M.S. tubes of 19 gauge thickness and sized of 19 mm x 19 mm for styles and 15x15 mm for top & bottom rails. M.S. frame shall have a coat of steel primers of approved make and manufacture. M.S. frame covered with 5 mm thick heat moulded PVC 'C' channel of size 30 mm thickness, 70 mm width out of whicj 50 mm shall be flat and 20 mm shall be tapered in 45 degree angle on both side forming styles and 5mm thick, 95 mm wide PVC sheet out of which75 mm shall be tapered in 45 degree on th inner side to form top and bottom rail and 115 mm wide PVC sheet out of which 75 mm shall be flat and 20 mm shall be tapered on both sides to form lock rail. Top, bottom and lock rails shall be provided both side of the panel. 10 mm (5 mmx2) thick, 20 mm wide cross PVC sheet be provided as gap insert for top rail & bottom rail. paneling of 5 mm thick both side PVC sheet to be fitted in the M.S. frame welded /sealed to the styles & rails with 7 mm (5 mm + 2 mm) thick x 15 mm wide PVC sheet beading on inner side, and joined together with solvent cement adhesive. An additional 5 mm thick PVC strip of 20 mm width is to be stuck on the interior side of the 'C' Channel using PVC solvent adhesive etc. complete as per direction of Engineer -in-charge, manufacture's specification & drawing.30 mm thick pre laminated PVC door shutters			
	Net Total	3.360sqm	@2852.54/sqm	9584.53
3.062	16.91.2			
	Providing and laying factory made chamfered edge Cement Concrete paver blocks in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength,			

Sl No	Specification	Quantity	Rate	Amount
	thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge.80 mm thick C.C. paver block of M-30 grade with approved color design and pattern.			
	Net Total	897.317sqm	@1121.78/sqm	1006592.26
3.063	50.10.2			
	Steel work for purlin/single section with G I pipes including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete			
	Net Total	317.764kg	@152.35/kg	48411.35
3.064	50.10.1			
	Steel work in built up G I tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting,fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete			
	Net Total	1034.131kg	@189.89/kg	196371.14
3.065	12.1.2			
	Providing corrugate G.S. sheet roofing including vertical/ curved surface fixed with polymer coated J or L hooks, bolts and nuts 8 mm diameter with bitumen and G.I. limpet washers or with G.I. limpet washers filled with white lead, including a coat of approved steel primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal / vertical or curved surfaces), excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required.0.80 mm thick with zinc coating less than 275 gm/m2			
	Net Total	39.600sqm	@1249.86/sqm	49494.46
			Heading Total(Rs)	3645572.26
4	**Interconnection of grit chamber with well- 2 nos**			
4.001	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 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	108.000cum	@555.54/cum	59998.32
4.002	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 3m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as			

Sl No	Specification	Quantity	Rate	Amount
	directed, within a lead of 50m, in all kinds of soil.			
	Net Total	108.000cum	@661.92/cum	71487.36
4.003	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 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 50m, in all kinds of soil.			
	Net Total	108.000cum	@768.31/cum	82977.48
4.004	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 but not exceeding 6m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	36.000cum	@874.68/cum	31488.48
4.005	100.6.1			
	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.			
	Net Total	600.000sqm	@749.09/sqm	449454.00
4.006	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	1.472cum	@2983.62/cum	4391.89
4.007	15.5			
	Extra for cutting reinforcement bars manually/ by mechanical means in R.C.C. or R.B. work (Payment shall be made on the cross sectional area of R.C.C. or R.B work) as per direction of Engineer-in-charge.			
	Net Total	5.120sqm	@1016.23/sqm	5203.10
4.008	100.14.9			
	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials: 500mm diameter Ductile Iron Class K-9 Pipes.			
	Net Total	60.000metre	@442.46/metre	26547.60

Sl No	Specification	Quantity	Rate	Amount
4.009	18.70.9			
	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:500 mm dia pipes			
	Net Total	12.000joint	@835.70/joint	10028.40
4.010	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	27.000cum	@296.98/cum	8018.46
4.011	OD45167/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 1.50m but not exceeding 3.00m			
	Net Total	27.000cum	@403.35/cum	10890.45
4.012	OD45168/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 3.00m but not exceeding 4.50m			
	Net Total	27.000cum	@509.75/cum	13763.25
4.013	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	1.936cum	@6814.88/cum	13193.61
4.014	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	7.964cum	@9085.13/cum	72353.98
4.015	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)			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	6.528cum	@8557.78/cum	55865.19
4.016	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	5.120sqm	@335.31/sqm	1716.79
4.017	OD45171/2022-2023			
	Centering and shuttering including strutting propping etc and removal of form etc. Well Steining for circular works			
	Net Total	90.244sqm	@348.02/sqm	31406.72
4.018	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	28.000each	@545.03/each	15260.84
4.019	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 (zone-III) : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	3.996cum	@7990.85/cum	31931.44
4.020	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	96.775sqm	@401.22/sqm	38828.07
4.021	OD45192/2022-2023			
	Plugging the full portion of the mouth of 225mm to 300mm dia sewer main using clay filled gunny bags and removing the same after completion of work etc complete			
	Net Total	12.000no	@943.41/no	11320.92
4.022	100.98.1008			
	Engaging Coolie.			
	Net Total	50.000no	@878.79/no	43939.50
4.023	100.98.1035			
	Engaging sewer man.			
	Net Total	50.000no	@878.79/no	43939.50

Sl No	Specification	Quantity	Rate	Amount
4.024	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	2238.000Kwh	@36.93/Kwh	82649.34
4.025	OD45213/2022-2023			
	Conveying from casting yard and fixing the RCC Cover slab size 2.00m dia,18cm thick including cost of 7.5kg cement/E			
	Net Total	2.000no	@635.94/no	1271.88
4.026	OD45220/2022-2023			
	Supplying and fixing 560mm dia CI MH Cover with frame(Heavy duty -HD 20)			
	Net Total	8.000no	@14173.90/no	113391.20
4.027	100.14.5			
	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials: 300mm diameter Ductile Iron Class K-9 Pipes.			
	Net Total	40.000metre	@205.17/metre	8206.80
4.028	100.98.119			
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.			
	Net Total	40.000metre	@4330.92/metre	173236.80
4.029	100.37.9.1			
	In situ fabrication of M.S. pipes of size 300mm (I.D.) using 8mm thick M.S. plate including cost and conveyance charges of M.S. plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under-coat of primer etc., complete.			
	Net Total	20.000metre	@7811.94/metre	156238.80
4.030	100.37.9.2			
	Fabricating M.S. flanges of diameter 300mm using 12mm thick M.S. plate including cost and conveyance charges of M.S. plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under-coat of primer etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	8.000no	@2869.05/no	22952.40
4.031	100.37.9.3			
	Cutting 300mm (I.D.) M.S. pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	8.000no	@312.70/no	2501.60
4.032	100.37.9.4			
	Welding 300mm (I.D.) M.S. pipes for making bends and other specials by gas/electric			

Sl No	Specification	Quantity	Rate	Amount
	welding machine including cost of gas and welding rods, all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	8.000no	@1181.97/no	9455.76
4.033	100.37.9.5			
	Grinding cut and weld edges of 300mm (I.D.) M.S. pipes during fabrication work including all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	8.000no	@222.02/no	1776.16
4.034	100.37.6.1			
	In situ fabrication of M.S. pipes of size 150mm (I.D.) using 8mm thick M.S. plate including cost and conveyance charges of M.S. plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under-coat of primer etc., complete.			
	Net Total	6.000metre	@4957.32/metre	29743.92
4.035	100.37.6.2			
	Fabricating M.S. flanges of diameter 150mm using 12mm thick M.S. plate including cost and conveyance charges of M.S. plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under-coat of primer etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	12.000no	@1472.89/no	17674.68
4.036	100.37.6.3			
	Cutting 150mm (I.D.) M.S. pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	12.000no	@164.25/no	1971.00
4.037	100.37.6.4			
	Welding 150mm (I.D.) M.S. pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods, all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	12.000no	@620.89/no	7450.68
4.038	100.37.6.5			
	Grinding cut and weld edges of 150mm (I.D.) M.S. pipes during fabrication work including all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	12.000no	@116.62/no	1399.44
4.039	100.31.1.7			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required, will be paid separately): 300mm diameter, Class I.			
	Net Total	2.000no	@2594.42/no	5188.84
4.040	100.32.6			

Sl No	Specification	Quantity	Rate	Amount
	Conveying and fixing C. I. Double Acting Air Valve of approved quality with bolts, nuts, rubber insertions etc., complete, but excluding the cost of air valve (tail pieces, if required, will be paid separately): 150mm Double Acting Air Valve.			
	Net Total	2.000no	@412.78/no	825.56
			Heading Total(Rs)	1769940.21
5	**Sewrage Pump House above the Well- 2 nos**			
5.001	OD45224/2022-2023			
	Providing and laying in position machine batched and machine mixed design mix M-30 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 @ 340 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).			
	Net Total	131.000cum	@11147.74/cum	1460353.94
5.002	20.2.2			
	Boring, providing and installing bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring, with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. all complete, including removal of excavated earth with all lifts and leads (Length of pile for payment shall be measured upto bottom of pile cap).400 mm dia piles			
	Net Total	280.000metre	@2500.05/metre	700014.00
5.003	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 (zone-III) : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	53.040cum	@7990.85/cum	423834.68
5.004	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	184.000sqm	@335.31/sqm	61697.04
5.005	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 @			

Sl No	Specification	Quantity	Rate	Amount
	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	151.000cum	@11065.65/cum	1670913.15
5.006	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	720.000sqm	@815.75/sqm	587340.00
5.007	5.9.5			
	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers			
	Net Total	846.000sqm	@649.80/sqm	549730.80
5.008	5.9.6			
	Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts			
	Net Total	108.480sqm	@863.61/sqm	93684.41
5.009	5.9.7			
	Centering and shuttering including strutting, etc. and removal of form for:Stairs, (excluding landings) except spiral - staircases)			
	Net Total	18.000sqm	@732.54/sqm	13185.72
5.010	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	35883.400kilogram	@98.30/kilogram	3527338.22
5.011	50.6.1.2			
	Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.			
	Net Total	118.180cum	@6602.11/cum	780237.36
5.012	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	2474.000sqm	@401.22/sqm	992618.28
5.013	13.51.2			
	Painting with silicon & acrylic emulsion based water thinnable sealer of approved brand and manufacture on wet or patchy portion of plastered surfaces:Two coats			
	Net Total	1903.000sqm	@151.87/sqm	289008.61
5.014	21.3.1			

Sl No	Specification	Quantity	Rate	Amount
	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer - in -Charge. (Cost of aluminium snap beading shall be paid in basic item):With float glass panes of 4.0 mm thickness			
	Net Total	43.000sqm	@1176.64/sqm	50595.52
5.015	10.6.1			
	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover			
	Net Total	36.000sqm	@3465.49/sqm	124757.64
5.016	11.41.2			
	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete.Size of Tile 600 x 600 mm.			
	Net Total	238.300sqm	@1766.29/sqm	420906.91
5.017	11.37			
	Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand), including pointing the joints with white cement and matching pigment etc., complete.			
	Net Total	9.000sqm	@1091.05/sqm	9819.45
5.018	11.4			
	52 mm thick cement concrete flooring with concrete hardener topping, under layer 40 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) and top layer 12 mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix : 2 graded stone aggregate 6mm nominal size) by volume, hardening compound mixed @ 2 litre per 50 kg of cement or as per manufacturer's specifications. This includes cost of cement slurry, but excluding the cost of nosing of steps etc. complete			
	Net Total	75.600sqm	@926.95/sqm	70077.42
5.019	17.3.1			
	Providing and fixing white vitreous china pedestal type water closet (European type) with seat and lid, 10 litre low level white vitreous china flushing cistern & C.P. flush bend with fittings & C.I. brackets, 40 mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved municipal design complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required :W.C. pan with ISI marked white			

Sl No	Specification	Quantity	Rate	Amount
	solid plastic seat and lid			
	Net Total	4.000each	@7868.88/each	31475.52
5.020	20.2.1			
	Boring, providing and installing bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring, with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. all complete, including removal of excavated earth with all lifts and leads (Length of pile for payment shall be measured upto bottom of pile cap).300 mm dia piles			
	Net Total	608.000metre	@2126.00/metre	1292608.00
5.021	20.6.1.1			
	Vertical load testing of piles in accordance with IS 2911(Part IV) including installation of loading platform and preparation of pile head or construction of test cap and dismantling of test cap after test etc. complete as per specification & the direction of engineer -in-Charge. Single pile upto 50 tonne capacityInitial test			
	Net Total	2.000per test	@62995.11/per test	125990.22
5.022	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	3.680cum	@2983.62/cum	10979.72
5.023	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	144.000cum	@7204.75/cum	1037484.00
5.024	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	1200.000cum	@525.83/cum	630996.00
			Heading Total(Rs)	14955646.61
6	**Materials and unforeseen-2 nos**			
6.001	OD45248/2022-2023			
	Supplying 500mm dia clear open sluice gate with mechanical drive of shaft length 4m, necessary arrangements to fix on wall inside the gate chamber			
	Net Total	8.000no	@100040.00/no	800320.00

Sl No	Specification	Quantity	Rate	Amount
6.002	100.98.123			
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 500mm Dia.			
	Net Total	60.000metre	@9874.49/metre	592469.40
6.003	100.98.436			
	Supply of CI Air Valve, Conforming to IS 14848 - 2000, Kinetic Air Valve Type DK, Size 80mm.			
	Net Total	2.000no	@11748.57/no	23497.14
6.004	100.98.467			
	Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 500mm.			
	Net Total	6.000no	@230538.00/no	1383228.00
6.005	100.98.487			
	Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 300mm.			
	Net Total	2.000no	@44042.92/no	88085.84
6.006	OD45252/2022-2023			
	Supplying and fixing 560mm dia CI MH Cover with frame(Heavy duty -HD 20)			
	Net Total	10.000no	@14173.90/no	141739.00
			Heading Total(Rs)	3029339.38
7	**Compound Wall and Gate-2 nos**			
7.001	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	90.000cum	@214.03/cum	19262.70
7.002	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	14.400cum	@6814.88/cum	98134.27
7.003	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	144.000cum	@7204.75/cum	1037484.00
7.004	5.1.3			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up			

Sl No	Specification	Quantity	Rate	Amount
	to plinth level:1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)			
	Net Total	50.000cum	@8588.50/cum	429425.00
7.005	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	480.000sqm	@717.20/sqm	344256.00
7.006	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	10000.000kilogram	@98.30/kilogram	983000.00
7.007	50.6.5.2			
	Hollow block masonry using pre cast blocks (Factory made) of size 40x20x15cm or nearest available size confirming to IS 2185 part 1 of 1979 for super structure up to floor two level with thickness 15cm in: CM 1:6 (1 cement : 6 coarse sand) etc complete			
	Net Total	54.000cum	@6005.43/cum	324293.22
7.008	13.1.1			
	12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)			
	Net Total	774.000sqm	@314.11/sqm	243121.14
7.009	13.83.2			
	Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile including applying additional coats wherever required to achieve even shade and colour.Two coats			
	Net Total	774.000sqm	@134.10/sqm	103793.40
7.010	10.25.2			
	Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works			
	Net Total	500.000kg	@154.18/kg	77090.00
			Heading Total(Rs)	3659859.73
			Total Estimation PAC	41139623.79
9	**Extra Charges**			
8.001	Provision for GST			
		41139623.79	0.00%	0.00

Sl No	Specification	Quantity	Rate	Amount
			Grand Total	0.00
			Round off	0.00
			Rounded Total(Rs)	41139623.79
	Rupees Four Crore Eleven Lakh Thirty Nine Thousand Six Hundred and Twenty Three			

DRAFT
e-PLATFORM FOR THE MANAGEMENT OF PUBLIC WORKS

GENERAL ABSTRACT

Others-Swatch Bharath Mission-Urban 2.0 :-Construction of Lift Manhole in Zone-I of Neyyattinkara Municipality-Construction of Lift Manhole in Zone-I of Neyyattinkara Municipality-Sewerage Work

Sl No	Head Description		Amount
1	Construction of Lift Manholes-23 nos -Working Charges		16655995.35
2	Road Restoration Charges		805317.60
	Total Estimation PAC		17461312.95
C	**Extra Charges**		
C.001	Provision for GST		
	17461312.95	0.00%	0.00
	Grand Total		0.00
	Round off		0.00
	Rounded Total(Rs)		17461312.95
	Rupees One Crore Seventy Four Lakh Sixty One Thousand Three Hundred and Twelve		

e-PLATFORM FOR THE MANAGEMENT OF PUBLIC WORKS

ABSTRACT ESTIMATE

Others-Swatch Bharath Mission-Urban 2.0 :-Construction of Lift Manhole in Zone-I of Neyyattinkara Municipality-Construction of Lift Manhole in Zone-I of Neyyattinkara Municipality-Sewerage Work

Sl No	Specification	Quantity	Rate	Amount
1	**Construction of Lift Manholes-23 nos -Working Charges**			
1.001	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	433.320cum	@214.03/cum	92743.48
1.002	OD35855/2022-2023			
	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 getting out and disposal of excavated earth lead upto 50 m and lift 1.5 m to 3.00m as directed by Engineer-in-charge.			
	Net Total	433.320cum	@320.40/cum	138835.73
1.003	OD35856/2022-2023			
	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 getting out and disposal of excavated earth lead upto 50 m and lift 3.0 m to 4.50 m as directed by Engineer-in-charge.			
	Net Total	433.320cum	@426.80/cum	184940.98
1.004	OD35857/2022-2023			
	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 getting out and disposal of excavated earth lead upto 50 m and lift 4.5 m to 6.00 m as directed by Engineer-in-charge.			
	Net Total	433.320cum	@533.18/cum	231037.56
1.005	100.2.9			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m but not exceeding 4.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Medium Rock where Blasting is Prohibited.			
	Net Total	433.320cum	@1723.15/cum	746675.36

Sl No	Specification	Quantity	Rate	Amount
1.006	100.4.1			
	Excavating in hard rock for trenches by blasting for laying pipes and stacking useful materials for measurements and disposing unserviceable materials within the initial lead of 50m and lift up to 1.50m (depth from 0.0m to 1.50m) and providing protection by earth filled cement bags during blasting to avoid damages to nearby structures (200 Nos. of earth filled cement bags for 10m3 of blasting)			
	Net Total	433.320cum	@3922.87/cum	1699858.03
1.007	100.4.8			
	Granite rock blasting in wells, measured in solids, including collecting and stacking spoil for measurement within the initial lead of 50m and lift up to 4.5m (3.0m to4.5m) but excluding bailing out water and including providing protection by earth filled cement bags (300 Nos. of earth filled cement bags / 10 m3 blasting) to avoid damages to the nearby structures)			
	Net Total	23.000cum	@6033.52/cum	138770.96
1.008	100.4.9			
	Granite rock blasting in wells, measured in solids, including collecting and stacking spoil for measurement within the initial lead of 50m and lift up to 6.0m (4.5m to 6.0m) but excluding bailing out water and including providing protection by earth filled cement bags (300 Nos. of earth filled cement bags / 10 m3 blasting) to avoid damages to the nearby structures)			
	Net Total	433.320cum	@6270.99/cum	2717345.39
1.009	100.4.S.1			
	Providing earth filled cement bags for protection during blasting in well in wet condition.			
	Net Total	1150.000no	@31.97/no	36765.50
1.010	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	3450.000Kwh	@36.93/Kwh	127408.50
1.011	100.98.1008			
	Engaging Coolie.			
	Net Total	115.000no	@878.79/no	101060.85
1.012	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.			
	Net Total	299.000metre	@96.32/metre	28799.68
1.013	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	43.700cum	@6814.88/cum	297810.26

Sl No	Specification	Quantity	Rate	Amount
1.014	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	225.000cum	@9085.13/cum	2044154.25
1.015	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	25309.200kilogram	@98.30/kilogram	2487894.36
1.016	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	2037.570sqm	@717.20/sqm	1461345.20
1.017	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	87.400sqm	@815.75/sqm	71296.55
1.018	13.8.1			
	15 mm cement plaster on rough side of single or half brick wall finished with a floating coat of neat cement of mix:1:3 (1 Cement : 3 fine sand)			
	Net Total	1040.980sqm	@452.40/sqm	470939.35
1.019	OD35861/2022-2023			
	Providing and fixing in position pre-cast R.C.C. manhole cover and frame of required shape and approved quality :Circular shape 560 mm internal diameter			
	Net Total	23.000no	@14330.13/no	329592.99
1.020	OD35860/2022-2023			
	Conveying heavy duty CI MH cover 560x560 mm with frame and fixing to line and levels including all necessary chipping and masonry work etc complete			
	Net Total	23.000no	@577.59/no	13284.57
1.021	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	1056.850cum	@258.56/cum	273259.14
1.022	100.6.1			
	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			

Sl No	Specification	Quantity	Rate	Amount
	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.			
	Net Total	1734.200sqm	@749.09/sqm	1299071.88
1.023	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	690.000each	@545.03/each	376070.70
1.024	OD35859/2022-2023			
	Carriage of Material(excavated earth) By Mechanical Transport including loading,unloading and stacking up tp 5 KM			
	Net Total	677.350cum	@201.63/cum	136574.08
1.025	OD35858/2022-2023			
	Miscellaneous works for necessary situation			
	Net Total	23.000L.S	@50020.00/L.S	1150460.00
	Heading Total(Rs)			16655995.35
2	**Road Restoration Charges**			
2.001	OD36067/2022-2023			
	Road Restoration charges-Concrete Road- 5473.44/m2			
	Net Total	40.000sqm	@5475.18/sqm	219007.20
2.002	OD36071/2022-2023			
	Road Restoration charges-Bituminous Road- 4069.51/m2			
	Net Total	144.000sqm	@4071.60/sqm	586310.40
	Heading Total(Rs)			805317.60
	Total Estimation PAC			17461312.95
4	**Extra Charges**			

Sl No	Specification	Quantity	Rate	Amount
3.001	Provision for GST			
		17461312.95	0.00%	0.00
			Grand Total	0.00
			Round off	0.00
			Rounded Total(Rs)	17461312.95
	Rupees One Crore Seventy Four Lakh Sixty One Thousand Three Hundred and Twelve			

DRAFT
e-PLATFORM FOR THE MANAGEMENT OF PUBLIC WORKS

GENERAL ABSTRACT

Others-Swatch Bharath Mission-Urban 2.0:-Supplying,Laying, Jointing, Testing and Commissioning of HDPE PE-100/PN-8 pipe for Sewer Network in Zone-I of Neyyattinkara Municipality and Construction of Manhole Chamber-Supplying,Laying, Jointing, Testing and Commissioning
of HDPE PE-100/PN-8 pipe for Sewer Network in Zone-I of Neyyattinkara Municipality and Construction of Manhole Chamber-Sewerage Work

Sl No	Head Description		Amount
1	Working Charges		107275800.01
2	Construction of Sewer Manholes- 585 nos and Miscellanious works		53927743.45
3	Road Restoration Charges		35040861.50
	Total Estimation PAC		196244404.96
C	**Extra Charges**		
C.001	Provision for GST		
	196244404.96	0.00%	0.00
	Grand Total		0.00
	Round off		0.00
	Rounded Total(Rs)		196244404.96
	Rupees Nineteen Crore Sixty Two Lakh Forty Four Thousand Four Hundred and Four		

DRAFT
e-PLATFORM FOR THE MANAGEMENT OF PUBLIC WORKS

ABSTRACT ESTIMATE

Others-Swatch Bharath Mission-Urban 2.0:-Supplying,Laying, Jointing, Testing and Commissioning of HDPE PE-100/PN-8 pipe for Sewer Network in Zone-I of Neyyattinkara Municipality and Construction of Manhole Chamber-Supplying,Laying, Jointing, Testing and Commissioning
of HDPE PE-100/PN-8 pipe for Sewer Network in Zone-I of Neyyattinkara Municipality and Construction of Manhole Chamber-Sewerage Work

Sl No	Specification	Quantity	Rate	Amount
1	**Working Charges**			
1.001	100.59.1			
	Cutting 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, traffic 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.			
	Net Total	30280.000metre	@30.44/metre	921723.20
1.002	15.59			
	Dismantling of flexible pavement (bituminous courses) by mechanical means and disposal of dismantled material up to a lead of 1 kilo metre, as per direction of Engineer-in-charge.			
	Net Total	2271.000cum	@378.13/cum	858733.23
1.003	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 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	24512.550cum	@555.54/cum	13617702.03
1.004	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 3m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	11276.370cum	@661.92/cum	7464054.83

Sl No	Specification	Quantity	Rate	Amount
1.005	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 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 50m, in all kinds of soil.			
	Net Total	4560.750cum	@768.31/cum	3504069.83
1.006	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 but not exceeding 6m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	3268.340cum	@874.68/cum	2858751.63
1.007	100.1.5			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm 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, in Ordinary Rock.			
	Net Total	2299.230cum	@806.73/cum	1854857.82
1.008	100.1.6			
	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 3m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Ordinary Rock.			
	Net Total	2186.910cum	@997.52/cum	2181486.46
1.009	100.1.7			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m but not exceeding 4.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Ordinary Rock.			
	Net Total	304.050cum	@1188.34/cum	361314.78
1.010	100.1.8			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m but not exceeding 6.0m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each			

Sl No	Specification	Quantity	Rate	Amount
	deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50, in Ordinary Rock.			
	Net Total	304.050cum	@1379.13/cum	419324.48
1.011	100.1.13			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Hard Rock where Blasting is Prohibited.			
	Net Total	817.085cum	@1556.29/cum	1271621.21
1.012	100.1.14			
	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 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Hard Rock where Blasting is Prohibited.			
	Net Total	817.085cum	@1747.09/cum	1427521.03
1.013	100.1.15			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m but not exceeding 4.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Hard Rock where Blasting is Prohibited.			
	Net Total	304.050cum	@1937.89/cum	589215.45
1.014	100.1.16			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m but not exceeding 6.0m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Hard Rock where Blasting is Prohibited.			
	Net Total	304.050cum	@2128.70/cum	647231.24
1.015	100.10.8			
	Laying HDPE pipes (IS : 4984) on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi-automatic electrofusion machines, testing the pipeline thus fabricated to suit the hydraulic 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 levelling the trenches including all labour charge, hire for appliances etc., complete but excluding cost of pipe and fittings: 225mm Nominal Outside Diameter Pipes.			
	Net Total	12178.000met	@377.32/metre	4595002.96

Sl No	Specification	Quantity	Rate	Amount
		re		
1.016	100.10.10			
	Laying HDPE pipes (IS : 4984) on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi-automatic electrofusion machines, testing the pipeline thus fabricated to suit the hydraulic 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 levelling the trenches including all labour charge, hire for appliances etc., complete but excluding cost of pipe and fittings: 280mm Nominal Outside Diameter Pipes.			
	Net Total	936.000metre	@519.76/metre	486495.36
1.017	100.10.12			
	Laying HDPE pipes (IS : 4984) on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi-automatic electrofusion machines, testing the pipeline thus fabricated to suit the hydraulic 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 levelling the trenches including all labour charge, hire for appliances etc., complete but excluding cost of pipe and fittings: 355mm Nominal Outside Diameter Pipes.			
	Net Total	2027.000metre	@655.56/metre	1328820.12
1.018	2.20.1			
	Open timbering in trenches including strutting and shoring complete (measurements to be taken of the face area timbered):Depth not exceeding 1.5 m			
	Net Total	2850.000sqm	@78.83/sqm	224665.50
1.019	2.20.2			
	Open timbering in trenches including strutting and shoring complete (measurements to be taken of the face area timbered):Depth exceeding 1.5 m but not exceeding 3 m			
	Net Total	7800.000sqm	@87.17/sqm	679926.00
1.020	2.20.3			
	Open timbering in trenches including strutting and shoring complete (measurements to be taken of the face area timbered):Depth exceeding 3 m but not exceeding 4.5 m			
	Net Total	8100.000sqm	@100.91/sqm	817371.00
1.021	100.6.1			
	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.			

Sl No	Specification	Quantity	Rate	Amount
	complete.			
	Net Total	6000.000sqm	@749.09/sqm	4494540.00
1.022	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.			
	Net Total	10000.000metre	@96.32/metre	963200.00
1.023	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	5968.000Kwh	@36.93/Kwh	220398.24
1.024	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	10.000cum	@2064.94/cum	20649.40
1.025	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	7.500cum	@2983.62/cum	22377.15
1.026	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	10.000cum	@9085.13/cum	90851.30
1.027	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	750.000kilogram	@98.30/kilogram	73725.00
1.028	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	10.000cum	@7204.75/cum	72047.50
1.029	100.41.39			
	Supply, stacking, spreading and consolidating of Quarry Muck in the trench of pipe			

Sl No	Specification	Quantity	Rate	Amount
	line, including carriage, loading, unloading & stacking up to any lead.			
	Net Total	1500.000cum	@547.87/cum	821805.00
1.030	4.1.5			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)			
	Net Total	168.750cum	@7367.55/cum	1243274.06
1.031	OD37413/2022-2023			
	Supply of PE Pipe, PE100, PN8, 355mm dia, conforming to IS 4984/2016			
	Net Total	2068.000metre	@4079.61/metre	8436633.48
1.032	OD37251/2022-2023			
	Supply of PE Pipe, PE100, PN8, 280mm dia, conforming to IS 4984/2016			
	Net Total	955.000metre	@2539.00/metre	2424745.00
1.033	OD37283/2022-2023			
	Supply of PE Pipe, PE100, PN8, 225mm dia, conforming to IS 4984/2016			
	Net Total	12422.000metre	@1644.51/metre	20428103.22
1.034	OD215705/2022-2023			
	Road Restoration charges-Concrete Road- 5473.44/m2			
	Net Total	3437.500sqm	@6357.40/sqm	21853562.50
	Heading Total(Rs)			107275800.01
2	**Construction of Sewer Manholes- 585 nos and Miscellanious works**			
2.001	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	2513.620cum	@214.03/cum	537990.09
2.002	OD37476/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 1.50m but not exceeding 3.00m			
	Net Total	1259.370cum	@403.35/cum	507966.89
2.003	OD37480/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means			

Sl No	Specification	Quantity	Rate	Amount
	in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 3.00m but not exceeding 4.50m			
	Net Total	516.800cum	@509.75/cum	263438.80
2.004	OD37484/2022-2023			
	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches of manholes or drains (exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottom,including getting out the excavated soil and disposal of surplus excavated soil as directed, with in a lead of 50 m for depth exceeding 4.50m but not exceeding 6.00m			
	Net Total	345.800cum	@616.12/cum	213054.30
2.005	100.2.9			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m but not exceeding 4.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Medium Rock where Blasting is Prohibited.			
	Net Total	251.362cum	@1723.15/cum	433134.43
2.006	100.4.1			
	Excavating in hard rock for trenches by blasting for laying pipes and stacking useful materials for measurements and disposing unserviceable materials within the initial lead of 50m and lift up to 1.50m (depth from 0.0m to 1.50m) and providing protection by earth filled cement bags during blasting to avoid damages to nearby structures (200 Nos. of earth filled cement bags for 10m3 of blasting)			
	Net Total	251.362cum	@3922.87/cum	986060.45
2.007	100.4.8			
	Granite rock blasting in wells, measured in solids, including collecting and stacking spoil for measurement within the initial lead of 50m and lift up to 4.5m (3.0m to4.5m) but excluding bailing out water and including providing protection by earth filled cement bags (300 Nos. of earth filled cement bags / 10 m3 blasting) to avoid damages to the nearby structures)			
	Net Total	34.580cum	@6033.52/cum	208639.12
2.008	100.4.9			
	Granite rock blasting in wells, measured in solids, including collecting and stacking spoil for measurement within the initial lead of 50m and lift up to 6.0m (4.5m to 6.0m) but excluding bailing out water and including providing protection by earth filled cement bags (300 Nos. of earth filled cement bags / 10 m3 blasting) to avoid damages to the nearby structures)			
	Net Total	34.580cum	@6270.99/cum	216850.83
2.009	100.4.S.1			
	Providing earth filled cement bags for protection during blasting in well in wet			

Sl No	Specification	Quantity	Rate	Amount
	condition.			
	Net Total	3000.000no	@31.97/no	95910.00
2.010	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	9998.650sqm	@717.20/sqm	7171031.78
2.011	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	807.650sqm	@815.75/sqm	658840.49
2.012	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	5222.000Kwh	@36.93/Kwh	192848.46
2.013	100.98.1008			
	Engaging Coolie.			
	Net Total	1170.000no	@878.79/no	1028184.30
2.014	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.			
	Net Total	2925.000metre	@96.32/metre	281736.00
2.015	13.8.1			
	15 mm cement plaster on rough side of single or half brick wall finished with a floating coat of neat cement of mix:1:3 (1 Cement : 3 fine sand)			
	Net Total	4425.300sqm	@452.40/sqm	2002005.72
2.016	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	1000.000cum	@258.56/cum	258560.00
2.017	100.6.1			
	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,			

Sl No	Specification	Quantity	Rate	Amount
	hire charges and conveyance for equipments, tools and plants and sundries etc. complete.			
	Net Total	5573.350sqm	@749.09/sqm	4174940.75
2.018	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	5500.000each	@545.03/each	2997665.00
2.019	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	200.130cum	@6814.88/cum	1363861.93
2.020	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	1125.770cum	@9085.13/cum	10227766.80
2.021	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	112577.000kilogram	@98.30/kilogram	11066319.10
2.022	OD37360/2022-2023			
	Conveying heavy duty CI MH cover 560x560 mm with frame and fixing to line and levels including all necessary chipping and masonry work etc complete			
	Net Total	585.000no	@577.59/no	337890.15
2.023	OD37520/2022-2023			
	Supplying and fixing 560mm dia CI MH Cover with frame(Heavy duty -HD 20)			
	Net Total	585.000no	@14173.90/no	8291731.50
2.024	OD37455/2022-2023			
	Carriage of Material(excavated earth) By Mechanical Transport including			

Sl No	Specification	Quantity	Rate	Amount
	loading,unloading and stacking up tp 5 KM			
	Net Total	2016.060cum	@204.02/cum	411316.56
			Heading Total(Rs)	53927743.45
3	**Road Restoration Charges**			
3.001	3.6			
	Excavation for roadwork in soil with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead upto 1000m			
	Net Total	4125.000cum	@48.56/cum	200310.00
3.002	4.1.B.2			
	Construction of granular sub-base by providing graded material, spreading in uniform layers with a motor grader on a prepared surface, mixing by mix in-place method with rotavator at OMC, and compacting with a vibratory roller to achieve the desired density, complete as per clause 401. Grading-VI - For sub-base cum drainage layer - Mix in Place Method			
	Net Total	2062.500cum	@3220.77/cum	6642838.13
3.003	4.12			
	Providing, laying, spreading and compacting graded stone aggregate to Wet Mix Macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.			
	Net Total	2062.500cum	@3241.37/cum	6685325.63
3.004	5.3.2.a			
	Providing and laying bituminous macadam with 80-100 TPH hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading premixed with a bituminous binder (VG 30), transported to the site, laid over a previously prepared surface with paver finisher to the required grade, level, and alignment and rolled as per clauses 501.6 and 501.7 to achieve the desired compaction For Grading II - (19 mm nominal size)			
	Net Total	1031.250cum	@8609.19/cum	8878227.19
3.005	5.6.2.a			
	Providing and laying bituminous concrete with 80-100 TPH hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with a bituminous binder(NRMB) @ 5.4 percent of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level, and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 507 complete in all respects For Grading - II (13.2 mm Nominal Size)			
	Net Total	495.000cum	@13225.89/cum	6546815.55

Sl No	Specification	Quantity	Rate	Amount
3.006	OD215682/2022-2023			
	Close Graded Premix Surfacing/Mixed seal surfacing: - case I, Type-A -By Manual means Providing , laying and rolling of close graded premix surfacing material of 20 mm thickness composed of 11.2 mm to 0.09mm (Type a) aggregates using penetration grade bitumen using VG-30 to the required line , grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant , laying and rolling with a smooth wheeled roller 8-10 tonne capacity and finishing to required level and grade			
	Net Total	16500.000per sqm	@283.55/per sqm	4678575.00
3.007	5.2.a			
	Providing and applying tack coat with bitumen emulsion(RS) using emulsion pressure distributor at the rate of 0.20 - 0.30 kg per sqm on the prepared bituminous surface cleaned with mechanical broom.			
	Net Total	16500.000sqm	@11.92/sqm	196680.00
3.008	5.1.a			
	Providing and applying primer coat with bitumen emulsion (SS) on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.70 - 1.0 kg/sqm using mechanical means.			
	Net Total	16500.000sqm	@73.46/sqm	1212090.00
	Heading Total(Rs)			35040861.50
	Total Estimation PAC			196244404.96
5	**Extra Charges**			
4.001	Provision for GST			
		196244404.96	0.00%	0.00
	Grand Total			0.00
	Round off			0.00
	Rounded Total(Rs)			196244404.96
	Rupees Nineteen Crore Sixty Two Lakh Forty Four Thousand Four Hundred and Four			

GENERAL ABSTRACT

Others-Swatch Bharath Mission-Urban 2.0:- Supplying,Laying,Testing and Commissioning of 250mm & 200mm DI K9 Sewer

Pumping main from MPS to STP & 150mm DI K9 from IPS to MPS in Zone-I of Neyyattinkara Municipality-Supplying,Laying,Testing and Commissioning of 250mm & 200mm DI K9 Sewer

Pumping main from MPS to STP & 150mm DI K9 from IPS to MPS in Zone-I of Neyyattinkara Municipality-Sewerage Work

Sl No	Head Description		Amount
1	Part A -Working Charges		1826447.50
2	Construction of Valve Chamber,Anchor Blocks, Culvert Crossing and Miscellanious Works		696487.10
3	Cost of Pipes & Specials		4591698.12
4	Part B - Supplying,Laying,Testing and Commissioning of 100mm DI K9 Sewer Pumping main from LMH to MH - 1. Working Charges		5834332.65
5	Construction of Valve Chamber,Anchor Blocks, Culvert Crossing and Miscellanious Works		777842.95
6	Cost of Pipes & Specials		10392226.01
7	Part C : 1. Construction of Transformer Room at MPS site		1573290.88
8	Part D : Construction of Transformer Room at STP site		2582484.41
9	Road Restoration Charges of Part A		9833292.00
10	Road Restoration Charges of Part B		43457522.50
	Total Estimation PAC		81565624.12
C	**Extra Charges**		
C.001	Provision for GST		
	81565624.12	0.00%	0.00
	Grand Total		0.00
	Round off		0.00
	Rounded Total(Rs)		81565624.12
	Rupees Eight Crore Fifteen Lakh Sixty Five Thousand Six Hundred and Twenty Four		

ABSTRACT ESTIMATE

Others-Swatch Bharath Mission-Urban 2.0:- Supplying,Laying,Testing and Commissioning of 250mm & 200mm DI K9 Sewer

Pumping main from MPS to STP & 150mm DI K9 from IPS to MPS in Zone-I of Neyyattinkara Municipality-Supplying,Laying,Testing and Commissioning of 250mm & 200mm DI K9 Sewer

Pumping main from MPS to STP & 150mm DI K9 from IPS to MPS in Zone-I of Neyyattinkara Municipality-Sewerage Work

Sl No	Specification	Quantity	Rate	Amount
1	**Part A -Working Charges**			
1.001	100.59.1			
	Cutting 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, traffic 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.			
	Net Total	4200.000metre	@30.44/metre	127848.00
1.002	15.59			
	Dismantling of flexible pavement (bituminous courses) by mechanical means and disposal of dismantled material up to a lead of 1 kilo metre, as per direction of Engineer-in-charge.			
	Net Total	252.000cum	@378.13/cum	95288.76
1.003	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 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	1682.700cum	@555.54/cum	934807.16
1.004	100.1.5			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm 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, in Ordinary Rock.			
	Net Total	40.000cum	@806.73/cum	32269.20

Sl No	Specification	Quantity	Rate	Amount
1.005	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.			
	Net Total	2100.000metre	@96.32/metre	202272.00
1.006	2.20.2			
	Open timbering in trenches including strutting and shoring complete (measurements to be taken of the face area timbered):Depth exceeding 1.5 m but not exceeding 3 m			
	Net Total	450.000sqm	@87.17/sqm	39226.50
1.007	100.14.4			
	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials: 250mm diameter Ductile Iron Class K-9 Pipes.			
	Net Total	30.000metre	@163.09/metre	4892.70
1.008	100.14.3			
	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials: 200mm diameter Ductile Iron Class K-9 Pipes.			
	Net Total	170.000metre	@122.14/metre	20763.80
1.009	100.14.2			
	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials: 150mm diameter Ductile Iron Class K-9 Pipes.			
	Net Total	1900.000metre	@87.67/metre	166573.00
1.010	18.83.6			
	Labour for cutting C.I. pipe with steel saw.250 mm diameter C.I. pipe			
	Net Total	5.000Each Cut	@535.65/Each Cut	2678.25
1.011	18.83.5			
	Labour for cutting C.I. pipe with steel saw.200 mm diameter C.I. pipe			
	Net Total	10.000Each Cut	@430.74/Each Cut	4307.40
1.012	18.83.4			
	Labour for cutting C.I. pipe with steel saw.150 mm diameter C.I. pipe			
	Net Total	75.000Each Cut	@322.95/Each Cut	24221.25
1.013	18.70.4			
	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:250 mm dia pipes			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	10.000joint	@316.01/joint	3160.10
1.014	18.70.3			
	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:200 mm dia pipes			
	Net Total	40.000joint	@258.77/joint	10350.80
1.015	18.70.2			
	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:150 mm dia pipes			
	Net Total	400.000joint	@176.38/joint	70552.00
1.016	100.35.4			
	Testing 250mm DI/CI pipeline with potable water to the required test pressure . 250 mm dia Observed Data derived from item no.1022 of PHED DATA			
	Net Total	30.000metre	@50.92/metre	1527.60
1.017	100.35.3			
	Testing 200mm DI/CI pipeline with potable water to the required test pressure 200 mm dia Observed Data derived from item no.1020 of PHED DATA			
	Net Total	170.000metre	@40.01/metre	6801.70
1.018	100.35.2			
	Testing 150mm DI/CI pipeline with potable water to the required test pressure 150 mm dia Observed Data derived from item no.1018 of PHED DATA			
	Net Total	1900.000metre	@31.53/metre	59907.00
1.019	18.24			
	Laying in position S & S or flanged C.I. special such as tees, bends, collars, tapers and caps etc. (excluding cost of specials).			
	Net Total	7.900quintal	@578.54/quintal	4570.47
1.020	OD47503/2022-2023			
	Conveying and fixing C I Sluice Valve of approved quality with bolts,nuts,rubber insertions etc . excluding the cost of air valve(the tail pieces if required will be paid seperately):50 mm SluiceValve Data derived from item no.18.59.1 of DAR			
	Net Total	4.000each	@2146.26/each	8585.04
1.021	100.32.3			
	Conveying and fixing C. I. Double Acting Air Valve of approved quality with bolts, nuts, rubber insertions etc., complete, but excluding the cost of air valve (tail pieces, if required, will be paid separately): 50mm Double Acting Air Valve.			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	4.000no	@219.59/no	878.36
1.022	100.31.1.6			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required, will be paid separately): 250mm diameter, Class I.			
	Net Total	1.000no	@2208.07/no	2208.07
1.023	100.31.1.4			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required, will be paid separately): 150mm diameter, Class I.			
	Net Total	1.000no	@1200.72/no	1200.72
1.024	100.31.1.5			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required, will be paid separately): 200mm diameter, Class I.			
	Net Total	1.000no	@1557.62/no	1557.62
			Heading Total(Rs)	1826447.50
2	**Construction of Valve Chamber,Anchor Blocks, Culvert Crossing and Miscellanious Works**			
2.001	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	45.360cum	@214.03/cum	9708.40
2.002	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	3.474cum	@6814.88/cum	23674.89
2.003	4.1.5			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)			
	Net Total	12.000cum	@7367.55/cum	88410.60
2.004	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	29.938cum	@9085.13/cum	271990.62
2.005	5.9.1			

Sl No	Specification	Quantity	Rate	Amount
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	75.600sqm	@335.31/sqm	25349.44
2.006	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	47.040sqm	@717.20/sqm	33737.09
2.007	5.9.6			
	Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts			
	Net Total	5.320sqm	@863.61/sqm	4594.41
2.008	5.9.5			
	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers			
	Net Total	18.740sqm	@649.80/sqm	12177.25
2.009	5.22A.6			
	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level.Thermo - Mechanically Treated bars of grade Fe-500D or more			
	Net Total	1759.420kg	@98.30/kg	172950.99
2.010	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	2.000cum	@2064.94/cum	4129.88
2.011	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	3.000cum	@7204.75/cum	21614.25
2.012	13.1.1			
	12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)			
	Net Total	40.400sqm	@314.11/sqm	12690.04
2.013	100.41.39			
	Supply, stacking, spreading and consolidating of Quarry Muck in the trench of pipe line, including carriage, loading, unloading & stacking up to any lead.			
	Net Total	24.000cum	@547.87/cum	13148.88
2.014	OD85498/2022-2023			
	Conveying heavy duty CI MH cover 560x560 mm with frame and fixing to line and levels including all			

Sl No	Specification	Quantity	Rate	Amount
	necessary chipping and masonry work etc complete			
	Net Total	4.000no	@577.59/no	2310.36
			Heading Total(Rs)	696487.10
3	**Cost of Pipes & Specials**			
3.001	100.98.118			
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 250mm Dia.			
	Net Total	31.000metre	@3464.73/metre	107406.63
3.002	100.98.117			
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 200mm Dia.			
	Net Total	174.000metre	@2480.43/metre	431594.82
3.003	100.98.116			
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 150mm Dia.			
	Net Total	1938.000metre	@1811.12/metre	3509950.56
3.004	OD47551/2022-2023			
	Brass full way valve with C.I. wheel (screwed end) 50 mm dia			
	Net Total	5.000no	@976.42/no	4882.10
3.005	100.98.446			
	Supply of CI Air Valve, Conforming to IS 14848 - 2000, Double Orifice Type DS2, Size 50mm.			
	Net Total	5.000no	@7946.98/no	39734.90
3.006	100.98.431			
	Supply of CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 150mm.			
	Net Total	2.000no	@12275.89/no	24551.78
3.007	100.98.432			
	Supply of CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 200mm.			
	Net Total	2.000no	@23526.18/no	47052.36
3.008	100.98.433			
	Supply of CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.0, Size 250mm.			
	Net Total	2.000no	@35383.94/no	70767.88
3.009	OD47577/2022-2023			
	560 mm dia cover with frame (Heavy duty)			
	Net Total	4.000each	@14173.90/each	56695.60
3.010	OD47584/2022-2023			
	Ductile Iron specials suitable for mechanical jointing as per I.S.9523 - up to 600 mm			

Sl No	Specification	Quantity	Rate	Amount
	dia			
	Net Total	7.900quintal	@20552.16/quintal	162362.06
3.011	OD47587/2022-2023			
	Ductile Iron K - 12 specials suitable for push on jointing up to 600 mm dia			
	Net Total	7.000quintal	@19528.49/quintal	136699.43
			Heading Total(Rs)	4591698.12
4	**Part B - Supplying,Laying,Testing and Commissioning of 100mm DI K9 Sewer Pumping main from LMH to MH - 1. Working Charges**			
4.001	100.59.1			
	Cutting 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, traffic 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.			
	Net Total	16100.000metre	@30.44/metre	490084.00
4.002	15.59			
	Dismantling of flexible pavement (bituminous courses) by mechanical means and disposal of dismantled material up to a lead of 1 kilo metre, as per direction of Engineer-in-charge.			
	Net Total	724.500cum	@378.13/cum	273955.19
4.003	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 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	5449.500cum	@555.54/cum	3027415.23
4.004	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 3m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	60.000cum	@661.92/cum	39715.20
4.005	2.20.2			
	Open timbering in trenches including strutting and shoring complete (measurements to be taken of the face area timbered):Depth exceeding 1.5 m but not exceeding 3 m			
	Net Total	200.000sqm	@87.17/sqm	17434.00

Sl No	Specification	Quantity	Rate	Amount
4.006	100.1.5			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm 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, in Ordinary Rock.			
	Net Total	75.000cum	@806.73/cum	60504.75
4.007	100.1.13			
	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in Hard Rock where Blasting is Prohibited.			
	Net Total	30.000cum	@1556.29/cum	46688.70
4.008	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.			
	Net Total	8050.000metre	@96.32/metre	775376.00
4.009	100.14.1			
	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials: 100mm diameter Ductile Iron Class K-9 Pipes.			
	Net Total	8050.000metre	@58.82/metre	473501.00
4.010	18.83.2			
	Labour for cutting C.I. pipe with steel saw.100 mm diameter C.I. pipe			
	Net Total	345.000Each Cut	@171.87/Each Cut	59295.15
4.011	18.70.1			
	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:100 mm dia pipes			
	Net Total	1725.000joint	@107.89/joint	186110.25
4.012	100.35.1			
	Testing 100mm DI/CI pipeline with potable water to the required test pressure 100 mm dia			
	Net Total	8050.000metre	@23.36/metre	188048.00
4.013	100.32.2			

Sl No	Specification	Quantity	Rate	Amount
	Conveying and fixing C. I. Single Acting Air Valve of approved quality with bolts, nuts, rubber insertions etc., complete, but excluding the cost of air valve (tail pieces, if required, will be paid separately): 40mm Single Acting Air Valve.			
	Net Total	6.000no	@176.70/no	1060.20
4.014	OD49554/2022-2023			
	Conveying and fixing GM Valve of approved quality with bolts,nuts,rubber insertions etc . excluding the cost of air valve(the tail pieces if required will be paid seperately): 40 mm GM Valve Observed Data derived from item no.18.59.of DAR			
	Net Total	6.000no	@176.70/no	1060.20
4.015	100.31.1.2			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required, will be paid separately): 100mm diameter, Class I.			
	Net Total	23.000no	@886.53/no	20390.19
4.016	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	1200.000Kwh	@36.93/Kwh	44316.00
4.017	100.37.5.1			
	In situ fabrication of M.S. pipes of size 100mm (I.D.) using 8mm thick M.S. plate including cost and conveyance charges of M.S. plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under-coat of primer etc., complete.			
	Net Total	25.000metre	@4006.82/metre	100170.50
4.018	100.37.5.2			
	Fabricating M.S. flanges of diameter 100mm using 12mm thick M.S. plate including cost and conveyance charges of M.S. plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under-coat of primer etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	8.000no	@1109.23/no	8873.84
4.019	100.37.5.3			
	Cutting 100mm (I.D.) M.S. pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	20.000no	@114.78/no	2295.60
4.020	100.37.5.4			
	Welding 100mm (I.D.) M.S. pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods, all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	35.000no	@433.89/no	15186.15
4.021	100.37.5.5			
	Grinding cut and weld edges of 100mm (I.D.) M.S. pipes during fabrication work including all labour and hire charges of tools etc., complete: For pipes fabricated with 8mm thick M.S. plates.			
	Net Total	35.000no	@81.50/no	2852.50
	Heading Total(Rs)			5834332.65
5	**Construction of Valve Chamber,Anchor Blocks, Culvert Crossing and Miscellanious Works**			
5.001	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	21.528cum	@214.03/cum	4607.64
5.002	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	1.656cum	@6814.88/cum	11285.44
5.003	4.1.5			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)			
	Net Total	27.000cum	@7367.55/cum	198923.85
5.004	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	22.751cum	@9085.13/cum	206695.79
5.005	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	77.640sqm	@335.31/sqm	26033.47
5.006	5.9.6			
	Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts			
	Net Total	24.640sqm	@863.61/sqm	21279.35
5.007	5.9.5			
	Centering and shuttering including strutting, etc. and removal of form for:Lintels,			

Sl No	Specification	Quantity	Rate	Amount
	beams, plinth beams, girders bressumers and cantilevers			
	Net Total	17.000sqm	@649.80/sqm	11046.60
5.008	5.22A.6			
	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level.Thermo - Mechanically Treated bars of grade Fe-500D or more			
	Net Total	2230.000kg	@98.30/kg	219209.00
5.009	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	5.000cum	@2064.94/cum	10324.70
5.010	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	5.000cum	@7204.75/cum	36023.75
5.011	13.1.1			
	12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)			
	Net Total	40.400sqm	@314.11/sqm	12690.04
5.012	100.41.39			
	Supply, stacking, spreading and consolidating of Quarry Muck in the trench of pipe line, including carriage, loading, unloading & stacking up to any lead.			
	Net Total	36.000cum	@547.87/cum	19723.32
			Heading Total(Rs)	777842.95
6	**Cost of Pipes & Specials**			
6.001	100.98.115			
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 100mm Dia.			
	Net Total	8211.000metre	@1204.78/metre	9892448.58
6.002	100.98.445			
	Supply of CI Air Valve, Conforming to IS 14848 - 2000, Double Orifice Type DS2, Size 40mm.			
	Net Total	7.000no	@6950.42/no	48652.94
6.003	OD49569/2022-2023			
	Brass full way valve with C.I. wheel -40 mm dia			
	Net Total	7.000no	@755.94/no	5291.58
6.004	100.98.429			
	Supply of CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.6, Size			

Sl No	Specification	Quantity	Rate	Amount
	100mm.			
	Net Total	27.000no	@8668.27/no	234043.29
6.005	OD49574/2022-2023			
	Ductile Iron K - 12 specials suitable for push on jointing up to 600 mm dia			
	Net Total	5.120quintal	@19528.49/quintal	99985.87
6.006	OD49575/2022-2023			
	Ductile Iron specials suitable for mechanical jointing as per I.S.9523 - up to 600 mm dia			
	Net Total	5.440quintal	@20552.16/quintal	111803.75
	Heading Total(Rs)			10392226.01
7	**Part C : 1. Construction of Transformer Room at MPS site**			
7.001	2.31			
	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared			
	Net Total	150.000sqm	@14.75/sqm	2212.50
7.002	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	83.754cum	@296.98/cum	24873.26
7.003	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	11.781cum	@6814.88/cum	80286.10
7.004	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	14.520sqm	@335.31/sqm	4868.70
7.005	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	16.654cum	@9085.13/cum	151303.76

Sl No	Specification	Quantity	Rate	Amount
7.006	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	13.213cum	@10954.02/cum	144735.47
7.007	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	3330.900kilogram	@98.30/kilogram	327427.47
7.008	5.9.6			
	Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts			
	Net Total	26.400sqm	@863.61/sqm	22799.30
7.009	5.9.5			
	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers			
	Net Total	74.880sqm	@649.80/sqm	48657.02
7.010	5.9.19			
	Centering and shuttering including strutting, etc. and removal of form for:Weather shade, Chajjas, corbels etc., including edges			
	Net Total	24.220sqm	@902.55/sqm	21859.76
7.011	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	52.460sqm	@815.75/sqm	42794.25
7.012	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	68.000sqm	@717.20/sqm	48769.60
7.013	50.6.1.2			
	Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.			
	Net Total	18.220cum	@6602.11/cum	120290.44
7.014	50.6.6.2			
	Hollow block masonry using pre cast solid blocks (factory made) of size 40x20x10cm			

Sl No	Specification	Quantity	Rate	Amount
	or nearest available size confirming to IS 2185 part I of 1979 for Super structure up to floor two level for 10 cm thick wall in: CM 1:6 (1 cement : 6 coarse sand) including cost of scaffolding etc complete			
	Net Total	3.042cum	@6662.37/cum	20266.93
7.015	13.1.1			
	12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)			
	Net Total	609.865sqm	@314.11/sqm	191564.70
7.016	13.44.1			
	Finishing walls with water proofing cement paint of required shade:New work (Two or more coats applied @ 3.84 kg/10 sqm)			
	Net Total	345.885sqm	@107.37/sqm	37137.67
7.017	13.60.1			
	Wall painting with acrylic emulsion paint of approved brand and manufacture to give an even shade:Two or more coats on new work			
	Net Total	345.885sqm	@151.43/sqm	52377.37
7.018	13.50.3			
	Applying priming coat:With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron /steel works			
	Net Total	75.000sqm	@59.67/sqm	4475.25
7.019	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	75.000sqm	@223.36/sqm	16752.00
7.020	10.6.2			
	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.20 mm M.S. laths with 1.20 mm thick top cover			
	Net Total	9.000sqm	@3300.14/sqm	29701.26
7.021	10.25.2			
	Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works			
	Net Total	175.000kg	@154.18/kg	26981.50

Sl No	Specification	Quantity	Rate	Amount
7.022	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	19.800cum	@258.56/cum	5119.49
7.023	20.1.1			
	Providing, driving and installing driven cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of shoe and the length of pile to be embedded in the pile cap etc. all complete. (Length of pile for payment shall be measured from top of shoe to the bottom of pile cap):400 mm dia piles			
	Net Total	33.000metre	@2641.47/metre	87168.51
7.024	OD49704/2022-2023			
	Providing and fixing glazed shutters for doors, windows and clerestory windows using 4 mm thick float glass panes, including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws.			
	Net Total	11.100sqm	@5124.79/sqm	56885.17
7.025	OD49763/2022-2023			
	Supplying and fixing 110mm PVC 6Kg pipe for drain out water from the roof of Transformer room			
	Net Total	12.000metre	@331.95/metre	3983.40
			Heading Total(Rs)	1573290.88
8	**Part D : Construction of Transformer Room at STP site**			
8.001	2.31			
	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared			
	Net Total	150.000sqm	@14.75/sqm	2212.50
8.002	2.8.1			
	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil			
	Net Total	67.320cum	@296.98/cum	19992.69
8.003	2.7.3			
	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.Hard rock (blasting prohibited)			
	Net Total	8.424cum	@1196.19/cum	10076.70

Sl No	Specification	Quantity	Rate	Amount
8.004	100.7.1			
	Bailing out water with 5HP engine and pump set including conveyance to the site, erecting, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc., complete.			
	Net Total	600.000Kwh	@36.93/Kwh	22158.00
8.005	OD49793/2022-2023			
	Boring 30/40mm dia holes of 1.50m deep in rock for anchoring steel bars of columns, using necessary anchors including all hire and labour for jacky- hammer .Anchoring 16mm steel bar in the bore holes already made using cement grout including all hire and labour charges for grouting etc. comlete./Each			
	Net Total	16.000each	@1001.86/each	16029.76
8.006	4.1.8			
	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)			
	Net Total	6.138cum	@6814.88/cum	41829.73
8.007	5.9.1			
	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete			
	Net Total	35.280sqm	@335.31/sqm	11829.74
8.008	5.1.2			
	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size			
	Net Total	28.524cum	@9085.13/cum	259144.25
8.009	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	26.209cum	@10954.02/cum	287093.91
8.010	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	5773.950kilogram	@98.30/kilogram	567579.29
8.011	5.9.6			
	Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	140.032sqm	@863.61/sqm	120933.04
8.012	5.9.5			
	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers			
	Net Total	108.080sqm	@649.80/sqm	70230.38
8.013	5.9.19			
	Centering and shuttering including strutting, etc. and removal of form for:Weather shade, Chajjas, corbels etc., including edges			
	Net Total	21.675sqm	@902.55/sqm	19562.77
8.014	5.9.3			
	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform			
	Net Total	42.960sqm	@815.75/sqm	35044.62
8.015	50.6.1.2			
	Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.			
	Net Total	14.590cum	@6602.11/cum	96324.78
8.016	50.6.6.2			
	Hollow block masonry using pre cast solid blocks (factory made) of size 40x20x10cm or nearest available size confirming to IS 2185 part I of 1979 for Super structure up to floor two level for 10 cm thick wall in: CM 1:6 (1 cement : 6 coarse sand) including cost of scaffolding etc complete			
	Net Total	1.962cum	@6662.37/cum	13071.57
8.017	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	54.000cum	@7204.75/cum	389056.50
8.018	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	300.000cum	@258.56/cum	77568.00
8.019	13.1.1			
	12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)			
	Net Total	501.728sqm	@314.11/sqm	157597.78
8.020	13.44.1			
	Finishing walls with water proofing cement paint of required shade:New work (Two			

Sl No	Specification	Quantity	Rate	Amount
	or more coats applied @ 3.84 kg/10 sqm)			
	Net Total	416.768sqm	@107.37/sqm	44748.38
8.021	13.60.1			
	Wall painting with acrylic emulsion paint of approved brand and manufacture to give an even shade:Two or more coats on new work			
	Net Total	416.768sqm	@151.43/sqm	63111.18
8.022	13.50.3			
	Applying priming coat:With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron /steel works			
	Net Total	38.750sqm	@59.67/sqm	2312.21
8.023	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	42.500sqm	@223.36/sqm	9492.80
8.024	10.6.2			
	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.20 mm M.S. laths with 1.20 mm thick top cover			
	Net Total	7.500sqm	@3300.14/sqm	24751.05
8.025	10.26.3			
	Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approves steel primer.G.I. pipes			
	Net Total	89.280kg	@186.00/kg	16606.08
8.026	10.25.2			
	Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works			
	Net Total	200.000kg	@154.18/kg	30836.00
8.027	20.1.1			
	Providing, driving and installing driven cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of shoe and the length of pile to be embedded in the pile cap etc.			

Sl No	Specification	Quantity	Rate	Amount
	all complete. (Length of pile for payment shall be measured from top of shoe to the bottom of pile cap):400 mm dia piles			
	Net Total	51.000metre	@2641.47/metre	134714.97
8.028	OD49796/2022-2023			
	Providing and fixing glazed shutters for doors, windows and clerestory windows using 4 mm thick float glass panes, including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws.			
	Net Total	6.750sqm	@5124.79/sqm	34592.33
8.029	OD49798/2022-2023			
	Supplying and fixing 110mm PVC 6Kg pipe for drain out water from the roof of Transformer room			
	Net Total	12.000metre	@331.95/metre	3983.40
	Heading Total(Rs)			2582484.41
9	**Road Restoration Charges of Part A**			
9.001	OD49819/2022-2023			
	Road restoration Charges- PWD Road4680.65/m2			
	Net Total	2100.000sqm	@4682.52/sqm	9833292.00
	Heading Total(Rs)			9833292.00
10	**Road Restoration Charges of Part B**			
10.001	OD49856/2022-2023			
	BM&BC Road restoration Charges- PWD Road- 5396.29/m2			
	Net Total	8050.000sqm	@5398.45/sqm	43457522.50
	Heading Total(Rs)			43457522.50
	Total Estimation PAC			81565624.12
12	**Extra Charges**			
11.001	Provision for GST			
	81565624.12		0.00%	0.00
	Grand Total			0.00
	Round off			0.00
	Rounded Total(Rs)			81565624.12
	Rupees Eight Crore Fifteen Lakh Sixty Five Thousand Six Hundred and Twenty Four			

GENERAL ABSTRACT

Others-Swatch Bharath Mission-Urban 2.0:- Construction of House connection Chamber,House service connections,SCADA & Automation,Installation of Pump Sets,Installation of Solar Power Plant,DG sets, etc in Zone-I of Neyyattinkara Municipality-Construction of House connection Chamber,House service connections,SCADA & Automation,Installation of Pump Sets,Installation of Solar Power Plant,DG sets, etc-Sewerage Work

Sl No	Head Description		Amount
1	House Service Connection		12923519.25
2	House Connection Chamber		23597880.45
3	Road Restoration Charges		14916828.13
4	SCADA & Automation		39046429.93
5	Installation of Pump Sets for Lift Manhole,IPS and MPS		15654706.55
6	Solar Power Plant		2627877.59
7	Diesel Generator Set		7958118.08
8	Electrification Work		15923010.93
9	Drop Arrangement		1363601.25
	Total Estimation PAC		134011972.16
C	**Extra Charges**		
C.001	Provision for GST		
	134011972.16	0.00%	0.00
	Grand Total		0.00
	Round off		0.00
	Rounded Total(Rs)		134011972.16
	Rupees Thirteen Crore Forty Lakh Eleven Thousand Nine Hundred and Seventy Two		

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ABSTRACT ESTIMATE

Others-Swatch Bharath Mission-Urban 2.0:- Construction of House connection Chamber,House service connections,SCADA & Automation,Installation of Pump Sets,Installation of Solar Power Plant,DG sets, etc in Zone-I of Neyyattinkara Municipality-Construction of House connection Chamber,House service connections,SCADA & Automation,Installation of Pump Sets,Installation of Solar Power Plant,DG sets, etc-Sewerage Work

Sl No	Specification	Quantity	Rate	Amount
1	**House Service Connection**			
1.001	100.59.1			
	Cutting 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, traffic 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.			
	Net Total	20000.000metre	@30.44/metre	608800.00
1.002	15.59			
	Dismantling of flexible pavement (bituminous courses) by mechanical means and disposal of dismantled material up to a lead of 1 kilo metre, as per direction of Engineer-in-charge.			
	Net Total	375.000cum	@378.13/cum	141798.75
1.003	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 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	4500.000cum	@555.54/cum	2499930.00
1.004	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 3m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating each deposited layer by ramming, watering, etc., and disposing of surplus excavated soil as directed, within a lead of 50m, in all kinds of soil.			
	Net Total	900.000cum	@661.92/cum	595728.00
1.005	100.10.2			

Sl No	Specification	Quantity	Rate	Amount
	Laying HDPE pipes (IS : 4984) on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi-automatic electrofusion machines, testing the pipeline thus fabricated to suit the hydraulic 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 levelling the trenches including all labour charge, hire for appliances etc., complete but excluding cost of pipe and fittings: 110mm Nominal Outer Diameter Pipes.			
	Net Total	12500.000metre	@126.52/metre	1581500.00
1.006	OD43492/2022-2023			
	Supply of PE Pipe, PE100, PN8, 110mm dia, conforming to IS 4984/2016.			
	Net Total	12500.000metre	@392.76/metre	4909500.00
1.007	2.27			
	Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.			
	Net Total	1125.000cum	@2298.90/cum	2586262.50
			Heading Total(Rs)	12923519.25
2	**House Connection Chamber**			
2.001	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	863.809cum	@214.03/cum	184881.04
2.002	19.28.1			
	Constructing brick masonry road gully chamber 45x45x77.5 cm with bricks in cement mortar 1:4 (1 cement:4 coarse sand) with pre -cast R.C.C vertical grating complete as per standard design:With common burnt clay F.P.S (non modular) bricks of class designation 7.5			
	Net Total	1271.000each	@6821.13/each	8669656.23
2.003	19.27.1			
	Constructing brick masonry road gully chamber 50x45x60 cm with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) including 500x450 mm pre- cast R.C.C. horizontal grating with frame complete as per standard design:With common burnt clay F.P.S(non modular) bricks of class designation 7.5			
	Net Total	762.000each	@6131.56/each	4672248.72
2.004	19.29.1			
	Constructing brick masonry road gully chamber 110x50x77.5 cm with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) including 500x450 mm pre-cast R.C.c horizontal grating with frame and vertical grating complete as per standard design:With common burnt clay F.P.S (non modular) bricks of class designation 7.5			
	Net Total	508.000each	@11593.38/each	5889437.04

Sl No	Specification	Quantity	Rate	Amount
2.005	19.4.1.1			
	Providing and fixing square-mouth S.W. gully trap class SP -1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design: 100x100 mm size P typeWith common burnt clay F.P.S. (non modular) bricks of class designation 7.5			
	Net Total	763.000each	@2715.53/each	2071949.39
2.006	19.4.1.2			
	Providing and fixing square-mouth S.W. gully trap class SP -1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design: 100x100 mm size P typeWith Sewer bricks conforming to IS: 4885			
	Net Total	457.000each	@2720.29/each	1243172.53
2.007	19.4.3.2			
	Providing and fixing square-mouth S.W. gully trap class SP -1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design: 180x150 mm size P typeWith sewer bricks conforming to IS: 4885			
	Net Total	305.000each	@2841.10/each	866535.50
			Heading Total(Rs)	23597880.45
3	**Road Restoration Charges**			
3.001	OD41043/2022-2023			
	Road Restoration charges-Concrete Road- 5473.44/m2			
	Net Total	1562.500sqm	@5475.63/sqm	8555671.88
3.002	OD41042/2022-2023			
	Road Restoration charges-Bituminous Road- 4069.51/m2			
	Net Total	1562.500sqm	@4071.14/sqm	6361156.25
			Heading Total(Rs)	14916828.13
4	**SCADA & Automation**			
4.001	OD43546/2022-2023			
	Quad-band GSM/GPRS modem with Ethernet bridge/ router/ serial server (RS232/485) interface.			
	Net Total	23.000no	@117966.20/no	2713222.60
4.002	OD43555/2022-2023			
	SCADA Design, manufacture, supply, installation, testing and commissioning of indoor			

Sl No	Specification	Quantity	Rate	Amount
	type PLC panel of size approx. 1100 mm X 800 mm X 2100mm (LBH) , fabricated out of min. 2 mm thick CRCA sheet complete with Operator Station (PC) including, necessary programming software for PLC & SCADA and comprising of all required accessories not limited to the following: Programmable Logic Controller (PLC) with Dual redundant CPU, Power supply module for IO & Processor rack (Standard DC), Back up Interface/Expansion Module(BCM/BEM), Rack (Backplane) 10 slots for IO and Processor – 1 lot DI - 1184 num DO – 720 num AI –112 num AO – 32 num Ethernet Switch- 6 num MCB 10A DP – 6 num MCB 4A DP – 4 num MCBSP2A – 20 num MCB 1A DP – 30 num 24 VDC Power Supply 10A – 2 num Push Buttons – 100 num Selector Switch – 50 num Control Relays – 550 num Annunciator with 24 Windows NO to NC Type Microprocessor Based, Window Size 75*42mm, 110VAC, with Electronic Hooter – 1 num Control Transformer - 4 num Emergency PB – 4 num Panel Cooling Fan – 4 num Panel Light with Door Switch – 4 num Control Indication Lamp – 50 num Wiring + TB etc – 1 lot Hardware – 1 lot HMI – 6 num Operator Station including, Core i5 processor, 8 GB DDR-3 RAM, 500 GB HDD, DVD RW Drive, RS-			
	Net Total	3.000no	@12111069.11/no	36333207.33
			Heading Total(Rs)	39046429.93
5	**Installation of Pump Sets for Lift Manhole,IPS and MPS**			
5.001	OD43584/2022-2023			
	Providing & installation of Electrical Sludge Pump with complete assembly and suitable control panel including connection cable of 30 Mtrs EPR with H Class Insulation. Tandem TC/TC and TC/TC Mechanical Seals. C.I Channel Impeller.SS Shaft and hardware. 4" Hose/Flange Outlet. 10HP, 3PH, 50HZ, 415V, 1450 Rpm			
	Net Total	92.000HP (Horse power)	@32914.12/HP (Horse power)	3028099.04
5.002	OD43594/2022-2023			
	Providing & installation of Electrical Sludge Pump with complete assembly and suitable control panel including connection cable of 15 Mtrs EPR with H Class Insulation. Tandem TC/TC and TC/TC Mechanical Seals. C.I Channel Impeller.SS Shaft and hardware. 4" Hose/Flange Outlet. 7.5HP, 3PH-50Hz, 415V, 1450 RPM			
	Net Total	172.500HP (Horse power)	@34183.99/HP (Horse power)	5896738.28
5.003	100.31.2.2			
	Conveying and fixing C.I. sluice valves (with cap) by providing bolts, nuts, rubber insertions etc., complete, but excluding the cost of the valve (tail pieces, if required,			

Sl No	Specification	Quantity	Rate	Amount
	will be paid separately): 100mm diameter, Class II.			
	Net Total	23.000no	@957.70/no	22027.10
5.004	100.98.429			
	Supply of CI Non Return Valve, Conforming to IS 5312 Part I - 1984, PN 1.6, Size 100mm.			
	Net Total	23.000no	@8668.27/no	199370.21
5.005	OD43608/2022-2023			
	Providing, Supplying and fixing of D/F DI Pressure Reducing Valve in pipe line including jointing etc. complete as per standard/ technical specification and direction of Engineer-in-Charge. 100 mm Dia			
	Net Total	23.000no	@71887.04/no	1653401.92
5.006	OD43618/2022-2023			
	Providing, erecting & Commissioning of Submersible sewage (Non clog) pumpsets along with DI k-9 discharge piping, valves, fittings, accessories & and associated equipment like, mechanically cleaned bar screens, conveyors, flange mounted gates (upstream & downstream of screens, 2 T EOT crane, pr. gauges, level sensors, full bore electromagnetic flowmeters on common header etc.; complete; of following Ratings			
	Net Total	140.000HP (Horse power)	@25553.00/HP (Horse power)	3577420.00
5.007	OD43621/2022-2023			
	Providing, erecting & Commissioning of Submersible sewage (Non clog) pumpsets along with DI k-9 discharge piping, valves, fittings, accessories & and associated equipment like, mechanically cleaned bar screens, conveyors, flange mounted gates (upstream & downstream of screens, 2 T EOT crane, pr. gauges, level sensors, full bore electromagnetic flowmeters on common header etc.; complete; of following Ratings			
	Net Total	50.000HP (Horse power)	@25553.00/HP (Horse power)	1277650.00
			Heading Total(Rs)	15654706.55
6	**Solar Power Plant**			
6.001	OD43672/2022-2023			
	Supplying, installing, testing and commissioning of 1-100 kWp capacity on grid solar power pack with GI mounting structure and inter connecting wires / cables without battery bank SPV modules and solar power conditioning unit of required capacity complete, with 5 years on site performance warrantee. Specification no. ESD-RTONG			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	1.000Kwh	@943229.02/Kwh	943229.02
6.002	OD43676/2022-2023			
	Supplying, installing, testing and commissioning of 1-100 kWp capacity on grid solar power pack with GI mounting structure and inter connecting wires / cables without battery bank SPV modules and solar power conditioning unit of required capacity complete, with 5 years on site performance warrantee. Specification no. ESD-RTONG			
	Net Total	1.000Kwh	@890827.26/Kwh	890827.26
6.003	OD43682/2022-2023			
	Solar Panels for LMH Supplying, installing, testing and commissioning of 39 kWp off grid solar power pack with GI mounting structure and interconnecting wires / cables along with 24V/12V pure sine wave solar power inverter (THD<5%), 24V/12V charge controller and 24V/12V C-10 rated lead acid battery bank of required capacity and required SPV modules for battery backup of 6 hrs complete, with 5 years on site performance warrantee as per Specification no. ESD-RT-OFG			
	Net Total	23.000no	@34513.97/no	793821.31
			Heading Total(Rs)	2627877.59
7	**Diesel Generator Set**			
7.001	OD43706/2022-2023			
	SITC of DG Set complete with 1500 RPM Diesel Engine of suitable BHP & AC Brush less SPDP Alternator mounted on a common base Frame & coupled through a flexible coupling or close coupled.Alternator shall be self regulated with standard Alternator Protection(Over voltage, over speed & under voltage). Engine shall have residential silencer, up to 10 M exhaust piping , electronic / Mechanical governor, Manual & electric Start, Batteries, Fuel tank (with Stand) & piping, control panel (16 G) with MCCB (4P; 25 KA), Ammeter, Voltmeter, Frequency Meter, Energy Meter & Hour Meter, Engine instruments panel, AVM and with Weatherproof, powder coated Acoustic enclosure for DG set for sound attenuation fabricated from 1.6 mm CRCA sheet steel (structure) with side wall fabricated from 1.6 mm CRCA sheet and filled with foam as per CPCB norms latest amendments & IS 8183 .The doors are fabricated from 1.6 mm CRCA sheet packed with acoustic material, floor of MS chequered plate 5.0 mmthick, All doors/ opening are sealed with neoprene/ EPDN gaskets. The enclosure has built in fuel tank, residential silencer (isolated from main DG chamber) with protection and tripping of DG set against temperature of more than 50 °C. All controls for operation of DG set re from outside the enclosure with DG control panel having microprocessor based genset monitoring nd control system mccb Ammeter, voltmeter, Pf meter, frequency meter, KWH meter, Ind. Lamps etc. mounted inside enclosure, visible and accessible from outside. The enclosure should be suitable for following capacity DG sets and alternator. Noise level is less than 75 db (A) at a distance of 1 Mtrs. duly certified by authorized agency. Complete in all respect of following capacity : (Radiator cooled and turbo charged)			

Sl No	Specification	Quantity	Rate	Amount
	Net Total	1.000no	@917581.72/no	917581.72
7.002	OD43747/2022-2023			
	SITC of DG Set complete with 1500 RPM Diesel Engine of suitable BHP & AC Brush less SPDP Alternator mounted on a common base Frame & coupled through a flexible coupling or close coupled.Alternator shall be self regulated with standard Alternator Protection(Over voltage, over speed & under voltage). Engine shall have residential silencer, up to 10 M exhaust piping , electronic / Mechanical governor, Manual & electric Start, Batteries, Fuel tank (with Stand) & piping, control panel (16 G) with MCCB (4P; 25 KA), Ammeter, Voltmeter, Frequency Meter, Energy Meter & Hour Meter, Engine instruments panel, AVM and with Weatherproof, powder coated Acoustic enclosure for DG set for sound attenuation fabricated from 1.6 mm CRCA sheet steel (structure) with side wall fabricated from 1.6 mm CRCA sheet and filled with foam as per CPCB norms latest amendments & IS 8183 .The doors are fabricated from 1.6 mm CRCA sheet packed with acoustic material, floor of MS chequered plate 5.0 mmthick, All doors/ opening are sealed with neoprene/ EPDN gaskets. The enclosure has built in fuel tank, residential silencer (isolated from main DG chamber) with protection and tripping of DG set against temperature of more than 50 °C. All controls for operation of DG set re from outside the enclosure with DG control panel having microprocessor based genset monitoring nd control system mccb Ammeter, voltmeter, Pf meter, frequency meter, KWH meter, Ind. Lamps etc. mounted inside enclosure, visible and accessible from outside. The enclosure should be suitable for following capacity DG sets and alternator. Noise level is less than 75 db (A) at a distance of 1 Mtrs. duly certified by authorized agency. Complete in all respect of following capacity : (Radiator cooled and turbo charged) 			
	Net Total	1.000no	@1859033.36/no	1859033.36
7.003	OD43997/2022-2023			
	SITC of DG Set complete with 1500 RPM Diesel Engine of suitable BHP & AC Brush less SPDP Alternator mounted on a common base Frame & coupled through a flexible coupling or close coupled.Alternator shall be self regulated with standard Alternator Protection(Over voltage, over speed & under voltage). Engine shall have residential silencer, up to 10 M exhaust piping , electronic / Mechanical governor, Manual & electric Start, Batteries, Fuel tank (with Stand) & piping, control panel (16 G) with MCCB (4P; 25 KA), Ammeter, Voltmeter, Frequency Meter, Energy Meter & Hour Meter, Engine instruments panel, AVM and with Weatherproof, powder coated Acoustic enclosure for DG set for sound attenuation fabricated from 1.6 mm CRCA sheet steel (structure) with side wall fabricated from 1.6 mm CRCA sheet and filled with foam as per CPCB norms latest amendments & IS 8183 .The doors are fabricated from 1.6 mm CRCA sheet packed with acoustic material, floor of MS chequered plate 5.0 mmthick, All doors/ opening are sealed with neoprene/ EPDN gaskets. The enclosure has built in fuel tank, residential silencer (isolated from main DG chamber) with protection and tripping of DG set against temperature of more than 50 °C. All controls for operation of DG set re from outside the enclosure with DG control panel having microprocessor based genset monitoring nd control system mccb Ammeter, voltmeter, Pf meter, frequency meter, KWH meter, Ind. Lamps etc.			

Sl No	Specification	Quantity	Rate	Amount
	mounted inside enclosure, visible and accessible from outside. The enclosure should be suitable for following capacity DG sets and alternator. Noise level is less than 75 db (A) at a distance of 1 Mtrs. duly certified by authorized agency. Complete in all respect of following capacity : (Radiator cooled and turbo charged) 500 KVA at 0.8 pf 415V 50Hz 3-Ø			
	Net Total	1.000no	@4455333.23/no	4455333.23
7.004	OD44000/2022-2023			
	SITC of AUTO MAINS FAILURE (AMF) Panel fabricated from CRCA sheet steel 2mmThick , Powder coated finish , Engine START & STOP commands, control RELAYS, selector switches for Ammeter & Voltmeter, Ammeter & Voltmeter , Control & Power Contactors, Timers, Electronic Hooter ,Visual & Alarm indication for faults, UPS, operator interface panel complete in all respect suitable for following capacity DG sets (PLC Based) 320 to 500 KVA			
	Net Total	1.000no	@300888.63/no	300888.63
7.005	OD44001/2022-2023			
	SITC of AUTO MAINS FAILURE (AMF) Panel fabricated from CRCA sheet steel 2mmThick , Powder coated finish , Engine START & STOP commands, control RELAYS, selector switches for Ammeter & Voltmeter, Ammeter & Voltmeter , Control & Power Contactors, Timers, Electronic Hooter ,Visual & Alarm indication for faults, UPS, operator interface panel complete in all respect suitable for following capacity DG sets (PLC Based) 180 to 250 KVA			
	Net Total	1.000no	@242074.26/no	242074.26
7.006	OD44004/2022-2023			
	SITC of AUTO MAINS FAILURE (AMF) Panel fabricated from CRCA sheet steel 2mmThick , Powder coated finish , Engine START & STOP commands, control RELAYS, selector switches for Ammeter & Voltmeter, Ammeter & Voltmeter , Control & Power Contactors, Timers, Electronic Hooter ,Visual & Alarm indication for faults, UPS, operator interface panel complete in all respect suitable for following capacity DG sets (PLC Based) 80 to 160 KVA			
	Net Total	1.000no	@183206.88/no	183206.88
			Heading Total(Rs)	7958118.08
8	**Electrification Work**			
8.001	OD44007/2022-2023			
	Providing, Designing, Manufacture & Supply for Electrical Sub-station, LT DISTRIBUTION WORK, EARTHING, OUTDOOR/ INDOOR ILLUMINATION WORK and FIRE FIGHTING SYSTEM complete including Testing at Manufacturer's works, Delivery at site, Erection & Installation at site, Testing, Pre-Commissiong Test, Commissioning & Handling over as per SLD after obtaining all statutory approval from all concerned authorities			
	Net Total	3.000no	@2500999.88/no	7502999.64
8.002	OD44009/2022-2023			

Sl No	Specification	Quantity	Rate	Amount
	33KV LINES , FOR SCADA COMPATIBILITY (IPS/MPS/STP)			
	Net Total	3.000km	@1381374.43/km	4144123.29
8.003	OD44016/2022-2023			
	1 11 KV line on 152 X 152 mm,37.1 Kg/Mtr. 13 Mtr. Long H-Beam with Dog conductor average span of 50 mtr DCDS (For Lift Manholes)			
	Net Total	10.000km	@427588.80/km	4275888.00
			Heading Total(Rs)	15923010.93
9	**Drop Arrangement**			
9.001	OD44019/2022-2023			
	Drop Arrangement Providing and fixing PVC-U pipes as per IS 15328 drop connection externally for depth from 0.60 m and upto 1.0 m drop from branch sewer line to main sewer manhole or vise versa including inspection and cleaning eye, PVC-U drop pipe and bend encased around with cement concrete M15 with all form work, cutting holes in walls and making good with brick/ stone masonry work in cement sand mortar 1:4 plastered with cement sand mortar 1:3 with stiff cement mortar 1:1 around PVC-U pipe in masonry wall, making required channels complete as per standard design and specifications and/ or as the directed by the Engineer:			
	Net Total	50.000no	@21871.05/no	1093552.50
9.002	OD44021/2022-2023			
	Providing and fixing PVC-U pipes as per IS 15328 drop connection externally for depth from 0.60 m and upto 1.0 m drop from branch sewer line to main sewer manhole or vise versa including inspection and cleaning eye, PVC-U drop pipe and bend encased around with cement concrete M15 with all form work, cutting holes in walls and making good with brick/ stone masonry work in cement sand mortar 1:4 plastered with cement sand mortar 1:3 with stiff cement mortar 1:1 around PVC-U pipe in masonry wall, making required channels complete as per standard design and specifications and/ or as the directed by the Engineer: Extra for additional drop depth of PVC-U pipes as per IS 15328 drop connection beyond 1.0 m complete as per standard specification and the direction of the Engineer. 200mm dia/250mm dia/315mm dia			
	Net Total	75.000metre	@3600.65/metre	270048.75
			Heading Total(Rs)	1363601.25
			Total Estimation PAC	134011972.16
11	**Extra Charges**			
10.001	Provision for GST			
		134011972.16	0.00%	0.00

Sl No	Specification	Quantity	Rate	Amount
			Grand Total	0.00
			Round off	0.00
			Rounded Total(Rs)	134011972.16
	Rupees Thirteen Crore Forty Lakh Eleven Thousand Nine Hundred and Seventy Two			

DRAFT
e-PLATFORM FOR THE MANAGEMENT OF PUBLIC WORKS

APPENDIX- H:- Annual Operation and Maintenance Cost for 10 Years@ 8% Annual Increase										
Fixed O&M Cost(Excluding Electicity charge)										
SL NO	**Year**	**Manpower at STP**	**Manpower at Pumping Station**	**Chemical**	**DG Set fuel @ STP**	**DG Set fuel @ MPS**	**Sludge Disposal**	**Sewer Network**	**Civil, Mechanical & Electrical**	**Total Fixed Cost**
1	1 st Year	2494112.00	3362069.00	825000.00	1102500.00	40350.00	5426100.00	1411128.00	390000.00	15051259.00
2	2 nd Year	2693641.00	3631035.00	891000.00	1190700.00	43578.00	5860188.00	1524018.00	421200.00	**16255360.00**
3	3 rd Year	2909132.00	3921518.00	962280.00	1285956.00	47064.00	6329003.00	1645939.00	454896.00	**17555789.00**
4	4 th Year	3141863.00	4235239.00	1039262.00	1388832.48	50829.00	6835323.00	1777614.00	491288.00	**18960252.00**
5	5 th Year	3393212.00	4574058.00	1122403.00	1499939.08	54895.00	7382149.00	1919823.00	530591.00	**20477072.00**
6	6 th Year	3664669.00	4939983.00	1212195.00	1619934.20	59287.00	7972721.00	2073409.00	573038.00	**22115238.00**
7	7 th Year	3957843.00	5335182.00	1309171.00	1749528.94	64030.00	8610539.00	2239282.00	618881.00	**23884457.00**
8	8 th Year	4274470.00	5761997.00	1413905.00	1889491.26	69152.00	9299382.00	2418425.00	668391.00	**25795214.00**
9	9 th Year	4616428.00	6222957.00	1527017.00	2040650.56	74684.00	10043333.00	2611899.00	721862.00	**27858831.00**
10	10 th Year	4985742.00	6720794.00	1649178.00	2203902.60	80659.00	10846800.00	2820851.00	779611.00	**30087537.00**
	Total	**36131112.00**	**48704832.00**	**11951411.00**	**15971435.12**	**584528.00**	**78605538.00**	**20442388.00**	**5649758.00**	**218041009.00**
									Total Fixed Cost	**218041009.00**

Expenditure on Staff for Pumping Stations & STP

For Pumping Stations

KWA SOR	Staff	Person/ MPS/IPS	Total MPS/IPS	KWA Rate/day	Salary/ Month	Salary/ Annum
100.98.1032	Pump Opertors	2	2	1220.51	36,615	1757534
100.99.1008	Helper	2	2	878.76	26,363	1265414
KWA(HR)	Sweepers	1	2	471.00	14,130	339120
					Total	**3362069**

For STP

KWA SOR	Staff	Person/ STP	Total STP	KWA Rate/day	Salary/ Month	Salary/ Annum
100.98.1032	Plant Supervisor cum Chemist	1	1	1220.51	36,615	439384
100.98.1009	Mechanic/Fitter	1	1	1162.28	34,868	418421
100.98.1032	Plant Operators	2	1	1220.51	36,615	878767
100.98.1009	Electircian	1	1	1162.28	34,868	418421
KWA(HR)	Unskilled persons (Helpers/gardeners)	1	1	471.00	14,130	169560
KWA(HR)	Sweepers	1	1	471.00	14,130	169560
					Total	
					Grand Total	**2494112.0**

Expenditure for maintanance in Sewer Network

For Sewer Network

DSR/KWA SOR	Staff	Person/ day	Total	KWA Rate/day	Salary/Amount per Month	Salary/Amount per Annum
0129	Sewer Man	1	1	878.76	26,363	316354
100.99.1008	Helper	1	1	878.76	26,363	316354
100.98.1009	Mechanic/Fitter	1	1	1162.28	34,868	418421
MR	Rent for sewer Cleaning machine		1	500.00	15,000	180000
MR	Vehicle Hire Charges		1		15,000	180000
					Total	**1411128.0**

Expenditure on Chemical use in STP

For Chemical

Particular	Unit	Unit Cost (in lacs) pa/MLD*	Flow (in MLD)	Total cost per annum (in Rs.)
Recurring Chemical/ Polymer Costs (Secondary Treatment)	Lacs pa/MLD	0.4	2.50	100000
Recurring Chemical, (Alum, Chlorine, Polymer) Costs, Tertiary Treatment	Lacs pa/MLD	2	2.50	500000
Other Chemical Cost	Lacs pa/MLD	0.9	2.50	225000
			Total	**825000.0**

**Rate has been taken form- Sewage Treatment in Class I Towns: Recommendations and Guidelines by IIT Kanpur*

Residual Disposal Cost for 3.00 MLD STP				
SL No.	**DESCRIPTION**	**QTY** Cum/day	**UNIT RATE Rs./Cum**	**AMOUNT**
1	Dewatered Sludge	50.00	₹ 300.00	₹ 15000.00
	*Qty (m3/day) = Flow (L/D) /1000 * (2% as Solid content)*			
2	Fine Screenings @ 45 Litres/MLD	0.11	₹ 200.00	₹ 22.50
	Qty (m3/day) = Flow (MLD) x 0.045			
3	Grit @ 0.05 - 0.15 Cum/MLD	0.25	₹ 200.00	₹ 50.00
	Qty (m3/day) =Flow (MLD) x 0.1			
	TOTAL (Rs./day)			15072.50
	Say			
	Estimated Cost per month in Rs. (30 days a month)			Rs. 452,175
	Estimated Cost per year in Rs. (for 12 months)			**Rs. 5,426,100**

D.G SET Running cost for MPS			
(a) *Fuel consumption for operation of Diesel Generator Set*			
H.S.D. Oil			
Capacity of D.G. Sets			15 KVA
No. of D.G.sets			1 Nos.
Average consumption			1 Litre/Hour
Average running of D.G.sets			1 Hour
Total H.S.D. required			365 Days x1hr/day
			365 Litre
	Cost of H.S.D Oil @ Rs.	90 /-per lit	90x365
			₹ 32,850.00
(b) *Mobil consumption for operation of Diesel Generator Set*			
Mobil Oil			
Total running hrs for 365days			730 hour
(i)Average M.Oil required during running of generating			
Set @ 0.5 lit/50hr to maintain the oil level			7.30 Litre
(ii)Changing of M. Oil in each 250hr running			
No of times of changing			2.92
Say			3 times
Mobil oil required per change=7.5lit/change			
Mobil oil required for change			22.50 Litre
Total Mobil oil required			30.00 Litre
	Cost of M. Oil @ Rs.	250 /-per lit	250x30
			₹ 7,500.00
		Total (a)+(b)	**40,350.00**
		Say	

D.G SET for STP			
(a) *Fuel consumption for operation of Diesel Generator Set*			
H.S.D. Oil			
Capacity of D.G. Sets			500 KVA
No. of D.G.sets			1 Nos.
Average consumption			33.33 Litre/Hour
Average running of D.G.sets			1 Hour
Total H.S.D. required			365 Days x1hr/day
			12166.67 Litre
	Cost of H.S.D Oil @ Rs.	90 /-per lit	90x14600
			₹ 1095000
(b) *Mobil consumption for operation of Diesel Generator Set*			
Mobil Oil			
Total running hrs for 365days			730 hour
(i)Average M.Oil required during running of generating			
Set @ 0.5 lit/50hr to maintain the oil level			7.30 Litre
(ii)Changing of M. Oil in each 250hr running			
No of times of changing			2.92
Say			3 times
Mobil oil required per change=7.5lit/change			
Mobil oil required for change			22.50 Litre
Total Mobil oil required			30.00 Litre
	Cost of M. Oil @ Rs.	250 /-per lit	250x30
			₹ 7,500.00
		Total (a)+(b)	**₹ 1102500.00**

DG Capacity for STP		
Sewage Treatment Plant		
Item	**Unit**	**For Year 2053**
Sewage Load	MLD	**2.50**
Total Daily Power Requirement (avg.),	kWh/d /MLD	157.70
Total KW	kW/day	394.25
Total load in KVA (assuming p.f. as 0.8)	KVA	492.81
KVA capacity of D. G. Set	KVA	**500.00**
Provide 1 no. DG Sets	KVA	**500.00**

Expenditure for maintanance of Civil,Mechanical & Electrical Items

For STP,Well,Pumping Stations,Lift Manholes and Sewer Network

DSR/KWA SOR	Staff	Unit	Total	Amount per Month	Amount per Annum
MR	Replacement/ Repair of electrical items	LS	1	7,500	90000
MR	Replacement/Repair of mechanical item	LS	1	15,000	180000
MR	Replacement/Repair of civil items	LS	1	10,000	120000
				Total	**390000.0**

Electricity Charge for One Year

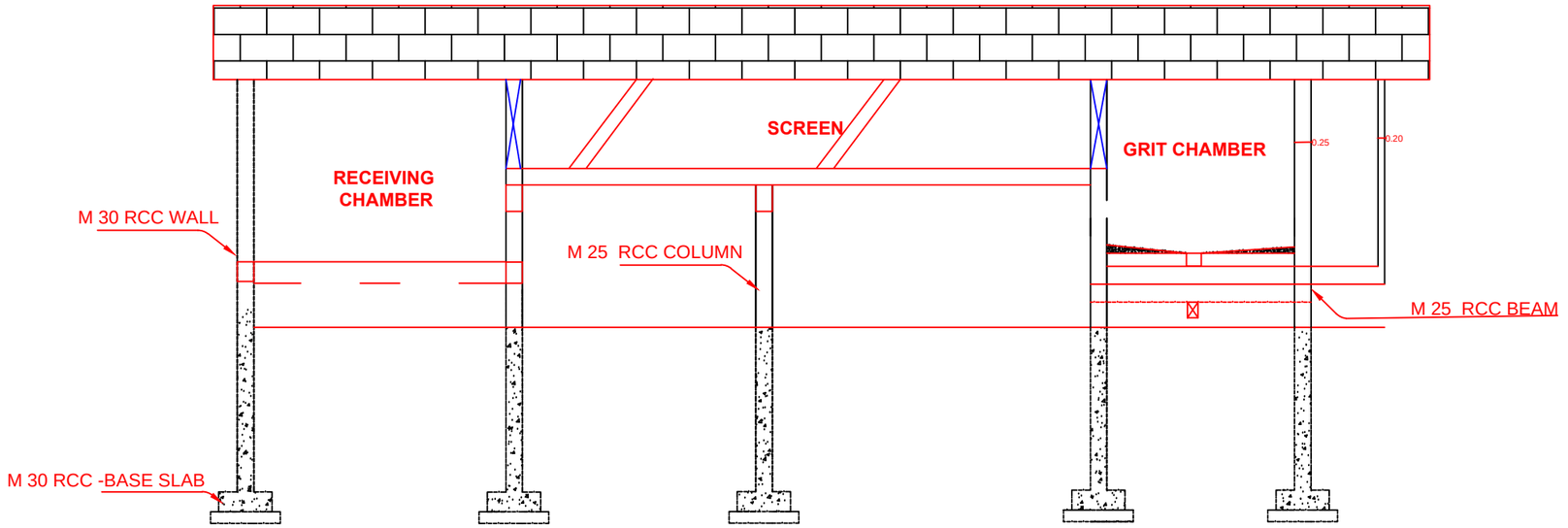
For STP,Well,Pumping Stations,Lift Manholes

DSR/KWA SOR	Description	Unit	Total	Amount per Month	Amount per Annum
MR	STP	LS	1	75,000	900000
MR	Pump House	LS	2	50,000	1200000
MR	Lift Manhole	LS	23	10,000	2760000
				Total	**4860000.0**

APPENDIX- H:- Annual Operation and Maintenance Cost for 10 Years@ 8% Annual Increase											
Fixed O&M Cost(Including Electicity charge)											
SL NO	Year	Manpower at STP	Manpower at Pumping Station	Chemical	DG Set fuel @ STP	DG Set fuel @ MPS	Sludge Disposal	Sewer Network	Civil, Mechanical & Electrical	Electricity charge	Total Fixed Cost
1	1 st Year	2494112.00	3362069.00	825000.00	1102500.00	40350.00	5426100.00	1411128.00	390000.00	4860000.00	19911259.00
2	2 nd Year	2693641.00	3631035.00	891000.00	1190700.00	43578.00	5860188.00	1524018.00	421200.00	5248800.00	21504160.00
3	3 rd Year	2909132.00	3921518.00	962280.00	1285956.00	47064.00	6329003.00	1645939.00	454896.00	5668704.00	23224492.00
4	4 th Year	3141863.00	4235239.00	1039262.00	1388832.48	50829.00	6835323.00	1777614.00	491288.00	6122200.00	25082450.00
5	5 th Year	3393212.00	4574058.00	1122403.00	1499939.08	54895.00	7382149.00	1919823.00	530591.00	6611976.00	27089046.00
6	6 th Year	3664669.00	4939983.00	1212195.00	1619934.20	59287.00	7972721.00	2073409.00	573038.00	7140934.00	29256170.00
7	7 th Year	3957843.00	5335182.00	1309171.00	1749528.94	64030.00	8610539.00	2239282.00	618881.00	7712209.00	31596666.00
8	8 th Year	4274470.00	5761997.00	1413905.00	1889491.26	69152.00	9299382.00	2418425.00	668391.00	8329186.00	34124399.00
9	9 th Year	4616428.00	6222957.00	1527017.00	2040650.56	74684.00	10043333.00	2611899.00	721862.00	8995521.00	36854352.00
10	10 th Year	4985742.00	6720794.00	1649178.00	2203902.60	80659.00	10846800.00	2820851.00	779611.00	9715163.00	39802701.00
	Total	**36131112.00**	**48704832.00**	**11951411.00**	**15971435.12**	**584528.00**	**78605538.00**	**20442388.00**	**5649758.00**	**70404693.00**	**288445695.00**
										18% GST	**51920225.00**
										Total Fixed Cost	**340365920.00**

DRAWINGS

RECEIVING CHAMBER



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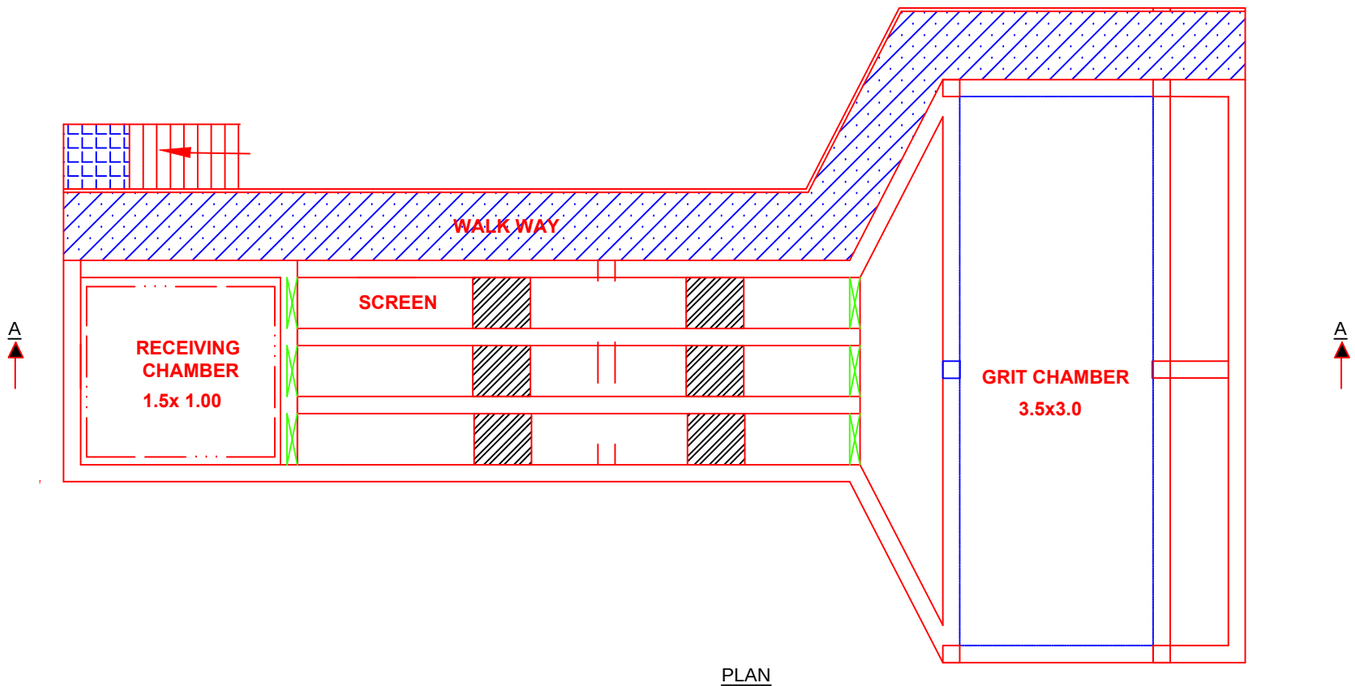
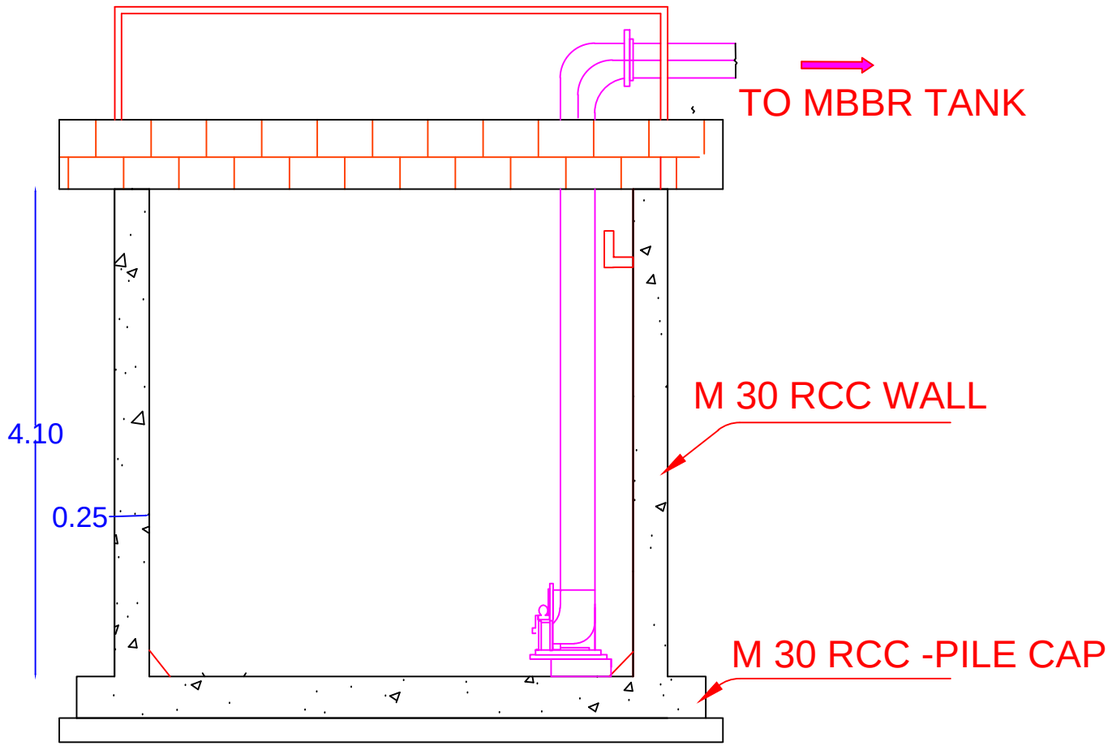


PLAN

EQUALISATION TANK



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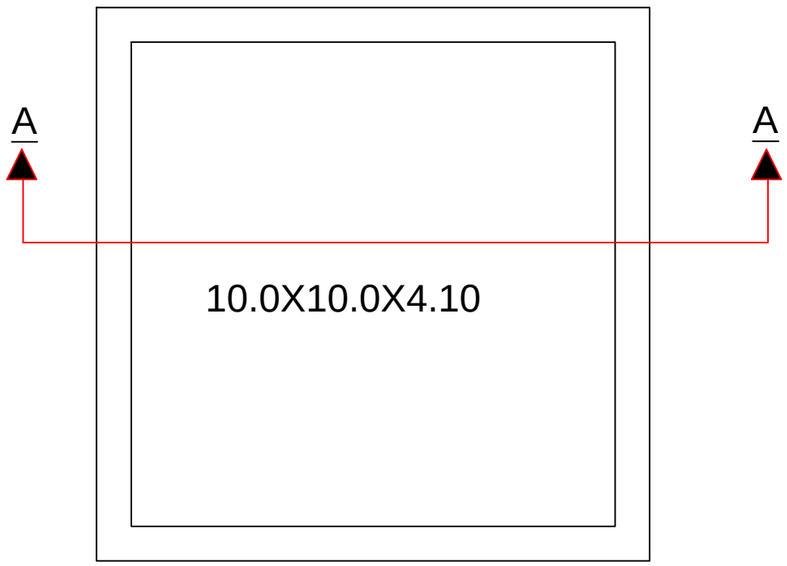
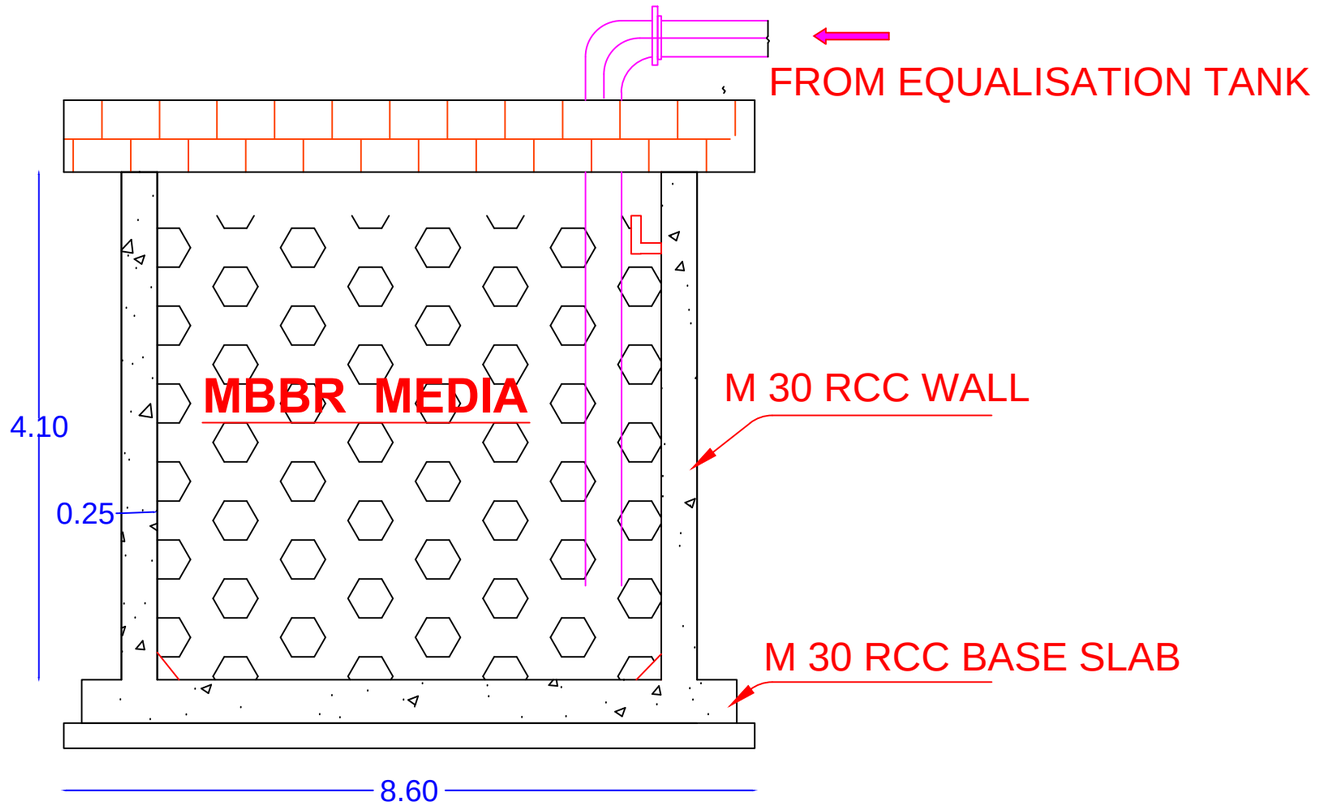


PLAN

MBBR



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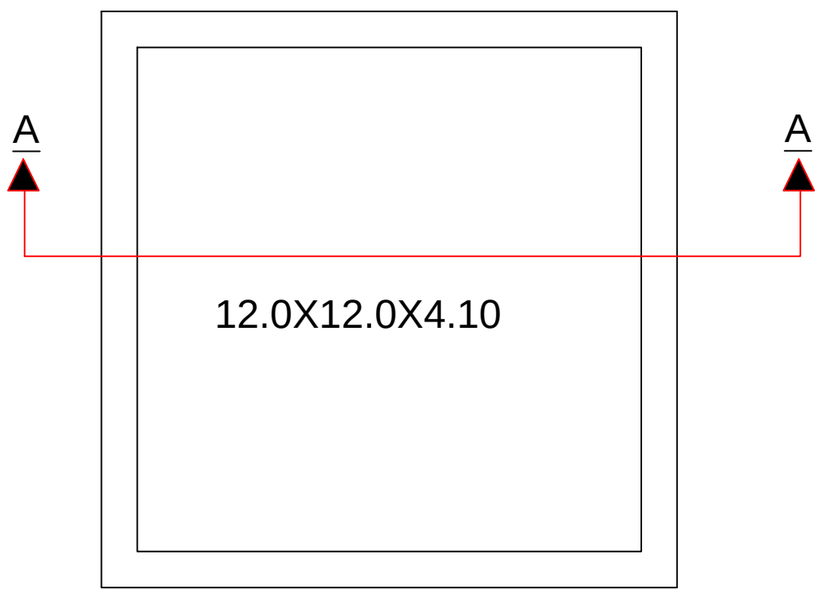
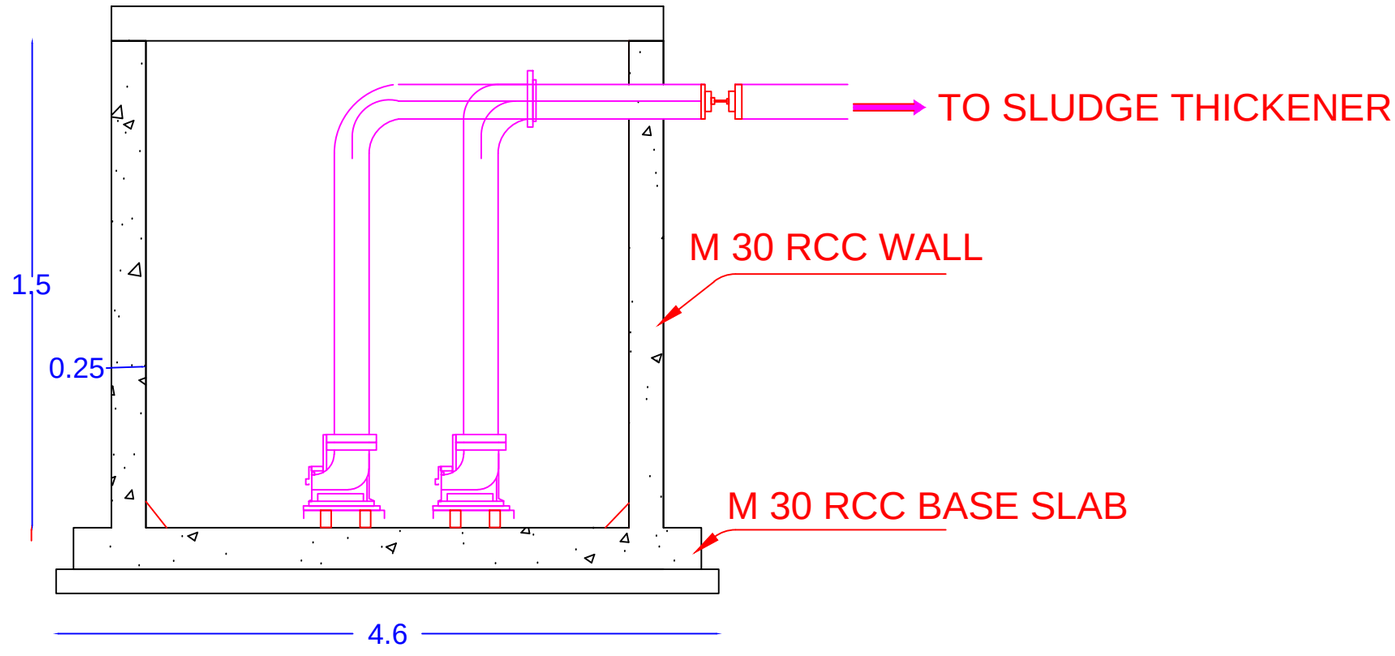


PLAN

SLUDGE SUMP



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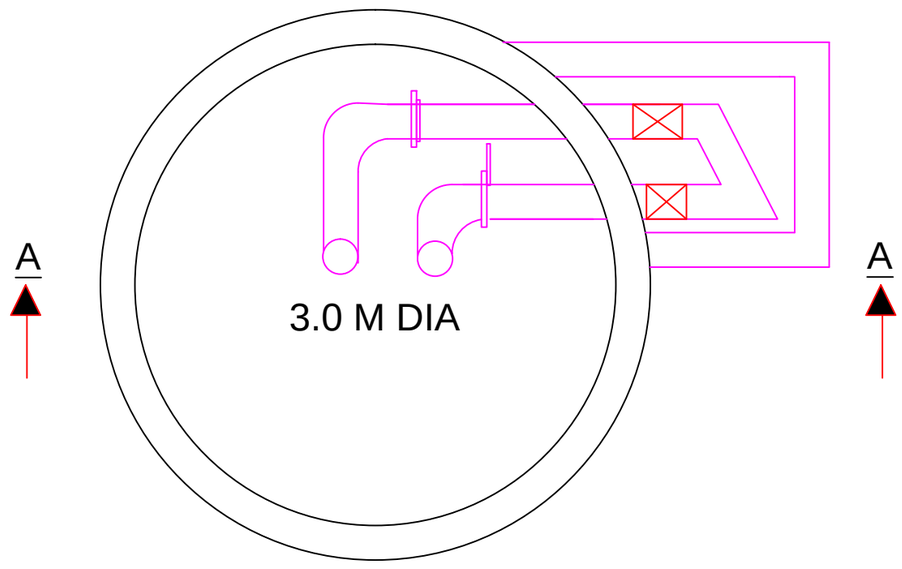
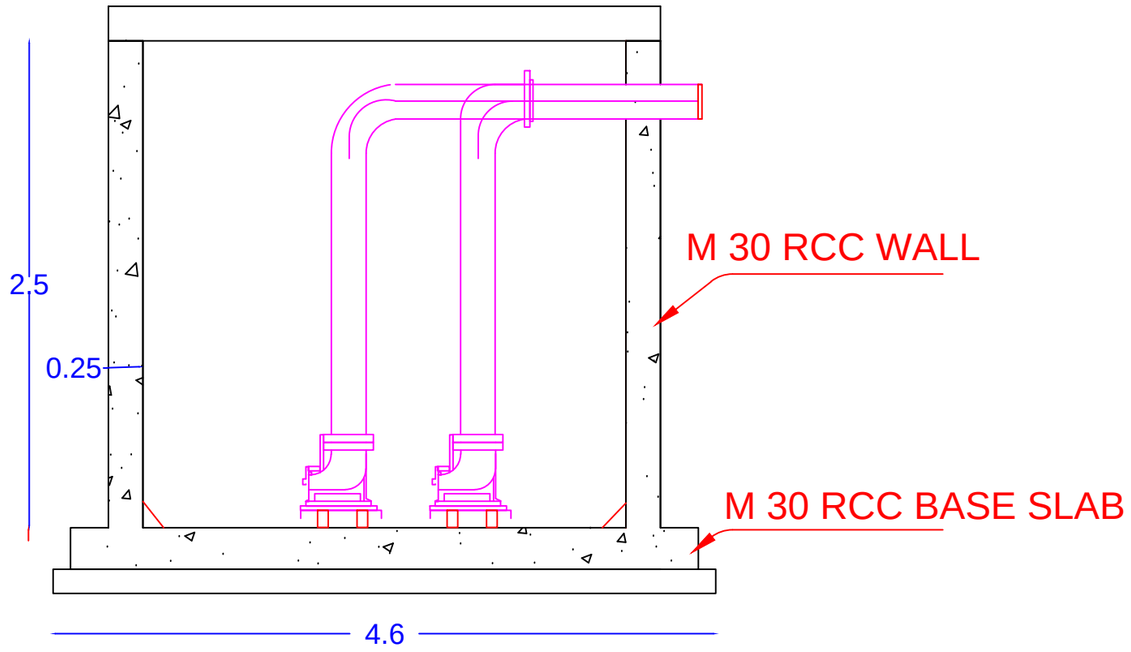


PLAN

SLUDGE THICKNENER



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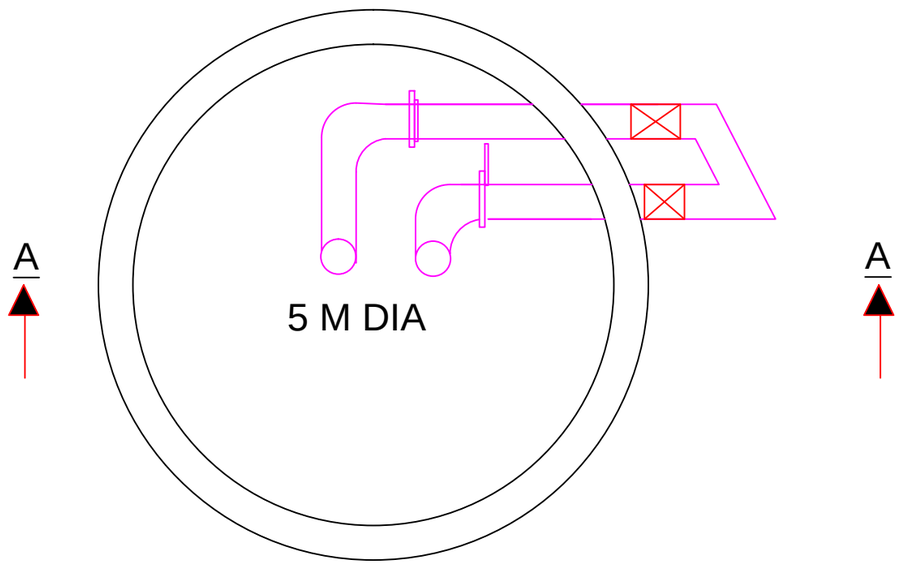
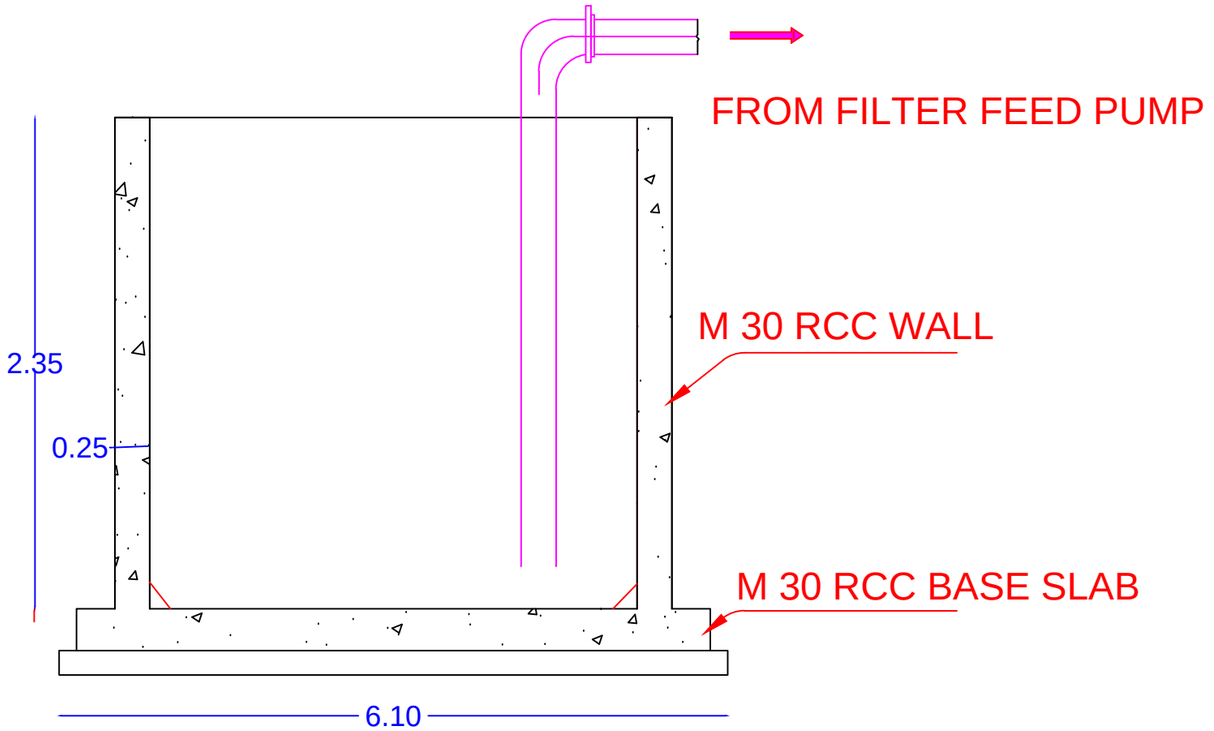


PLAN

FILTER FEED TANK



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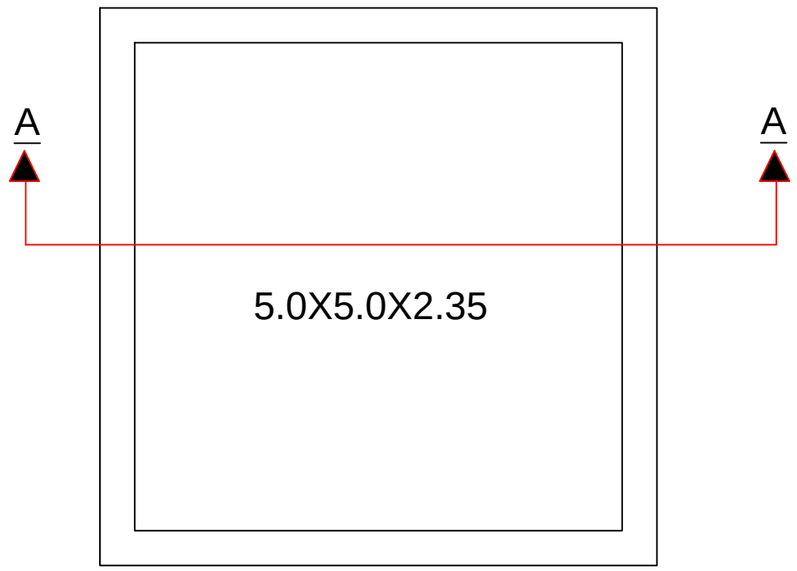
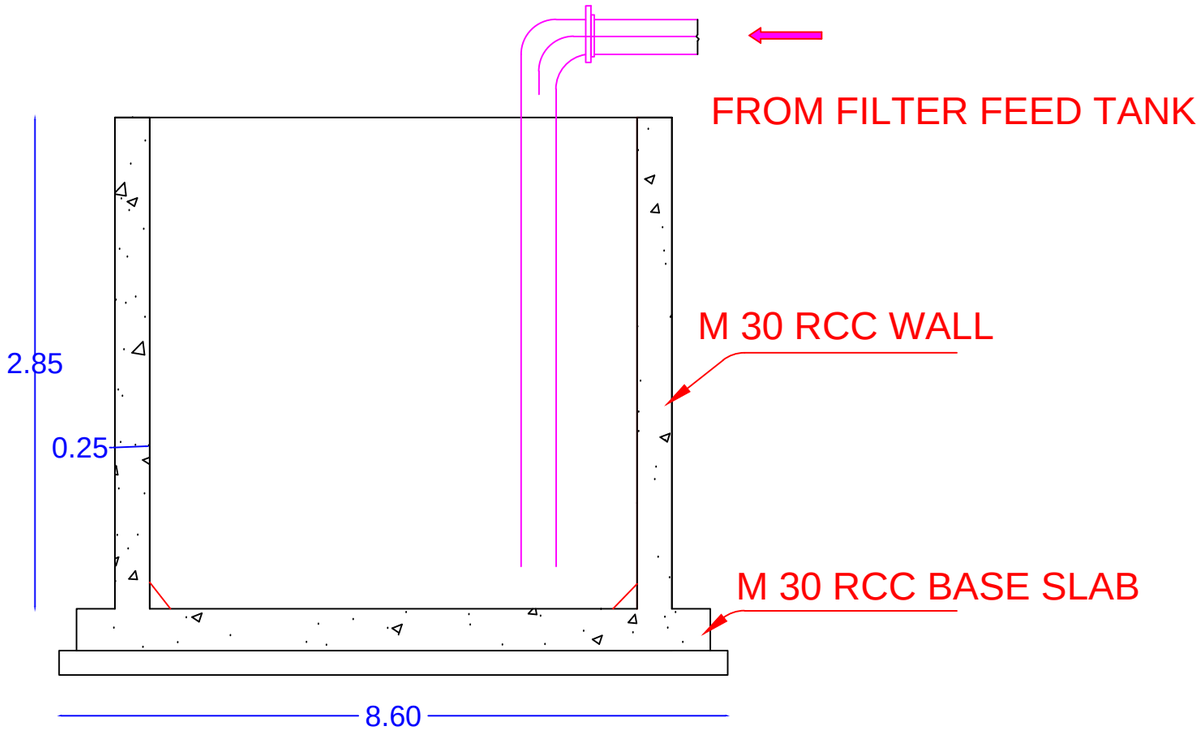
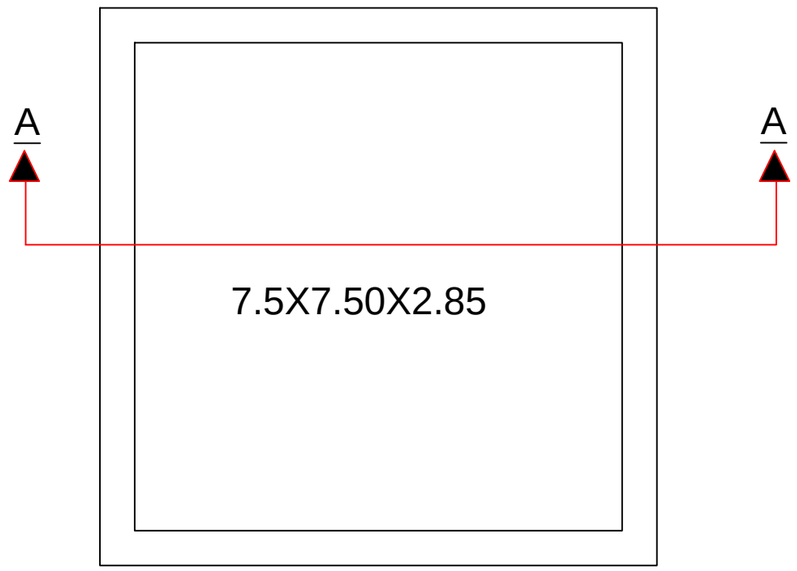


PLAN

TREATED WATER TANK

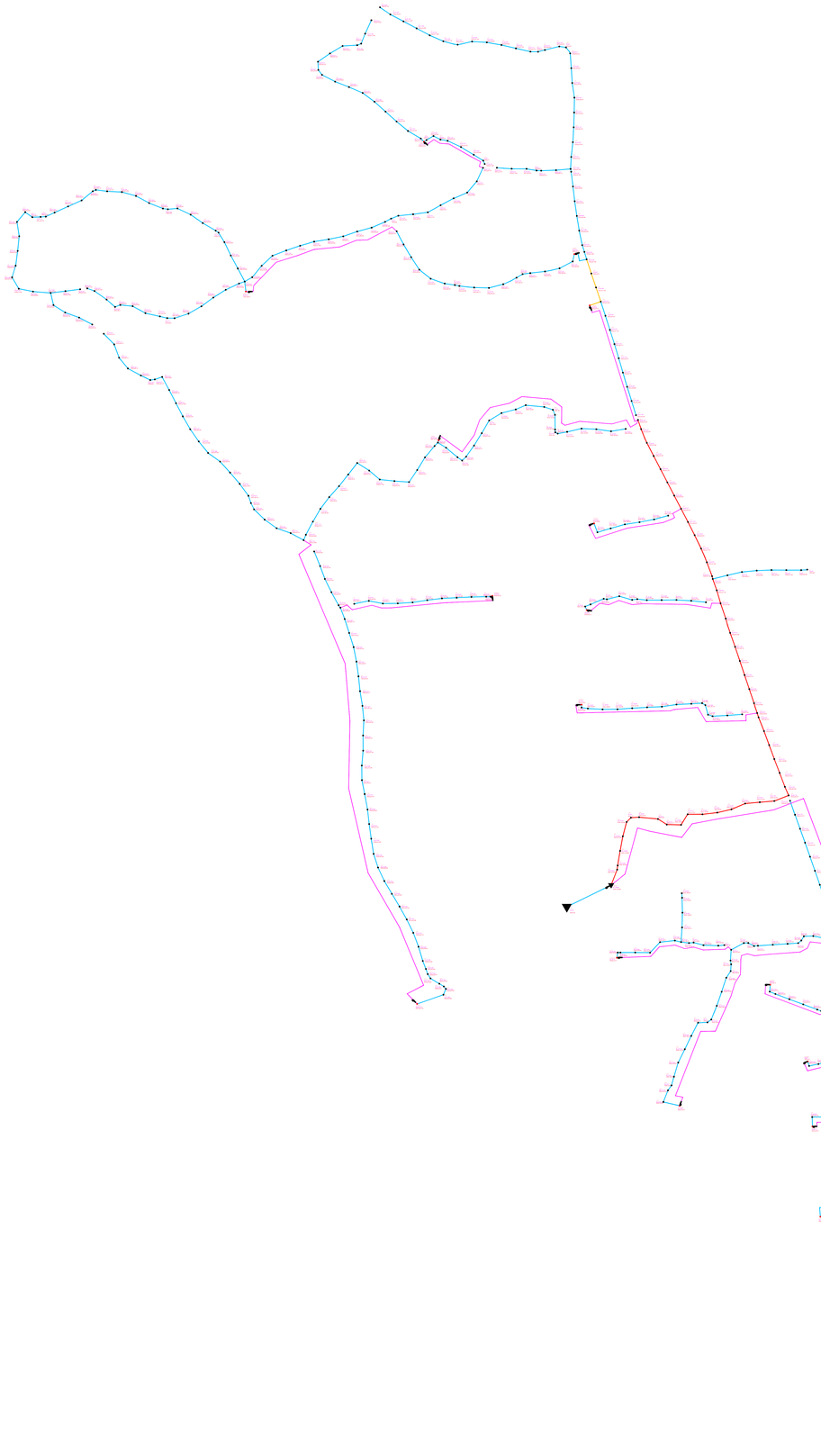


SECTION AA



PLAN

SEWAGE NETWORK - NEYYATTINKARA ZONE 1



N

LEGEND

- 208 SEWER
- 260 SEWER
- 329 SEWER
- PUMPING LINE
- PUMP
- MAN HOLE
- LIFTING MAN HOLE

KERALA WATER AUTHORITY
PPD CAMP OFFICE TVM
NEYYATTINKARA ZONE 1

SEWARAGE NETWORK			SCALE : 1:100
ASST. ENGINEER	ASST. EXE. ENGINEER	EXECUTIVE ENGINEER	SUPT. ENGINEER