

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

**UNDER GROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN
PANCHAYAT**

BY

**TWAD BOARD, SEWERAGE DIVISION
PERUNDURAI**

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EIA Consultant

HUBERT ENVIRO CARE SYSTEMS PRIVATE LIMITED, CHENNAI

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EXECUTIVE SUMMARY

Tamil Nadu Government made a policy announcement of providing Under Ground Sewerage Scheme in all urban local bodies in a phased manner at District head quarter towns. Perundurai Town is a selection grade Town Panchayat in Erode District of Tamil Nadu State. It lies at a latitude of 11°16'26" N. and Longitude of 77°35'18" E. It is situated at 20 Km from Erode Town and nearer to National high way 47. This Town Panchayat is bounded by Karumandichellipalayam TP in North, Ingur village Panchayat in South, Vadamugam Vellode village panchayat in East and Pattakampalayam, Kullampalayam and Ponmudi Village panchayats in West.

Existing Drainage System

Perundurai Town is supplied with 135 lpcd water supply at present. Perundurai town does not have any underground sewerage scheme at present. Individual septic tanks are in use for collecting the night soil from toilets. However the sullage water from kitchens, bathrooms, wash basins, cloth washing etc. is directly discharged into existing road side open drains. In places where economically weaker sections of the society reside, there are no septic tanks either and total waste water is discharged into road side open drains, resulting in large scale pollution of existing natural water courses i.e. major storm water drains. The discharge of raw untreated sewage/effluent into storm water drains is creating unhygienic conditions around drains, lake and posing serious health hazard. The solid wastes are directly dumped in the dumpyard at Panikampalayam.

Need for the Project

With the rapid growth of the population in Perundurai town panchayat, the lack of proper drainage system and sewage treatment facility has become an ever – larger problem for public and from environmental point of view. Therefore, the Tamilnadu Government has decided to provide an Underground Sewerage Scheme with STP at Pannikkampalayam, within the Solid waste dumping yard, Perundurai as a part of urban development project for TWAD Board, Perundurai.

Project Proposal

This project area comprises of 15 wards in Perundurai town in Erode District. The area covered by Perundurai Town within Town Panchayat limits as per topographical survey map is 23.39 km². Based on terrain, 4 numbers of main drainage zones have been identified for Perundurai Town with each zone draining towards a

lowest point. Drainage Zone-I sub divided into two sub areas, Drainage Zone – II subdivided into four sub areas, Drainage Zone-III has two sub areas, Drainage zone-IV two sub areas.

Package - Includes sewer works, lift stations, pumping stations, pumping mains including civil and electromechanical works and establishment of Sewage Treatment Plant.

Design Period

Design period is taken as 30 years for this Underground Sewerage Scheme, keeping the base year as 2015. Intermediate design period is 15 years from 2015 to 2030 and the ultimate stage will be at 2045.

Project Description

Tamil Nadu Water Supply and Drainage Board have proposed to establish Underground Sewerage System connecting 15 wards in Perundurai town by categorizing it to 4 zones and treating the sewage generated by setting up a Sewage Treatment Plant of 3.14 MLD capacity using FAB Technology. The sewage generation rate are adopted to be 100 lpcd.

Salient Features of the project components are below :

- Total length of the sewerage network is 47.496 km
- Manholes construction – 1932 Nos
- 6 Numbers of Lifting Stations
- 4 numbers of Pumping stations
- House Service Connection – 5700 Nos
- Sewage Treatment Plant of capacity 3.14 MLD with FAB Technology at Compost yard near Panikampalayam in Perundurai.
- The treated sewage is disposed through 400mm dia RCCpipe to nearby Kuttai at 50m from the STP which flows through gravity to large odai at Perundurai.

Categorization of the Project

The proposed project is classified as per ECSMF Environmental Categorization as E1 (Sewerage Network, Lifting station, Pumping Station and Treatment Plant). Hence

this project requires detailed Environmental Impact Assessment and preparation of management measures.

As per TNPCB Industrial Categorization, STP is categorized as **Red Category** (Code No. 1081- Common Treatment and Disposal Facilities), as per re-categorization of Industries vide B.P. No. 06 dated 02.08.2016.

Cost Details

The total cost of the project is Rs.54.78 crores and the maintenance cost per annum is Rs.110.84 crores for five years.

Environmental Regulatory Framework

Clearances/NOC required for laying of pipe lines from various user agencies are as follows:

- State Highways – 1 No
- Consent to Establishment under Air and Water has been obtained from Tamil Nadu Pollution Control Board.
- Labour Working License

BASELINE STUDY

a) Meteorological Environment

The micro-meteorological conditions during the study period for hourly data of wind speed, wind direction and temperature were recorded at the project site. The nearest Indian Meteorological department (IMD) station located to project site is Coimbatore (Pelamedu) the annually determined wind direction is from South West to North East.

The site specific meteorological data of study period during the study period (April – June 2017) Maximum temperature is 42°C, Minimum temperature is 24°C and Average temperature is 32.6°C. The Average Relative humidity is 55%. Average Wind Speed in study period is 3.9 m/s. Study period predominant wind pattern is from South to North.

b) Ambient Air Quality

Ambient Air Quality was monitored at 8 locations within the study area. The particulate matter PM_{2.5} ranged between 17.8–28.4 µg/m³ across the monitoring locations, PM₁₀

ranged between 37.65–50.1 $\mu\text{g}/\text{m}^3$, SO_2 varied between 6.8 – 9.7 $\mu\text{g}/\text{m}^3$, NO_2 varied between 15.09 - 23.40 $\mu\text{g}/\text{m}^3$, and some are BDL, all the parameters are well within the National Ambient Air Quality Standards at all monitoring locations during the study period.

c) Noise Environment

The existing ambient noise levels were monitored using precision noise level meter in and around the project site at 10 km radius at 8 locations during study period (April-June 2017)

- In commercial area time noise levels varied from 60.5dB(A) to 61.5dB(A) and night time noise levels varied from 51.3 dB(A) to 53.8 dB(A), which is within prescribed limit by MoEF&CC (65 dB(A)) Day time & 55dB(A) Night time).
- In residential area day time noise levels varied from 48.6 dB (A) to 53.5dB (A) and night time noise levels varied from 40.6dB (A) to 43.6 dB (A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area noise are within the limit prescribed by MoEF&CC (55 dB (A) Day time & 45 dB (A) Night time).

d) Water Environment

The prevailing status of water quality at 4 locations for surface water and 8 locations for ground water have been assessed during April 2017. The standard methods prescribed in IS were followed for sample collection, preservation and analysis in the laboratory for various physiochemical parameters.

Ground water quality

- The ground water results of the study area indicate that the average pH ranges is varied between 7.45-7.81.
- The desirable limit of the Total Dissolved Solids is 500 mg/l and permissible limit is 2000 mg/l. Total Dissolved Solids ranges is varied between 746 mg/l -1174 mg/l for the ground water and its meets the permissible limits of IS 10500: 2012

- The desirable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area is ranges between 143 mg/l -250 mg/l
- The desirable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. The sulphate content of the ground water of the study area is varied between 54 mg/l -107 mg/l meeting the desirable limit of the IS 10500: 2012.
- The Total hardness range is between 293-533 mg/l for ground water and all location within the permissible limit of the IS 10500:2012.

Surface water quality

- In the surface water the pH varied between 7.32 – 7.87.
- The Total Dissolved Solids ranges is varied between 407-593 mg/l for the surface water The TDS value of some of the samples meeting class A and remaining meeting Class B standards of IS: 2296 -1982.
- The desirable limit of the chloride content is 250mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area is ranges between 98 mg/l -150 mg/l
- The Sulphate content of the surface water meeting the minimum range of 35 mg/l and maximum range of 48 mg/l. The surface water samples meeting the class A standard of IS: 2296 1982.
- The Total hardness ranges is between 125 – 225 mg/l for ground water its meeting the permissible limit of the IS 2296 - 1982
- DO of the sample varies between 5.1 – 6 mg/l
- BOD of the sample varies between 3.2–5.9 mg/l
- COD of the sample varies between 9.7 – 15.2 mg/l

e) Land Environment

Assessment of soil characteristics is of paramount importance since the vegetation growth, agricultural practices and production is directly related to the soil fertility and quality. Soil sampling was carried out at eight (08) locations in the study area. It is observed that,

- The pH of the soil samples ranged from 6.67 -7.71 indicating that the soils are almost neutral in nature.
- Conductivity of the soil samples ranged from 244-528 $\mu\text{S}/\text{cm}$. As the EC value is less than 2000 $\mu\text{S}/\text{cm}$, the soil is found to be non-saline in nature
- The Moisture Content of the soil samples varied from 8.78-21.7 (%).
- Nitrogen content ranged from 56.3 to 259 mg/ha
- Phosphorous ranged from 97 to 198 mg/ha
- Potassium content ranges from 53 to 200 mg/ha.

f) Greenbelt Development

- Green belt is proposed to implement in the STP, and Main Pumping Stations. About 1000 trees of native species are proposed to be planted.
- The impact during the construction and operation phase on land use, topography, surface water, ground water, ambient air quality, noise quality, land environment, traffic, ecology and social aspects have been assessed and management measures have been identified. Impacts will be minimal on account of the proposed mitigation measures.

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

When identifying the potential impacts of a new project on the existing environment, such as the proposed Sewage Treatment Plant situated at Panikampalayam, Perundurai. Construction of sewer line with sewage treatment plant and there after operation of this system, if undertaken without a proper understanding of the relationships inherent in environmental function, can be accompanied by disruptions to the environment, from which it may take a long time to regain equilibrium. In human terms, this may mean that generations must function in a debilitated environment and suffer many possible associated socio-economic hardships and financial losses.

Some of the major environmental impacts of sewerage system include damage to local ecosystems, loss of productive agricultural lands, demographic change, accelerated urbanization, and introduction of disease. The need of development and growth in the area must be matched with the conservation of the existing natural resources.

In general, construction of a new sewage treatment plant will have a positive environmental impact on the town. It is expected to produce a long term improvement in public health of the residents, as well as to significantly reduce a source of chronic water pollution of an ecologically valuable portion of the water body where the sewerage drains.

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

- An Environmental Management planning wing to regulate, monitor and audit positive and/or negative environmental impacts by considering day-to-day operations of the STP.
- TWAD will provide proper mitigative measures to mitigate the impacts.
- The collected raw sewages from the individual houses shall be treated by common STP for efficient treatment and it meets the prescribed norms by TNPCB.
- The treated wastewater from the common STP after confirming the prescribed norms will be discharged to nearest kuttai.
- Rainwater harvesting program shall also be implemented for conservation of water.
- Occupational Health & Safety shall be followed for the working employees.
- Dense green belt facility can be provided with in the STP, Pumping stations premises.

Implementation and Institutional Arrangements

The proposed project is to provide an Underground Sewerage Supply Scheme to Perundurai Town Panchayat. This project will be implemented by TWAD under the scheme of SMIF-TN II-1 at an estimating cost of Rs. 54.78 Crores. The project is proposed to be implemented by TWAD through Prospective contractor. The environmental management plan identified for the construction will be included in the bid documents for ensuring implementation of the environmental safeguards. Implementation of the management measures by the contractor will be ensured by TWAD Board and report on ECSMF compliance will be submitted to TNUIFSL periodically. The management measures

identified for operation phase will be taken up by the Prospective contractor upto maintenance period and beyond that by TWAD Board.

Grievance Mechanism

TWAD Board has proposed to provide Underground Sewerage Supply Scheme to Perundurai town and treat the Sewage in Sewage Treatment Plant of 3.14 MLD using Fluidized Bio-reactor Technology. The management measures identified for the operation phase will be taken up by the TWAD Board upon completion of construction activities. The TWAD Board will have Grievance Redressal mechanisms to handle the grievances of the project. A project level grievance Redressal committee will be set up and the members are as follows (preferably one of them as women)

- Executive Engineer (Projects – TWAD Board)
- Executive Officer (Perundurai Town Panchayat)
- A person who is publicly known in the local area

TWAD Board will submit monthly reports on the status of compliance with the ECSMF requirements to TNUIFSL.

PROJECT BENEFITS

- Perundurai Town Hygienic will be improved
- Mixing of Sewage water into Land, Canals, and Lakes & Ponds will be reduced
- Ground Water degradation will be reduced
- Soil contamination will be reduced
- Sewage odour can be reduced in the open area Overall Water pollution and soil pollution due to Sewage will be reduced and the safe environment will be improved in and around the project area i.e., Perundurai Town.

CONCLUSION

- The impact on environment will be minimum and can be further reduced by implementing various mitigating measures and regular monitoring programs.
- The proposed sewage treatment plant have beneficial impacts in terms of hygienic and safe disposal of treated effluent with incidental benefits like employment opportunities both in the construction stage as well as operational

stage. Also the modernized installation will facilitate greater level of operating safety.

- Due to the proposed project the socio economic activities will be developed in and around the project area.
- The monitoring program on various environmental parameters will be undertaken for the continual improvements towards protecting the environment to achieve the above requirements.
- Proper methods have been planned to safe and secured disposal of treated effluent and handling of solid waste.
- Dense Greenbelt can be developed around the project site. So odour will be reduced for the surrounding residential peoples (Panikampalayam Village).

CHAPTER – 1 INTRODUCTION

1.1 Preamble:

Tamil Nadu Water Supply and Drainage Board (TWAD Board) is a statutory body formed by Government of Tamil Nadu. It is responsible for the implementation of providing water supply and sewerage facilities to the public of the entire state of Tamil Nadu except Chennai Metropolitan Area. The activities of TWAD board will be guided and monitored by the Board of Directors of senior level administrators and Engineers of Government of Tamil Nadu.

The Director of Town Panchayat, Chennai on behalf of Perundurai Town Panchayat has formulated a project for providing "Underground Sewerage Scheme (UGSS)" for Perundurai Town. The primary objective of this project is providing sewerage and waste water treatment works for Perundurai Town with special emphasis on best available technology to optimize the project implementation period.

1.2 Profile of Perundurai

Perundurai town panchayat is located at a distance of 14.6 km from ENE of Erode district. 24.5Km from NNW of Gobichettipalayam, 29.7Km from SW of Tiruppur and 29 Km from South of Kangayam. The location of the town is located at latitude 11.255402 to 11.280655 N and longitude 77.574283 to 77.592307 E. Average Elevation of the town is 292m (958 ft). As per 2011 census, the population of Perundurai is 24, 930.

Males constitute 48.93% of the population and female constitute 51.07%. Perundurai has an average literacy rate of 85.93%.

1.3 Existing Drainage System

Perundurai Town is supplied with 135 lpcd water supply at present. Perundurai town does not have any underground sewerage scheme at present. Individual septic tanks are in use for collecting the night soil from toilets. However the sullage water

from kitchens, bathrooms, wash basins, cloth washing etc. is directly discharged into existing road side open drains. In places where economically weaker sections of the society reside, there are no septic tanks either and total waste water is discharged into road side open drains, resulting in large scale pollution of existing natural water courses i.e. major storm water drains. The discharge of raw untreated sewage/effluent into storm water drains is creating unhygienic conditions around drains, lake and posing serious health hazard. The solid wastes are directly dumped in the dumpyard at Panikampalayam.

1.4 Need for the Project

With the rapid growth of the population in Perundurai town panchayat, the lack of proper drainage system and sewage treatment facility has become an ever – larger problem for public and from environmental point of view. Therefore, the Tamilnadu Government has decided to provide an Underground Sewerage Scheme with STP at Pannikkampalayam, within the Solid waste dumping yard, Perundurai as a part of urban development project for TWAD Board, Perundurai.

1.5 Scope of the Proposal

The scope of the proposal is to provide Underground Sewerage System with Sewerage network, Lifting stations, Pumping stations and Pumping Mains covering the entire area of Perundurai Town Panchayat and treat the collected sewage in 3.14 MLD STP at Compost yard near Panikampalayam.

This Project is implemented under Kfw assisted SMIF – TN. The implementing agency is TWAD Board.

1.6 Categorization of the Project

The proposed project is classified as per ECSMF Environmental Categorization as E1 (Sewerage Network, Lifting station, Pumping Station and Treatment Plant). Hence this project requires detailed Environmental Impact Assessment and preparation of management measures.

As per TNPCB Industrial Categorization, STP is categorized as **Red Category** (Code No. 1081- Common Treatment and Disposal Facilities), as per re-categorization of Industries vide B.P. No. 06 dated 02.08.2016.

1.7 Objective of the Report

- To identify the potential impact by the UGSS on related environmental aspects and identify management measures.
- To develop a set of practices to be followed during preconstruction, construction and post construction periods in order to avoid the foreseeable negative impacts.

1.8 Environmental Impact Assessment of the project will include

- Collection of baseline information on various components of the environment
- Identification of areas and aspects those are environmentally or socially significant
- Conducting community consultations on various environmental and social aspects of the project and documenting the same.
- Determining the magnitude of environmental impacts and formulation of mitigation measures for consideration and incorporation during planning/design, construction and operational phases of the project implementation
- Preparation of environmental enhancement plans for improving the environmental quality of the project corridor; and
- Preparation of environmental management plans including a program for monitoring environmental impacts, implementation schedule and responsibilities. It also specifies requirements of Institutional strengthening, if any, supervision program and contracting procedures for execution of environmental mitigation works.

1.9 Structure of the Report:

The structure of EIA report is given below

- **EXECUTIVE SUMMARY**
- **Chapter 1** – Introduction
- **Chapter 2** – Project Description
- **Chapter 3** – Environmental Regulatory Framework
- **Chapter 4** – Baseline Environmental Profile
- **Chapter 5** – Assessment of Anticipated Impacts and Mitigation Measures
- **Chapter 6** – Environmental Management Plan
- **Chapter 7** – Public Consultation
- **Chapter 8** – Implementation and Institutional Arrangements
- **Chapter 9** – Project Benefits
- **Chapter 10** - Conclusion

CHAPTER 2: PROJECT DESCRIPTION

Tamil Nadu Water Supply and Drainage Board have proposed to establish Underground Sewerage System connecting 15 wards in Perundurai town by categorizing it to 4 zones and treating the sewage generated by setting up a Sewage Treatment Plant of 3.14 MLD capacity using FAB Technology. The sewage generation rate was adopted to be 110 lpcd.

The proposed project involves the construction of 6 lifting stations and 4 pumping stations for conveying the sewage collected at various locations to inlet chamber of proposed 3.14 MLD capacity STP at Panikampalayam Compost yard.

The Google view of the project site is shown in **Figure 2.1**. The flow diagram of UGSS is given **Figure 2.2**. The land ownership details are given in **Annexure-I** and the government order for this project is given in **Annexure-II**.

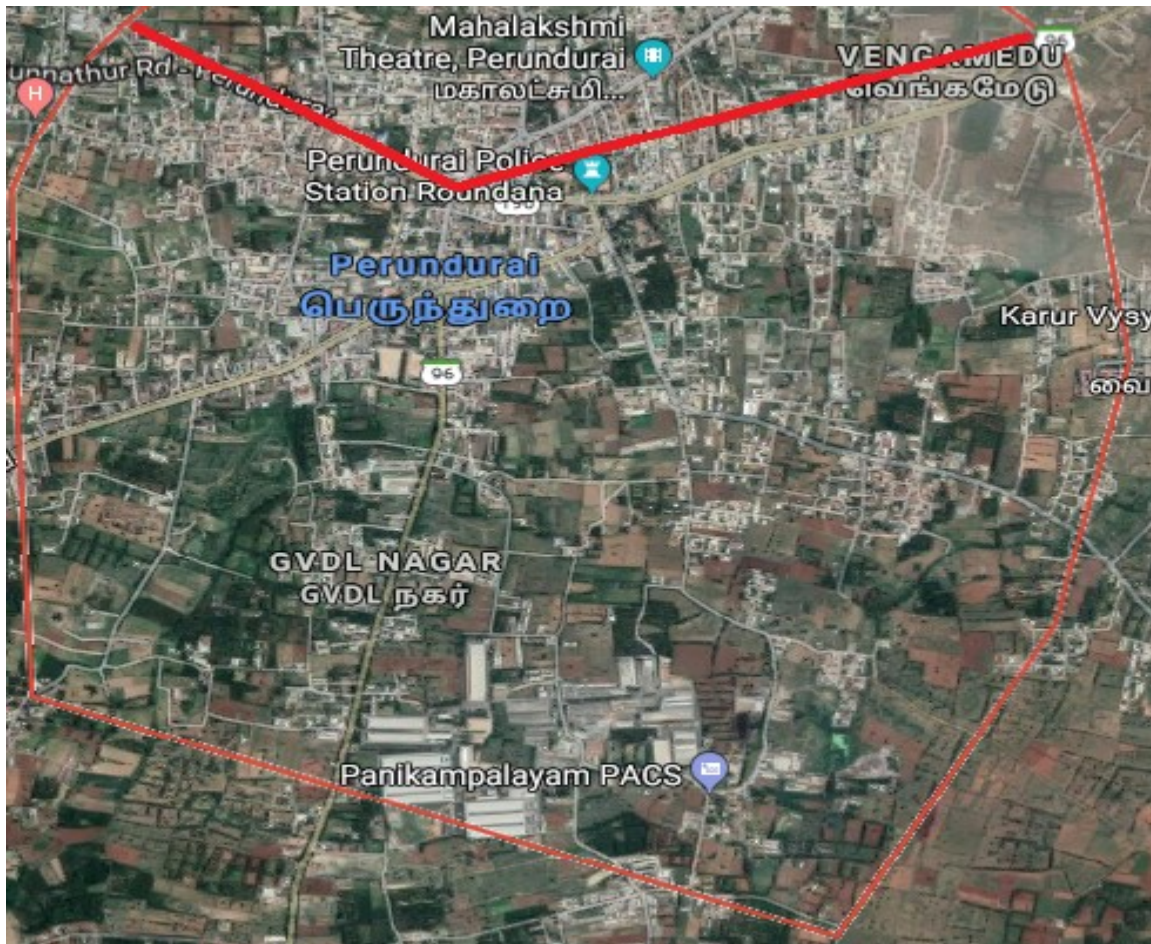


Figure 2-1 - Google view of the project site

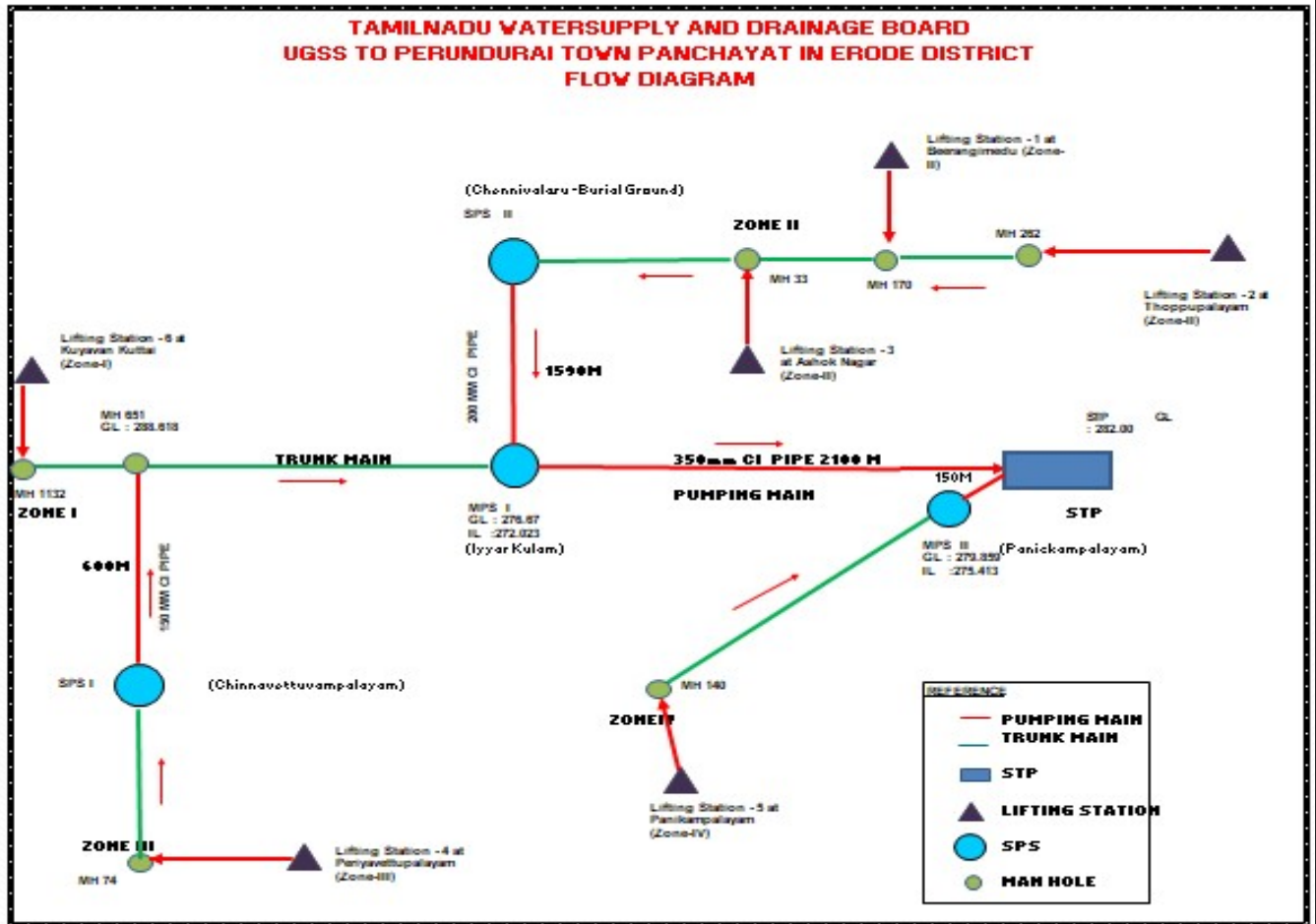


Figure 2-2 - Flow Diagram

2.1 Salient Features of the project components are below :

- Total length of the sewerage network is 47.496 km
- Manholes construction – 1932 Nos
- 6 Numbers of Lifting Stations
- 4 numbers of Pumping stations
- House Service Connection – 5700 Nos
- Sewage Treatment Plant of capacity 3.14 MLD with FAB Technology at Compost yard near Panikampalayam in Perundurai.
- The treated sewage is disposed through 400mm dia RCCpipe to nearby Kuttai at 50m from the STP which flows through gravity to large odai at Perundurai.

The project cost is Rs. 54.78 crores and the Commissioner of Municipal Administrative Sanction was accorded vide G.O. (D) No. 24, dated: 17-01-2013

2.2 Project Proposal

Perundurai Town Panchayat is located at a distance of 14.6 Km from ENE of Erode town. Area of the Perundurai town panchayat is 23.39 Sq.km. With the rapid expansion and urbanization of Perundurai Town, an underground sewerage scheme has been formulated for the town and the collection system works are ready to progress. The final sewage from the main pumping will be redirected to the proposed Sewage Treatment Plant for final treatment and the treated effluent will be redirected to the Kuttai (Permission letter Enclosed).

The sewage from the residential area is discharged into the corresponding underground sewerage system. Sewerage zones are interconnected with the sub pumping stations and ultimately collecting into the main pumping station, where sewage will be pumped to the Sewage Treatment Plant. The treatment system adopted is Fluidized Aerobic Bio Reactor Technology (FAB).

2.2.1 Zone - I

This pumping station at Iyerkulam covers 1, 2, 3, 4, 5, 6, 7, 11/P, 12/P&14 wards and the length of collection system is 31,444m. It has 3001 Domestic House Service connections and 167 Commercial Buildings.

2.2.2 Zone - II

This pumping station at Chennivalasu covers 8,9,10 wards and the length of collection system is 10,829m. It has 1171 Domestic House Service connections and 65 Commercial Buildings.

2.2.3 Zone - III

This pumping station at Cinna Vettuvapalayam covers 13 wards and the length of collection system is 5687m. It has 688 Domestic House Service connections and 38 Commercial Buildings.

2.2.4 Zone -IV

This pumping station at Panikkampalayam covers 11/P & 12 wards and the length of collection system is 3853m. It has 442 Domestic House Service connections and 25 Commercial Buildings.

Detailed Scheme plan is enclosed as **Figure 2.3.**

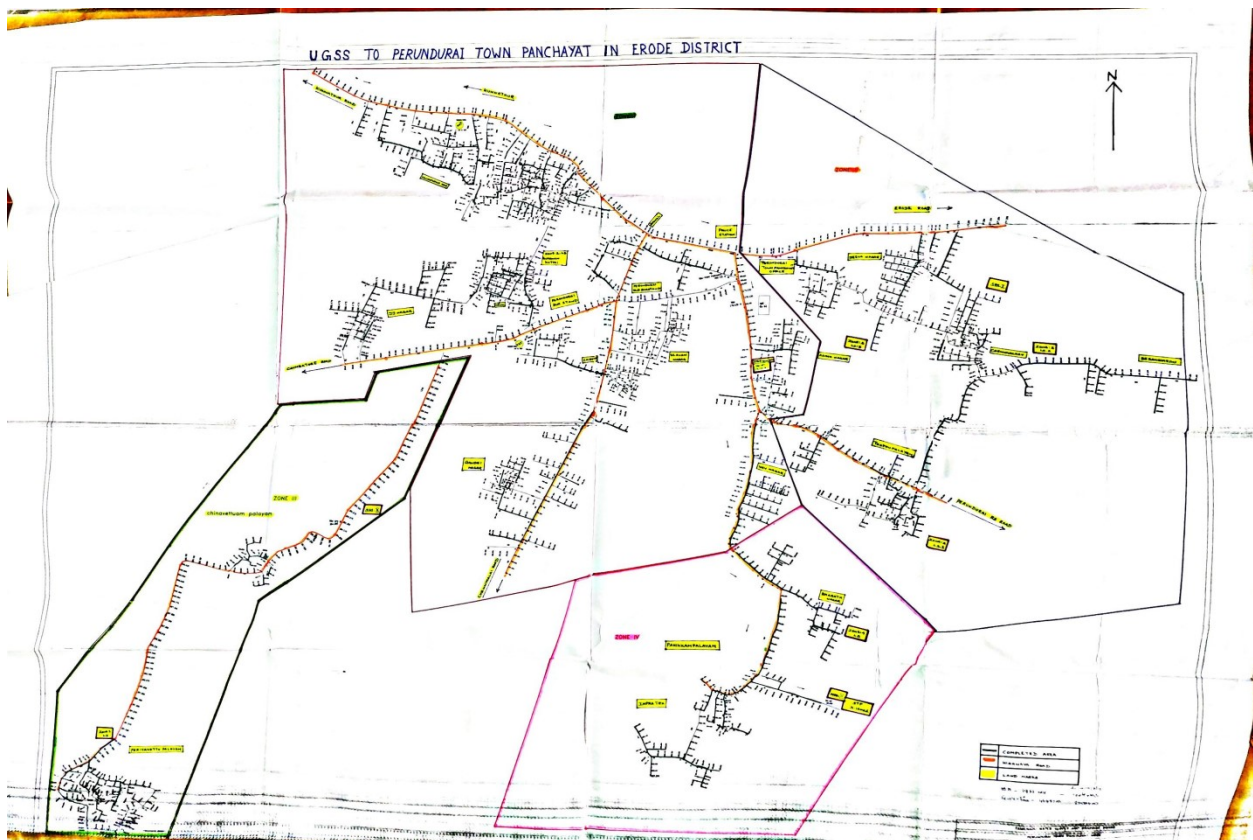


Figure 2.3- Detailed Scheme plan

2.2.5 Project Details

Sewerage system is designed as a separate underground system catering only to domestic wastewater; storm runoff generated during rains will be carried by existing open drains and disposed into natural streams/ water bodies. Industrial wastewater will not be disposed into sewers. Sewerage system is designed for 100 liters per capital per day, based on sewage generation rate of 80% of water supply. Sewerage system is design with gravity flow as far as possible, however topography do not permit a complete gravity system from collection to inlet at the STP, and therefore wherever required sewage lifting and pumping stations introduced to optimize the system design.

Table 2.1: Proposed Sewerage Subproject Components

	Infrastructure	Function	Description	Location
1	Sewer Network	Collect sewage from houses and convey to lifting / pumping stations by gravity	Total length of Collection system: 46.497 km; Size: 150-300 mm dia: Stoneware pipes – 41.121 Km 200-450 mm dia RCC pipes – 6.375 Km Manholes – 1932 Nos	Sewers will be laid underground in the roads and internal streets in the project area. Sewers will be laid in all roads and internal streets in the project area.
2	Sewage Pumping Mains	Convey sewage from lifting stations to higher level manholes; and pumping stations to STP, under pressure	Length: 9.00 km; Size: 150 – 350 mm dia CI pipes	Pumping mains will be laid from 6 lifting stations to nearby higher level manhole/ pumping station, and from pumping station to pumping stations / STP. These will be laid mostly along edge of the roads.
3	Sewage lift stations (LS)	Collect sewage from low level sewer and pump to higher level manholes	Sewage lift stations (LS): 6 Nos. Components of LS <ul style="list-style-type: none"> • Suction well of dia 2.0 m -3.0 m and depth 4.00 – 7.00 m. • Non-clog submersible pump Sets <ul style="list-style-type: none"> • Pump room with control panel box 	Lift well will be constructed in small available extent of land or along the road side. Lift stations are of 2.0 m -3.0 m dia to accommodate two small capacity submersible sewage pumps and 2.0 m x 1.5m size room or Kiosk to accommodate Pump, Control Panel. Lift stations are proposed at following locations:

a)	Lifting Station - 1			1) At Thoppupalayam for Zone- II area: The raw sewage at LS-1 is pumped to main gravity manhole MH No . 263 of Zone-II.
b)	Lifting Station - 2			2) At Beerangimedu (Road side) for Zone- II area: The raw sewage at LS-2 is pumped to main gravity manhole MH No . 171 of Zone-II.
c)	Lifting Station - 3			3) At Ashok Nagar (Road side) for Zone- II area: The raw sewage at LS-3 is pumped to main gravity manhole MH No . 33 of Zone-II.
d)	Lifting Station - 4			4) At Periyavettuvampalayam for Zone- III area: The raw sewage at LS-4 is pumped to main gravity manhole MH No . 74 of Zone-III. (near Chinnavettuvampalayam)
e)	Lifting Station - 5			5) At Panikampalayam for Zone- IV area: The raw sewage at LS-5 is pumped to main gravity manhole MH No . 132 of Zone-IV.
f)	Lifting Station - 6			6) At Kuyavankuttai for Zone- I area: The raw sewage at LS-6 is pumped to main gravity manhole MH No . 1032 of Zone-I.

4	Sub-Pumping Stations (SPS)	Collect sewage from lift stations pump to Main Pumping Station	Sub- Pumping stations: 2 Nos.	Sub pumping stations are proposed to lift the Sewage collected by gravity and from Lifting stations are pumped to Main Pumping stations. Sub Pumping stations are proposed at following locations: New sewage pumping station are proposed in the identified vacant lands belongs to CMWSSB/ GCC/ Govt.(Revenue lands), for which necessary land alienation action initiated.
a)	SPS-I		Components of SPS – I Suction well Dia 3.0 and depth from 4.50 m Non-clog submersible pump sets	1) At Chinnavettuvampalayam for Zone-III area: The raw sewage from SPS-I is pumped to main gravity manhole MH No . 651 of Zone-1 area.
b)	SPS-II		Components of SPS -II <ul style="list-style-type: none"> • Screen dia 3.5 m and depth 5.0m • Grit dia 2.0 m and depth 6.0m • Suction well Dia 5.0 m and depth 7.6 m • Non-clog submersible pump sets 	2) At Chennivalasu for Zone-II area: The raw sewage collected from various lifting stations and through gravity in SPS-II is pumped to Main pumping Station– I of Zone-I area. New Sub- pumping station is proposed in the identified vacant lands Govt.(Revenue lands), for which necessary land alienation action initiated.
4	Main Pumping Stations (MPS)	Collect sewage from lift stations and SPS, pump to STP	Main Pumping stations: 2 Nos.	Main pumping stations are proposed to lift the Sewage collected by gravity, from Lifting stations and SPS are pumped to STP. Sub Pumping

				stations are proposed at following locations:																				
a)	MPS-I		Components of MPS -I <ul style="list-style-type: none">• Screen dia 5.0 m and depth 6.0m• Grit dia 3.50 m and depth 7.0m• Suction well Dia 6.50 m and depth 8.5 m<ul style="list-style-type: none">• Non-clog submersible pump sets	1) At Ayyarkulam for Zone-I area: The raw sewage from MPS-I is pumped to STP at panikampalayam																				
b)	SPS-II		Components of MPS -II <ul style="list-style-type: none">• Screen dia 2.0 m and depth 5.0m• Grit dia 2.0 m and depth 6.0m• Suction well Dia 2.0 m and depth 7.5 m<ul style="list-style-type: none">• Non-clog submersible pump sets	2) At Panikampalayam for Zone-IV area: The raw sewage collected from v lifting stations and through gravity in MPS-II is pumped to STP at panikampalayam. MPS-II is located within the STP site.																				
5	House service connections	Collect sewage from individual houses and convey into network	5700Nos (Domestic& commercial)	Provision has been given from property boundary to nearest manhole.																				
6	Sewage Treatment Plant	Treat the sewage and dispose the treated water with standards	3.14 MLD capacity Components of STP and its size: <table><tr><th>Components</th><th>Size</th></tr><tr><td>Receiving Chamber</td><td>2.0 m x 2.0m x 2.5 m</td></tr><tr><td>Coarse Screen Chamber</td><td>2.6 mx 0.5x 0.45m</td></tr><tr><td>Fine Screen Chamber</td><td>3.2m x 0.5m x 0.45m</td></tr><tr><td>Grit Chamber</td><td>3.5m x 3.5m x 0.75m</td></tr><tr><td>Flow Measuring Channel</td><td>5.0m x 0.45m x 0.45m</td></tr><tr><td>Oil & Grease Tank</td><td>14.0m x 4.0m x 3.0m</td></tr><tr><td>Collection well</td><td>16.0m dia x 5.0m</td></tr><tr><td>Distribution Chamber</td><td>3.0m x 2.0m x 1.5m</td></tr><tr><td>Fluidized Aerobic Bio (FAB) Reactor</td><td>12.0m x 12.0m x 4.0m</td></tr></table>		Components	Size	Receiving Chamber	2.0 m x 2.0m x 2.5 m	Coarse Screen Chamber	2.6 mx 0.5x 0.45m	Fine Screen Chamber	3.2m x 0.5m x 0.45m	Grit Chamber	3.5m x 3.5m x 0.75m	Flow Measuring Channel	5.0m x 0.45m x 0.45m	Oil & Grease Tank	14.0m x 4.0m x 3.0m	Collection well	16.0m dia x 5.0m	Distribution Chamber	3.0m x 2.0m x 1.5m	Fluidized Aerobic Bio (FAB) Reactor	12.0m x 12.0m x 4.0m
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Distribution Chamber	3.0m x 2.0m x 1.5m																							
Fluidized Aerobic Bio (FAB) Reactor	12.0m x 12.0m x 4.0m																							

			Secondary Clarifier	12.0m dia x 3.0m
			Chlorine Contact Tank	9.0m x 3.0m x 2.7m
			Sludge Sump	1.6m dia x 4.0m
			Sludge Thickener	3.5m dia x 3.5m
			Centifuge House	6.0m x 5.0m
			Blower Room	8.0m x 5.0m x 5.3 m

2.3 Sewage Treatment Plant

The sewage treatment plant covers an area of 1.25 Acres. The STP with FAB Technology has a capacity of 3.14 MLD. The Google view of layout of STP is shown in **Figure 2.4**. The Layout of STP is shown in **Figure 2.5**. The **Figure 2.6** shows the STP Process flow diagram



Figure 2-4Google View of STP Site at Panikampalayam

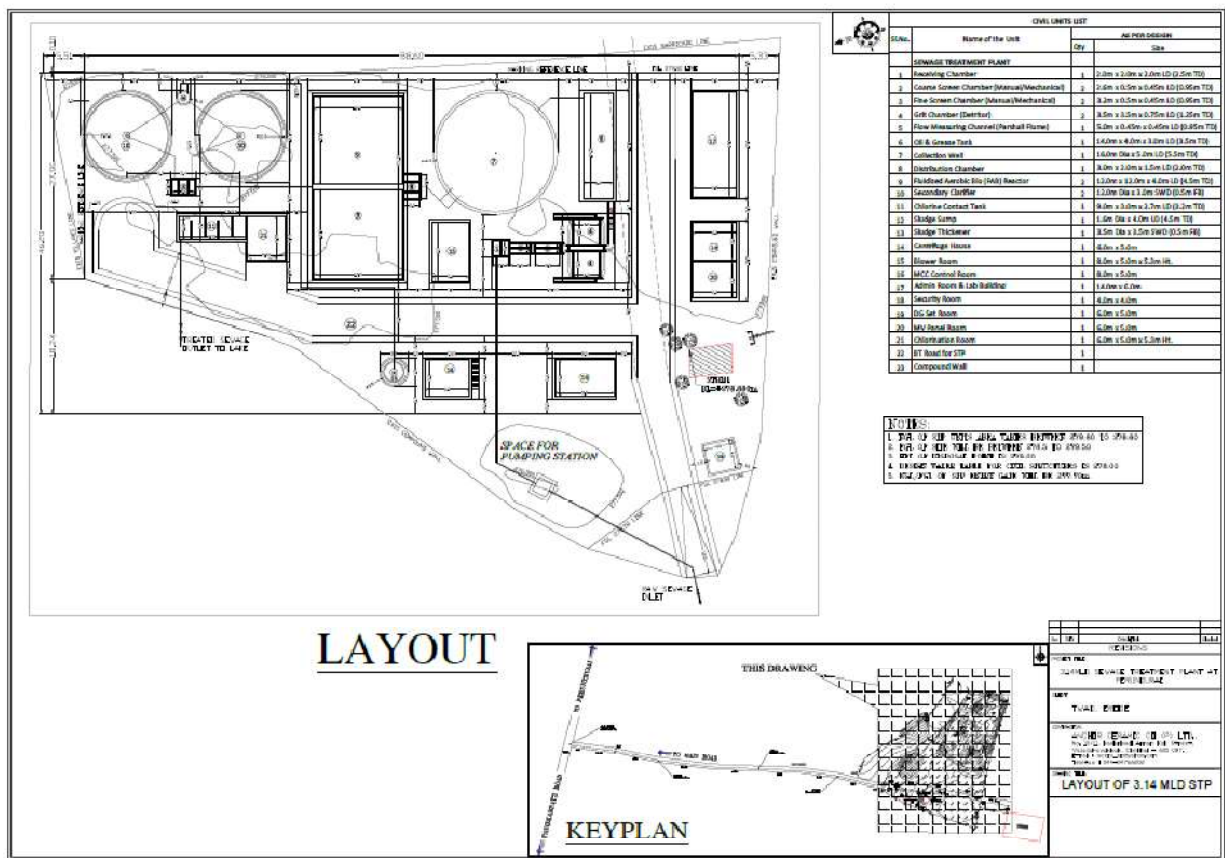


Figure 0.5 - STP Layout

From here the sewage is sent to the grit chamber where fine particles like sand are removed through sedimentation. The sand being heavier than sewage settles down and can be removed. From the grit chamber the sewage is sent to the parshall flume chamber. Parshall flumes are used to check the flow in the plant. An electromagnetic flow meter should be installed in the Parshall Flume. The Screened sewage is then led to the distribution Chamber-I. The sewage from the distribution Chamber-I is then led to two Nos. of aeration tank. Biological treatment takes place in the aeration tank. Air is diffused through air blowers to oxidize organic matters. The overflow from the aeration tank is sent to distribution chamber- II and then to two Nos. of secondary clarifier. The underflow clarifier sludge is returned to the distribution Chamber- I for mixing and the excess sludge from the secondary clarifier is sent to the centrifuge for dewatering. Recirculation of the sludge will take place effectively. The digested sludge is then pumped into the centrifuge through screw pump to separate the solids from the treated effluent. The drain out from the Centrifuge is collected in the filtrate sludge sump which is then sent back to the distribution chamber-I through filtrate pump.

The overflow from the secondary clarifier is sent to distribution Chamber- III and to Chlorine Contact tank where Chlorine is dozed. The treated effluent from the Chlorine contact tank is led to the kuttai.

A 20 kVA DG will be provided as a standby source of power.

2.4.1 Sewage Receiver

The Raw Sewage will be collected through pipe lines into a receiving chamber from where it will be taken into downstream screens. The function of the receiving chamber is to reduce the incoming velocity. A Receiving chamber shall be of adequate size to meet the requirements of workability inside it. The flow from the receiving chamber will lead to screen Chamber.

2.4.2 Primary Treatment

In primary treatment, a portion of the suspended solids and organic matter is removed from the wastewater. The liquid effluent from primary treatment, often contains a large amount of suspended organic materials, and has a high BOD (about 60% of original). Sometimes, the preliminary as well as primary treatments are classified together, under primary treatment.

The organic solids, which are separated out in the sedimentation tanks in the primary treatment, are often stabilized by anaerobic decomposition in a digestion tank or incinerated. The residue is used for landfills or as a soil conditioner. The principal function of primary treatment is to act as a precursor to secondary treatment.

2.4.3 Fine Screening

Fine screens are to be provided for the removal of fine floating material coming with the sewage. One is mechanically operated and the other screen is provided as standby. The fine screens should be capable to screen out most of the medium & fine floating and material such as hair, debris, weeds, paper, rags etc. which could clog the downstream units. The Fine screen shall be inclined with bar screen. It should be of sturdy design and the bar screen shall be of stainless steel flats. The screenings shall be dropped on conveyor above the top of the screen channel. A conveyor system of suitable width shall be provided which shall be adjacent to the screens. The screening materials as collected will drop automatically into a wheelbarrows for its disposal.

2.4.4 De-gritting

Screened sewage will be gravitable to minimum two numbers of Grit separator tank for the removal of grit and small inorganic particulars matter of specific gravity above 2.65 and particle size above 150 microns. One is mechanically operated and the other is provided as standby. The Grit separator tank shall be

of RCC construction complete with mechanical internals and square in size. The grit separated shall be properly collected and be transferred for disposal. The regrettetted sewage shall flow through open channels from the grit separators and confluence into a single channel of suitable width.

2.4.5 Flow Measurement

A Flow measurement unit in the form of ultrasonic flow transmitter will have to be provided in the Par shall Flume and at the outlet of treated effluent, to measure the daily inlet & outfall of quantity.

2.4.6 Secondary Treatment Process

Screened, de-gritted sewage shall be fed into the Fluidized Bio Reactor Treatment system to meet the treated effluent quality prescribed by TNPCB. The outflow from the aeration tank will have 92% BOD reduction. The outlet of Secondary Clarifier will have 40% BOD reduction. Any problem in aeration tank will be due to diffusers provided in the tank. This can be rectified by lifting the diffusers and manually cleaning the blockages. If the blower has any problem, a standby blower is also provided in aeration tank. A part of the sludge from secondary clarifier will be returned back to the aeration tank, to maintain the MLSS concentration. For effective performance of the return sludge system, a stand by pump is essential. The cost should be included in the estimate.

2.4.7 Tertiary Treatment

Tertiary treatment is used to further purify the water contaminants, especially pathogens. The level of tertiary treatment performed depends on the quality of effluent desired. This is determined by the size of the receiving body of water, and the intended use of that water.

2.4.8 Chlorination

This is the most widely practiced means of disinfecting water. The strong oxidizing capacity of chlorine destroys or inhibits the growth of pathogens, reduces the BOD, reduces odour, water color and oxidizes metal ions. The

chlorinators and tonners shall be housed in a separate building to be located adjacent to mixing tank / contact tank with separate room for chlorinators and tonners.

2.4.9 Sludge Handling System

As there is no primary clarifier, only the digested sludge will be separated out in the secondary clarifiers through centrifuge house where the sludge is dewatered.

The dewatered sludge quantity generated will be around 0.96 tons/ day, and it will be used as manure for raising fodder crops and balance quantity if any will be disposed off from the STP site to the nearby municipal compost yard. The filtrate from the centrifuge is again taken to the aeration tank through distribution Chamber-I for effective treatment. For proper dewatering of the sludge, a stand by centrifuge feed pump should be provided and the cost should be included in the Estimate.

The grit and waste from the screens and sludge will be used for fodder cultivation and remaining to Perundurai town Dumping Yard at regular intervals.

Table 2.2: Quality of incoming sewage and treated effluent from STP

Sl.No	Parameters	Unit	Quality of incoming Sewage	Quality of Treated effluent from STP	TNPCB Discharge Standards
1	pH		7.61	8.00	5.5-9.0
2	Total Suspended Solids	mg/l	105	20	30
3	Total Dissolved Solids	mg/l	1250	1050	2100
4	Chlorides (Cl)	mg/l	295	100	1000

5	Oil and Grease	mg/l	12	6	10
6	BOD at 20° C for 5 days	mg/l	180	12	20
7	COD	mg/l	240	100	250

2.4.10 Disposal of Treated Sewage

The treated sewage is disposed through 600mm dia RCCpipe to nearby Kuttai at 50 m from the STP which over flows and flows through gravity toodai and reaches Chennimalaipalayam lake. The sewage will be treated in such a way that can be used for irrigation purposes. The permission for disposal of treated sewage is enclosed as **Annexure-III**

2.4.11 Future Expansion

The functional design of STP has been designed for the intermediate quantity of 3.14 MLD. On account of expansion an additional units would be installed to meet the ultimate stage quantity. The existing land area is sufficient for the future expansion.

2.4.12 Gardening, Landscaping and Tree Plantation

All along the periphery of the STP premises suitable species high rise trees shall be planted creating a buffer zone of 3.0 m wide such that there will be no odour nuisance in surrounding areas and improve aesthetics of the area. Also all along the shoulder of proposed roads, decorative plants shall be plated. All the open spaced around the buildings and process structures shall be provided with grass turfing.

2.5 Design Considerations

- All the Primary Treatment Units have been designed for ultimate capacity of STP (4.26 MLD). In secondary Treatment Units, the Aeration tank-2Nos and

the Secondary Clarifier-2Nos are designed for 3.14 MLD (Intermediate quantity).

- The STP technology to be adopted is Fluidized Aerobic Bio Reactor. No primary sludge generation is involved.
- Compound wall of 1.8m height is proposed around the STP to protect the STP.
- Independent access through SS (Stainless Steel) ladders and connected access through walkway to all units are to be provided.
- Handrails in Stainless Steel are provided on both sides of walkway for safety of the officials during Operation of the STP.
- Suitable capacity of Generator is provided to operate during power failure.
- Inner access road of 3.75m width for 660m length is to be provided to facilitate all season access to the STP components by men and motor vehicles.
- Lab facilities is provided in the STP site for monitoring the Treated water and also TNPCB will monitor the treated water monthly twice and submit the report.
- In STP Administrative Building is provided in STP site in which sanitary facilities and drinking water facilities are provided.

2.6 Land Details

Sl. No	Components (Pumping Station, Lift Stations, Lift manholes, STP)	Location	Available Extent (in Acres)	Required Extent (in Acres)	Land Classification & Ownership	Current Land use	Acquisition /Transfer/ Alienation Status
1	Lift station-1	Thoppupalayam	0.05 Acre	0.05 Acre	TOWN Panchayat land	Vacant, proposed UGSS	Site Handed over to TWAD Board
2	Lift station-2	Beerangi medu	0.05 Acre	0.05 Acre		Vacant, proposed UGSS	Site Handed over to TWAD Board
3	Lift station-3	Ashok Nagar	0.05 Acre	0.05 Acre		Vacant, proposed UGSS	Site Handed over to TWAD Board
4	Lift station-4	Periyavettuvapalayam	0.05 Acre	0.05 Acre		Vacant, proposed UGSS	Site Handed over to TWAD Board
5	Lift station-5	Panickampalayam	0.05 Acre	0.05 Acre		Vacant, proposed UGSS	Site Handed over to TWAD Board
6	Lift station-6	Kuyavankuttai	0.05 Acre	0.05 Acre		Vacant, proposed UGSS	Site Handed over to TWAD Board
7	SPS-I	Chinnavettuvapalayam	0.2 Acre	0.1 Acre	State highways Land	Vacant, proposed UGSS	To be applied
8	SPS-II	Chennivalasu	0.5 Acre	0.2 Acre	Govt (Revenue land)	Vacant, proposed UGSS	Land Alienation applied
9	MPS-I	Iyyarkulam	0.5 Acre	0.5 Acre	Govt	Vacant,	Land alienation

					(Revenue land)	proposed UGSS	applied and got approved. Site Handed over to TWAD Board
10	MPS-II	Panickampalaya m	0.25 acre	0.25 acre	Town Panchayat Own Land	Dumping yard, proposed UGSS	Site Handed over to TWAD Board
11	STP	Panickampalaya m	2.5 acre	1.25acre	Town Panchayat Own Land	Dumping yard, proposed UGSS	Site Handed over to TWAD Board

3 ENVIRONMENTAL REGULATORY FRAMEWORK

3.1 Introduction

This section reviews the policies, regulations and administrative framework within which the project works are to be implemented. The review includes the Environmental, Climate Change and Social Management Framework (ECSMF) developed by TNUIFSL, Operational policies / directives of Funding Agencies through TNUIFSL, sector-specific Environmental Policies & Regulations of the Government of India and the institutional profile of various agencies such as Tamil Nadu Pollution Control Board (TNPCB) and other stakeholders associated with the project.

3.2 Environmental Legislations

Salient features of some of the major laws that are applicable are given below;

3.2.1 Water (Prevention and Control of Pollution) Act, 1974

The basic objective of this Act is to maintain and restore the wholesomeness of the country's aquatic resources by prevention and control of pollution. Consequently, the Water Act, a Central law, was enacted under Article 252(1) of the Constitution, which empowers the Union Government to legislate in a field reserved for the States. All the States have approved implementation of the Water Act. As during operation, it is likely that the ground water quality and surface water quality may be altered. Therefore this act is applicable to the proposed project.

3.2.2 Air (Prevention and Control of Pollution) Act, 1981

The Union Government under Article 253 of the Constitution passed this Statute. This Act provides for the prevention, control and abatement of air pollution and confers powers to the Central and State Pollution Control Board with a view to carry out the aforesaid purposes. This act is applicable to the proposed project.

3.2.3 Environment (Protection) Act, 1986

The Union Government under Article 253 of the Constitution passed this Statute. The Environment (Protection) Act, 1986 seeks to achieve the objective of protection and improvement of environment and for matters connected therewith. This legislation enables the co-ordination of activities of the various regulatory agencies; setting up of an authority or authorities with advocate powers for environmental protection etc., This Act is applicable to the proposed project.

Objective of this Act is to provide the protection and improvement of environment (which includes water, air, land, human being, other living creatures, plants, microorganism and properties) and for matters connected therewith.

3.2.4 Public Liability Insurance Act, 1991

The Act provides public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances. A Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

3.2.5 Solid Waste Management Rules, 2016

The SWM Rules, 2016 contain two schedules prescribing the details as mentioned further. These schedules should be referred for complying with the specifications and the standards prescribed therein.

Schedule – I : Specifications for Sanitary Landfills

Schedule – II : Standards for Processing and Treatment of Solid Waste

Schedule No.	Sections	Details Prescribed
Schedule – I Specifications	A.	Criteria for site selection
	B.	Criteria for development of facilities at the sanitary landfills

for Sanitary Landfills	C.	Criteria for specifications for land-filling operations and closure on completion of land filling
	D.	Criteria for pollution prevention
	E.	Criteria for water quality monitoring
	F.	Criteria for ambient air quality monitoring
	G.	Criteria for plantation at landfill site
	H.	Criteria for post care of landfill site
	I.	Criteria for special provisions for hilly areas
	J.	Closure and rehabilitation of old dumps
Schedule – II Standards for Processing and Treatment of Solid Waste	A.	Standards for composting
	B.	Standards for treated leachates
	C.	Standards for incineration

3.2.6 The Noise Pollution (Regulation And Control) Rules, 2000

The Union Government has laid down statutory norms to regulate and control noise levels to prevent their adverse effects on human health and the psychological well being of the people. Under the new regulation, different areas and zones are to be identified as industrial, commercial, and residential or silence areas and anyone exceeding the specified noise level would be liable for action. In industrial areas, the noise level limit during the day time (6 am to 10 pm) is 75 decibels and during night (10 pm to 6 am) 70 decibels.

Similarly, for commercial areas day time limit is 65 decibels and night limit is 55 decibels. In the case of residential areas, the limits are respectively 55 decibels and 45 decibels and for the silence zones, 50 and 40 decibels.

3.3 World Bank Policies

Following are the Operation Policy & Directorate of the World Bank.

3.3.1 Environmental Assessment OP/BP 4.01

This requires the borrower to screen projects upstream in the project cycle for potential impacts. Thereafter, an appropriate EA approach to assess, minimize /

enhance and mitigate potentially adverse impacts is selected depending on nature and scale of project. The EA needs to be integrated in the project development process such that timely measures can be applied to address identified impacts. The policy requires consultation with affected groups and NGO's to recognize community concerns and the need to address the same as part of EA. For this project, there is no objection from the public.

3.3.2 Cultural Property - OP 11.03

Requirements - World Bank's Operational Policy Note 11.03 which aims at preserving and avoiding the elimination of structures having archaeological (prehistoric), paleontological, historical, religious and unique natural values. Projects that could significantly damage non-replicable cultural properties are declined for funding and the Bank will in turn assist protection and enhancement of cultural properties encountered in the project rather than leaving that protection to chance. The project does not attract this Policy.

3.3.3 Natural Habitats – OP/BP 4.04

This policy sets out the World Bank's policy on supporting and emphasizing the precautionary approach to natural resource management and ensuring opportunities for environmentally sustainable development. As per this policy, projects that involve significant conversion or degradation of critical natural habitats are not supported by the Bank. The project does not attract this Policy.

3.3.4 Forests – OP/BP 4.36

This sets out specific policy on protection of forests through consideration of forest related impacts of all investment operations, ensuring restrictions for operations affecting critical forest conservation areas, and improving commercial forest practice through use of modern certification systems. The policy requires consultation with local people, the private sector and other stakeholders in forest area. The project does not attract this Policy.

3.3.5 Pest Management - OP 4.09

This policy supports environmentally sound pest management, including integrated pest management, but does not prohibit the use of highly hazardous pesticides. Pest Management is the borrower's responsibility in the context of a project's EA. The same will be taken care during the operation of the system.

3.3.6 Involuntary Resettlement - OP/BP 4.12

This policy is implemented in projects which displace people. It requires public participation in resettlement planning as part of EA for projects. It is intended to restore or improve income earning capacity of displaced populations. The project does not attract this Policy.

3.3.7 Indigenous Peoples – OP/BP 4.20

The purpose of this policy is to ensure indigenous people benefit from Bank financed developed and to avoid or mitigate adverse affects on indigenous people. It applies to projects that might adversely affect indigenous peoples or when they are targeted beneficiaries. Requires participation of indigenous people in creation of "indigenous people development plans". The project does not attract this Policy.

3.3.8 Sustainability Guidelines

This policy includes:

- a preliminary appraisal, called screening, to determine the environmental, social and climate relevance and environmental, social and climate risks of a FC measure; and, if the relevance is affirmed
- the definition of the scope (scoping) to identify and assess the FC measure's environmental, social and climate-relevant impacts and risks more accurately, including potential to protect the climate and increase the adaptive capacities of the target group in close cooperation with the executing agency

- The design and implementation of an ESDD, in-depth climate adaptation assessment and/or in-depth climate mitigation assessment in order to examine all or individual aspects of the FC measure, including participatory approaches to involve affected local groups and keep the public in the partner country informed.

The Sustainability Guideline of KfW describes principles and procedures to assess the environmental, social and climate impacts during the preparation of measures financed by KfW. According to the guidelines, all funding activities of KfW must be subject to an ESIA and a climate change assessment as defined in this guideline. SG of the KfW has been adequately considered while updating the ESF into ECSMF to include the climate change perspective with a view to ensuring climate resilience and mitigation measures during planning and implementation of urban infrastructure projects

3.4 Legal/Regulatory Clearances For The Project

The following are the list of approvals required for the implementation of proposed project.

3.4.1 Clearances/ NOC Required from Competent Authority

The summary of applicable Clearance / NOC required for the proposed project is given in **Table 3.1**.

Table 3.1 - Clearances/ NOC Required from Competent Authority

S.NO	Activity	Clearance / NOC Required	Statutory Authority	Status
1	Land for Proposed STP	No objection certificate	Town Panchayat own Land	Permission obtained
2	Establishment of Proposed STP	Consent To Establishment under Air and Water Act	TNPCB	Permission obtained
3	Operation of STP	Consent To Operate under Air and Water Act	TNPCB	Permission will be obtained before operation of STP

5	Sewer line and Pumping main crossing and laying near local roads and Highways	No objection certificate	Highways Authority	Permission will be obtained prior to execution
6	Disposal of Treated Sewage	No objection certificate	Local Authority	Permission obtained
7	Working of labour	License	Labour welfare board	Permission obtained

4 BASELINE ENVIRONMENTAL STATUS

4.1 Preamble

This chapter depicts the establishment of baseline for valued environmental components, as identified in project town of Perundurai, Erode district, Tamil Nadu. The primary baseline data monitored covering three (3) months i.e. (April-June 2017), and secondary data was collected from Government and Semi-Government organizations. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) Ltd, Chennai, and a MoEF&CC approved Environmental Testing Laboratory for the following Terrestrial environmental components.

- **Meteorology:** Temperature, Relative Humidity, Rainfall, Wind Speed & Direction-
- **Ambient Air Quality:** Particulate matter <10 micron size (PM₁₀), Particulate matter <2.5 micron size (PM_{2.5}), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Lead (Pb), Ozone (O₃), Benzene (C₆H₆), Benzo (a) pyrene (C₂₀H₁₂), Arsenic (As), Nickel (Ni) & Ammonia (NH₃), -
- **Ambient Noise Levels:** Day equivalent noise levels, Night equivalent noise levels -
- **Inland Water Quality:** Groundwater Quality, Surface Water Quality
- **Soil Quality**
- **Ecological Environment**
- **Socio economic Status**

4.2 Environmentally/Ecologically Sensitive Areas

The details of environmentally/ecologically sensitive areas covering within 15 km from project boundary are given in **Table 0-2** and **Figure 4-2**.

Table-4.1 -Environmentally Sensitive Areas within 15km from Project Boundary

S.No	Areas	Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Vellode Bird Sanctuary≈5.7 Km towards ESE
2	Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Noyyal River ≈14.98 Km towards SSE
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Vellode Bird Sanctuary≈5.7 Km towards ESE
4	Inland, coastal, marine or underground waters	Nil
5	State, National boundaries	Nil
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Chennimalai Lord Murugan Temple≈11.23Km towards S
7	Defence installations	Nil
8	Densely populated or built-up area (Nearest Town,City,District)	Perundurai Town ≈1.6Km towards NW

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9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Schools & Colleges			
		S. No	Schools & Colleges	Distance (~km)	Direction
		1.	Sri Durga matriculation higher school	3.06	SSW
		2.	Kongu Polytechnic college	1.55	NE
		3.	Kongu Velalar Polytechnic College	6.69	WNW
		4.	Kongu Engineering College	1.93	NE
		5.	M.P Nachimuthuu M.Jaganathan Engineering College	8.88	SSE
		6.	Maharaja college for women	2.95	NE
		7.	Nandha Engineering College	4.04	NE
		8.	National Management College	5.68	NW
		9.	Palaniswamy College of Art	2.9	NNE
		10.	Perundurai medical college	3.65	NW
		11.	Vidhya Mandhir Institute of Technology	5.44	SSW

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			Religious places		
		12.	Chennimalai Lord Murugan Temple	11.23	S
			Hospitals		
		13.	Shree Shanti Hospital	2.04	NNW
		14.	MNP Nursing Home	3.17	NW
			Tourist places		
		15.	Vellode Bird Sanctuary	6.08	E
			Others		
		16.	SIDCO	4.36	WSW
		17.	Perundurai Railway Station	3.89	E
10	Areas containing important, high quality or scarce resources, (groundwater resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	Nil			
11	Areas already subjected to pollution or environmental damage (those where existing legal environmental standards are exceeded)	No Notified/Recognized polluted area within 15Km distance.			
12	Areas susceptible to natural hazard which could cause the project to present environmental problems, (earthquakes, subsidence, landslides, erosion or extreme or adverse climatic conditions)	This area is generally plain not prone to any natural disasters. The study area falls under Zone-II, according to the Indian Standard Seismic Zoning Map.			

Study Area

A 10Km radial distance with the proposed project site as the epicenter has been identified as the General study area for assessing the baseline environmental status. The

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core study area is the project area and its immediate surroundings to the tune of 1.0 Km radius from the boundary. Further the Project Impact/Influence Area (PIA) is 10Km from the boundary of the core area covering Perundurai Town, Erode district, Tamil Nadu.

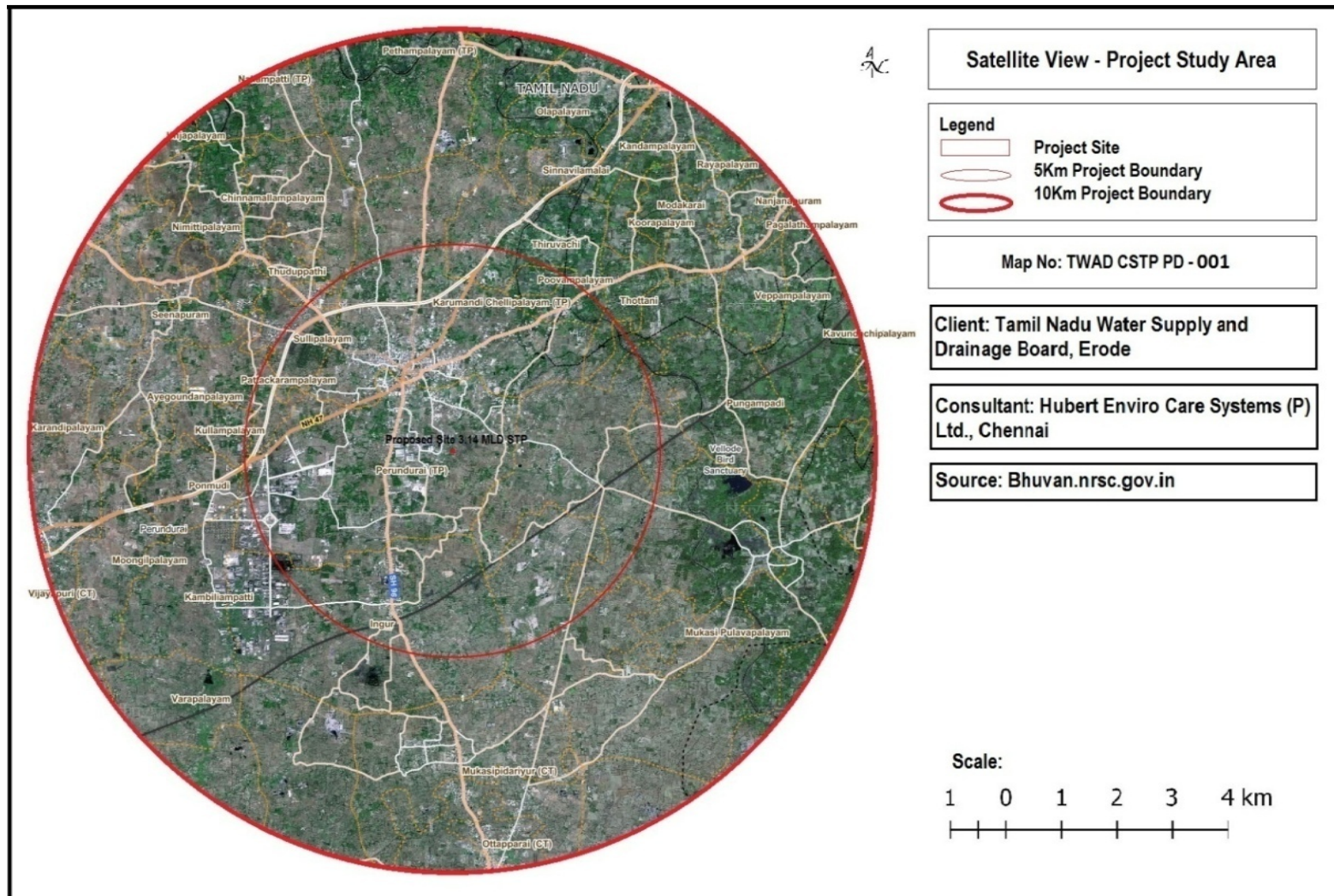


Figure 4-1 Map showing the Satellite Image of the study area

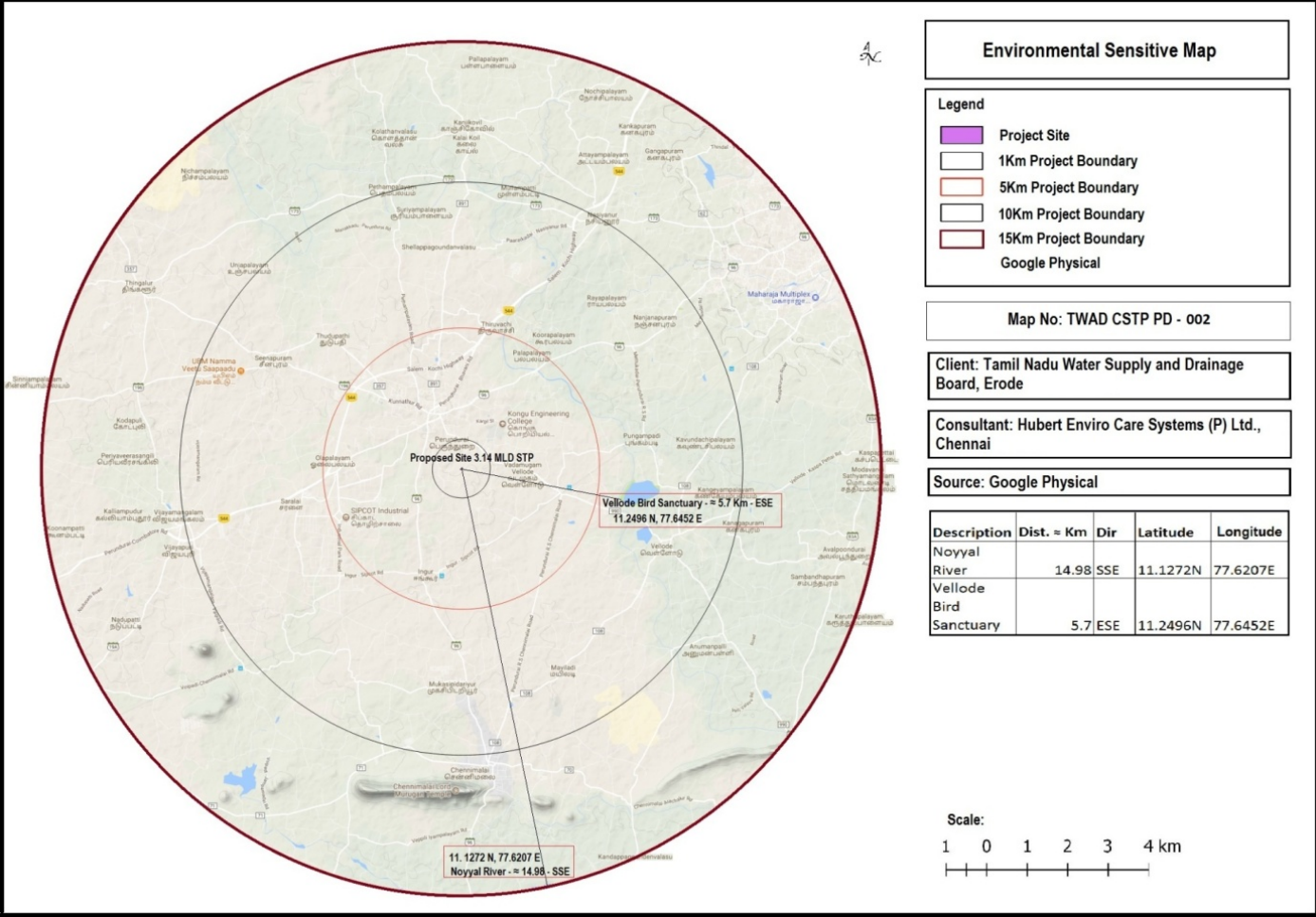


Figure 4-2Environmental sensitive areas covering within 15 km from project boundary

4.3 Physical Conditions

In this section, the physical conditions of PIA district are discussed in general and wherever possible references to the conditions prevailing in the study area in particular are also provided. The physical conditions are discussed as under:

- District profile
- Drainage, land use, geology, Physiography
- Natural resources
- Climatic conditions, seismic zone characteristics and natural hazard

4.3.1 PIA District Profile

The district lies between 10°36' and 11°58' degrees of northern latitude and between 76°49' and 77°58' Degrees of the Eastern Longitude. It has an area of 5,722.64 sq.kms and is bounded by Karnataka State in the North, Udhagamandalam District in the North West, Coimbatore, Tirupur District in the West, Tirupur District in the South, Karur District in the South East and Namakkal, Salem districts in the East.

Source : <http://dcmsme.gov.in/dips/2016-17/DIP.ERODE.2015.16.pdf>

4.3.2 Climatic Conditions

The western part of the Erode district enjoys a salubrious climate because of the hilly region, whereas the central and eastern parts of the district are hot and humid. The cooler and pleasant climate prevails in the hilly regions. The weather is extremely pleasant during the period from November to February both in the plains and on the hills. Mornings in general are more humid than the afternoons. The relative humidity varies from 65 to 87 percent during the northeast monsoon period between October and November. The hot weather begins early in March, the highest temperature being reached in April and May. Highest temperatures are recorded during the months of April and May with temperatures reaching 40°C. The weather in the plains during the summer i.e., from April to June is generally dry and hot. Weather cools down progressively from about the middle of June and by December. The night temperatures are the lowest in the hills.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf

4.3.3 Natural resources of Erode district

4.3.3.1 Forest Resources

In terms of natural resources such as forests, rivers, climate soil and minerals the district is fairly endowed. The forest occupies over 29% of the total area in the district. The district has a total forest area of 2.43 lakhs hectares, with Sathyamangalam and Bhavani taluks together accounting for as much as 94% of this area. Sathy taluk alone accounts for 61% of the forest area in the district. Sathy, Thalamali, Burgur and Anthiyur are the 4 forest ranges earning under Divisional Forest Office, Erode. The important forest products are sandalwood, rosewood, timber, teak, bamboo, firewood, charcoal, tamarind and herbs. There is still vast scope for tapping the forest potential.

Source: http://shodhganga.inflibnet.ac.in/bitstream/10603/102430/10/10_chapter%203.pdf

4.3.3.2 Irrigation

Canals are the major source of water for irrigation in the district, accounting for about 57.00 percent of the total area irrigated in the district. Dug wells, and bore wells are accounting for about 32.55 and 9.09 percent of the total area irrigated respectively. Other sources and tanks accounting for about 1.21, and 0.14 percent respectively. It is observed that the well irrigation is the highest in Dharapuram block followed by block Andhiyur.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf

S.No	Irrigation by Difference Sources	Areas in Ha
1.	Dug wells	52474
2.	Tube wells/ Bore wells	14659
3.	Tanks/Ponds	228
4.	Canals	91904
5.	Other Sources	1952
Net irrigated area		161217
Cross irrigated area		184904

4.3.3.3 Agricultural Resources

Agriculture is a major occupation of the district. According to recent agriculture census, the number of operational land holdings was 3,26,499 covering an area of 505615.74 hectare, out of which net area sown is 283727 hectares and an area of 26486 hectares is sown more than once. Paddy is grown extensively as an irrigated crop in Erode, Gobi and Dharapuram taluks. Cholan is widely grown as an irrigated crop in Dharapuram and Erode taluks. Cotton, Groundnut, Gingelly and Turmeric are also grown exclusively in this district. District is famous for Turmeric cultivation and on an average the Turmeric crop is raised in an area of 5500 hectares. Banana is also grown in 3000 hectares annually.

Source:

http://shodhganga.inflibnet.ac.in/bitstream/10603/102430/10/10_chapter%203.pdf

4.3.3.4 Mineral Resources

Major minerals quarts and Feldspar are occurring in this district mainly in Perundurai Taluk. Quarts available here is of good quality and is used in electronic industry and the Feldspar is consumed by the ceramic industry.

Black Granites are occurring in Thalavadi, Mallanguli, Thingalur in Sathyamangalam Taluk and in Bargur and Nerinjipettai areas of Bhavani Taluk. Black Granite available is medium black in colour with green background and white spots. Multi Colour Granites are found in Mallanguli, Alambadi, Sivanmalai areas. Rough stone for construction are available in all the taluks in particular rough stone quarries and stone crushers have been established in Ammapettai, Bhavanisagar areas. Sand deposits are available in Bhavaniand Cauveri river beds. Sand leases had been granted in Bhavani and Cauveri river beds.

Source: <http://dcmsme.gov.in/dips/2016-17/DIP.ERODE.2015.16.pdf>

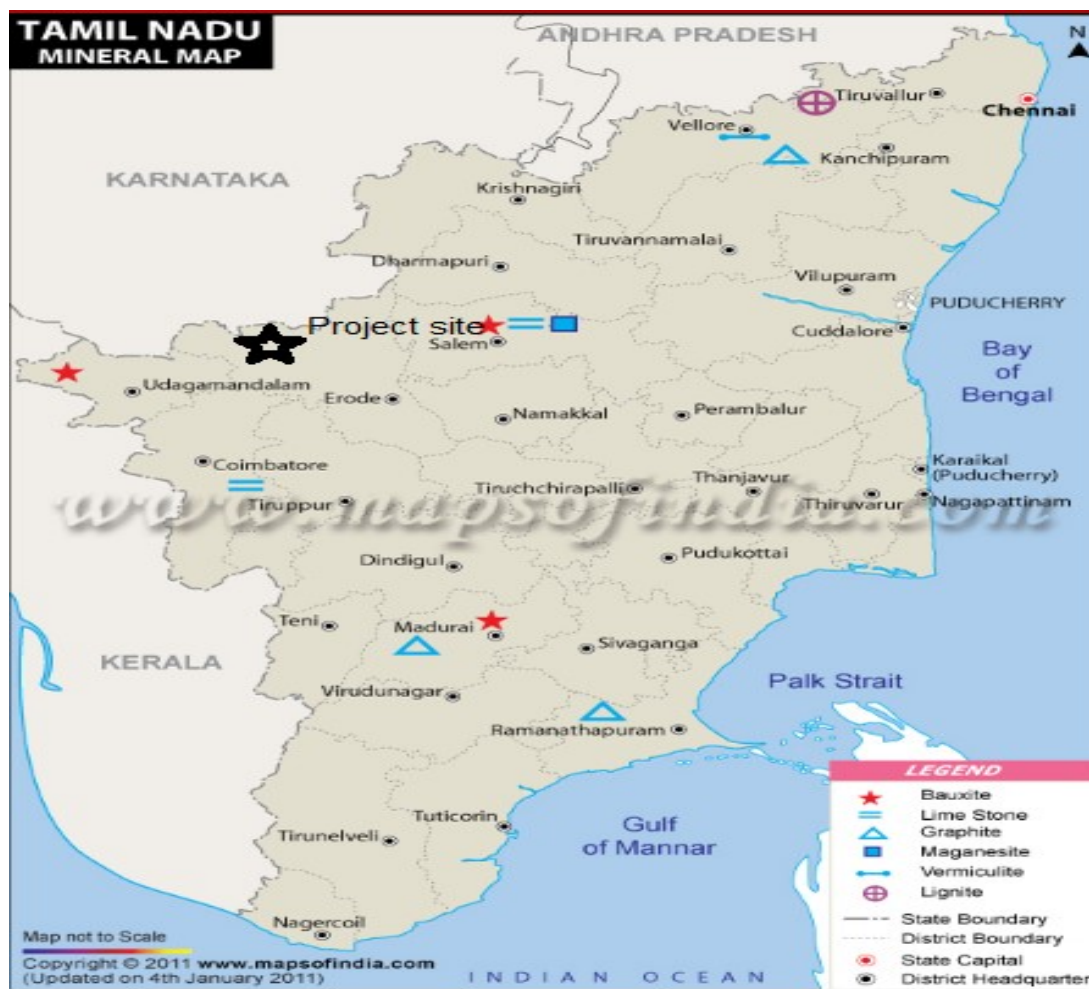


Figure 4-3 Mineral Map of Tamil Nadu

4.3.4 Land Use & Land Cover

The total geographical area of the district is 572,264 hectares. Of these 199,389 hectares have been brought under cultivation as net area sown. This accounts for 34.8% of the total area of the district. Area sown more than once is 25,397 hectares i.e. 12.73% of the total net area sown. Total cropped area is 224,786 hectares i.e. 39.2% of the total area in the district. Forests account for 227,511 hectares i.e. 39% of the total area. Cultivable waste has been reduced to mere 1707 hectares in the district. Less than 9.2% of the total area is put to non-agricultural use (53,004 hectares). However, 14.5% is accounted for by fallow lands (83,368 hectares). Trees, crops, groves, Orchards etc. together account for about 0.6% of the total area in the district. Of the 199,389 hectares

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brought under cultivation, 25397 hectares are sown more than once, thus enhancing the total area cropped to 224,786 hectares. If this is taken into account, the percentage of total cropped area to total area of the district will work out to 39.2% thus publishing better utilization of available land resources in the District .Details of district land use/land cover statistics for Erode district given in **Table 4-3** and Land Use map of Erode District is given in **Figure 4-4**. Land Use pattern of Erode District is given in **Figure 4-5**.

Table 4-3 District land use/land cover statistics for Erode District

S.No	Division of Land Use/Land Cover	Area in Sq.Km	Area in Hectare	Area in Acres	Area in %
1.	Forest, Evergreen/Semi-evergreen	1133.85	113385	280180	13.89
2.	Agriculture, Plantation	342.27	34227	84576.63	4.19
3.	Barren/uncultivable/ Wastelands, Scrub land	193.85	19385	47901.3	2.37
4.	Grass/Grazing	136.53	13653	33737.25	1.67
5.	Builtup,Urban	112.66	11266	27838.85	1.38
6.	Wetlands/Water Bodies, River/Stream/canals	71.97	7197	17784.15	0.88
7.	Builtup,Mining	14.58	1458	3602.791	0.18
8.	Barren/uncultivable/ Wastelands, Barren rocky	8.42	842	2080.624	0.10
9.	Forest, Forest Plantation	3.17	317	783.3229	0.039
10.	Agriculture, Crop land	3864.55	386455	954949.6	47.33
11	Agriculture, Fallow	839.71	83971	207496.5	10.28
12.	Forest, Deciduous	719.81	71981	177868.7	8.82
13.	Forest, scrub forest	413.81	41381	102254.5	5.068
14.	Builtup,Rural	207.98	20798	51392.9	2.55
15.	Wetlands/Water Bodies, Reservoir/Lakes/Ponds	97.82	9782	24171.81	1.20
16.	Barren/uncultivable/ Wastelands, Salt Affected land	3.42	342	845.0991	0.042

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17.	Wetlands/Water Bodies, Inland Wetland	0.58	58	143.3209	0.007
18.	Barren/uncultivable/ Wastelands, Sandy area	0.03	3	7.41315	0.0004
	Total	8165.01	816501	2017614.8	100.0

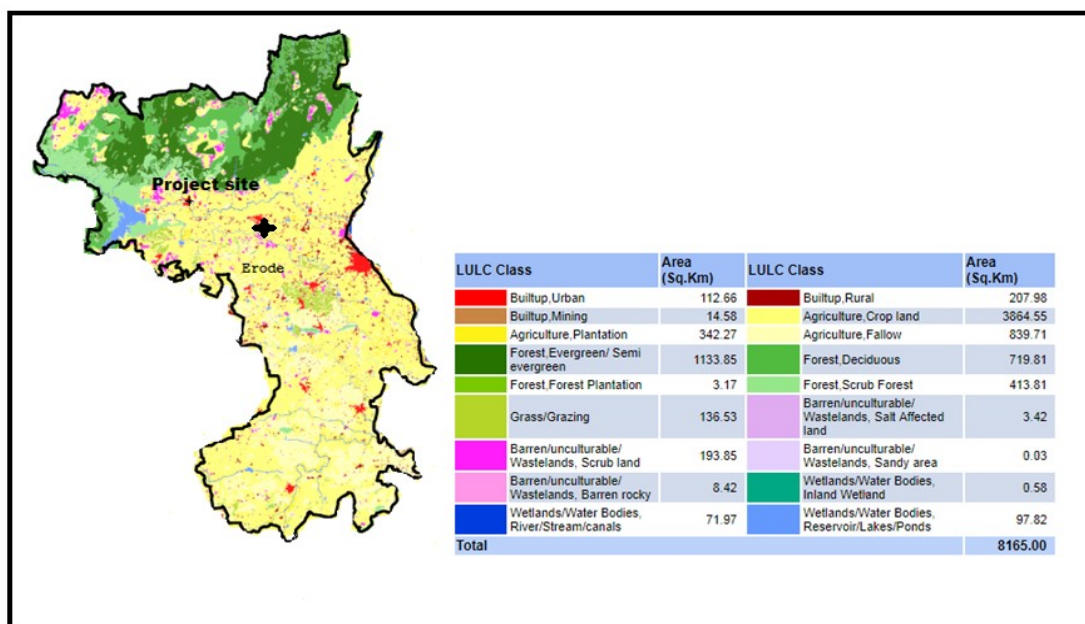


Figure 4-4 Land Use Map of Erode District

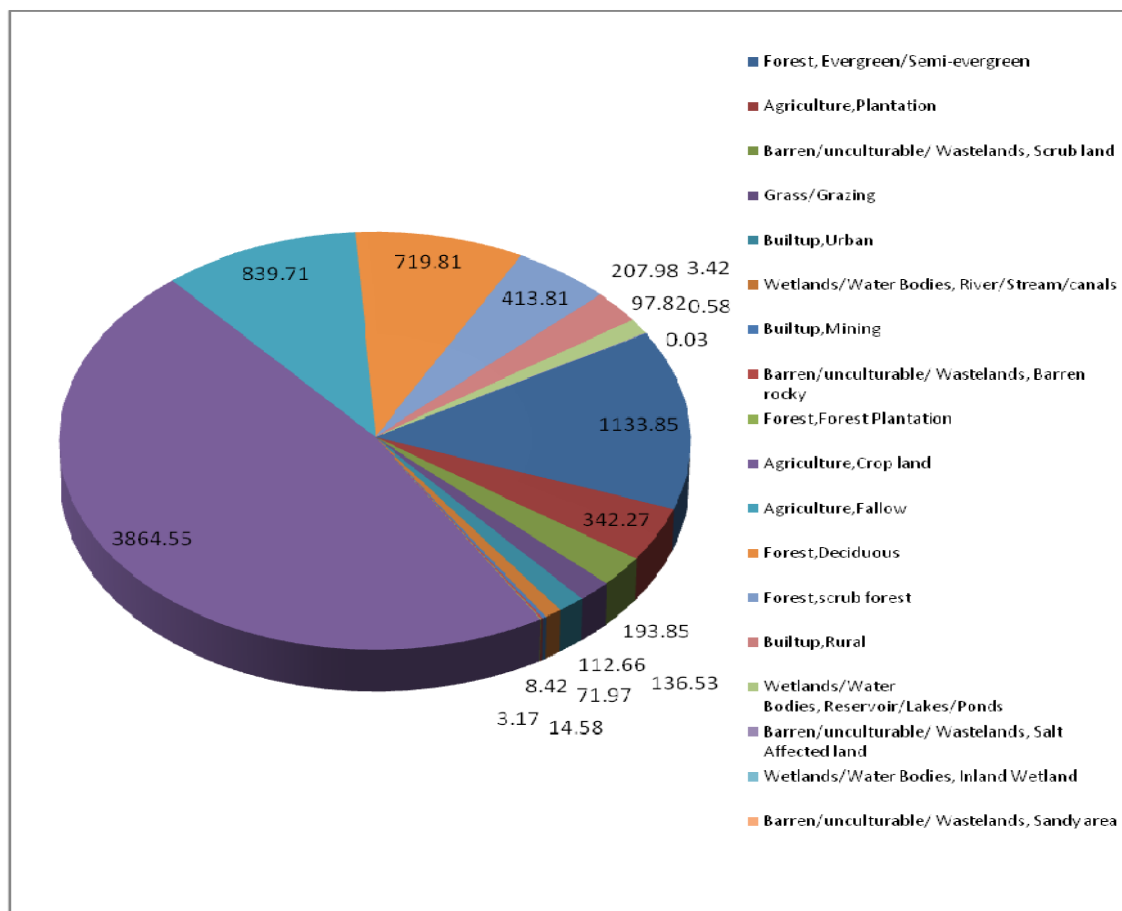


Figure 4-5 Land Use/ land cover Pattern of PIA district

4.3.5 Topography

Erode District lies 171.91 meters above mean sea level. The soil of the District is predominantly red sandy to red gravelly type in the taluks of Bhavani, Erode, and Perundurai. Red loamy soil occurs at the bottom of the valleys in the taluks of Gobichettipalayam and Sathyamanagalam. Physical map of Erode is given in **Figure 4-6**.

Source: <http://dcmsme.gov.in/dips/2016-17/DIP.ERODE.2015.16.pdf>



Figure 4-6 Physical map of Tamil Nadu

4.3.6 Geology of PIA District

Erode district of Tamil Nadu falls in the south of Palaghat-Cauvery shear zone. The Geophysical Mapping was taken up to delineate the chromitite bands within the ultramafic sequence. The study indicate a gravity high zone in the central part of the toposheet-58F/14 with magnetic bipolar anomalies, correlated to charnockite group of rocks and a gravity low with sparse magnetic variations in the south-western part around Kolapalli suggesting anorthosite body.

Source: https://www.gsi.gov.in/webcenter/ShowProperty.jsessionid=0Z55efYJ_BESqyoTUVmGW1xLxCw-v2tcVblEs3RAfnoIcg8zvPf2!-107032927!-68022989?nodeId=%2FUCM%2FDPORT1GSIGOVI063287%2F%2FidcPrimaryFile&revision=latestreleased

4.3.7 Geomorphology of PIA District

The Erode district forms part of the uplands of the state. Physiographically the district can be divided into hilly area, the upland area and plains area. The prominent geomorphic units identified in the district through interpretation of Satellite imagery are 1) Structural hills, 2) Inselberg, 3) Ridges, 4) Valley fill, 5) Pediments, 6) Shallow Pediments.

The hilly area is represented by the Western Ghats in the northwestern part of the district, the Biligiri Rangan hills in the north, Bodamalai Betta hills in the northwestern parts and Konbattarayan hills in the north central part of the district. Konbattarayan hill (1699 m above MSL) is the highest peak in the district while Moyar Gorge is a picturesque gorge in the Western Ghats through which Moyar river traverses.

The Kongunadu uplands lie south of Bhavani River and the Lower Bhavani canal passes through these uplands. Scattered hillocks and knolls of moderate elevations occur within these uplands. The plains area is characterized by an undulating topography with a general gradient due east and southeast. The plains are limited to the east and southwestern border of the district. The plains west of Cauvery river are known as Lower Cauvery plains.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf

4.3.8 Hydrogeology of PIA District

Erode district is underlain entirely by Archaean Crystalline formations with Recent alluvial deposits occurring along the river and streams courses and colluvium of valley-fills. The important aquifer systems in the district are constituted by weathered, fissured and fractured crystalline rocks and the recent alluvial deposits. The porous formations in the district are represented by alluvium and colluvium. The alluvial deposits are confined to the major river and stream courses only. Ground water occurs under phreatic conditions. The maximum saturated thickness of these aquifers is upto 5 m depending upon the topographic conditions. The area lying at the foot hill zones which are seen in the northern parts of the district is underlain by the colluvial material derived from the nearby hill ranges comprising sands and gravels. The maximum saturated thickness of these aquifers is upto 20 m depending upon the topographic conditions. Ground water occurs under phreatic conditions. Hydrogeology map of PIA district is shown in **Figure 4-7**.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf

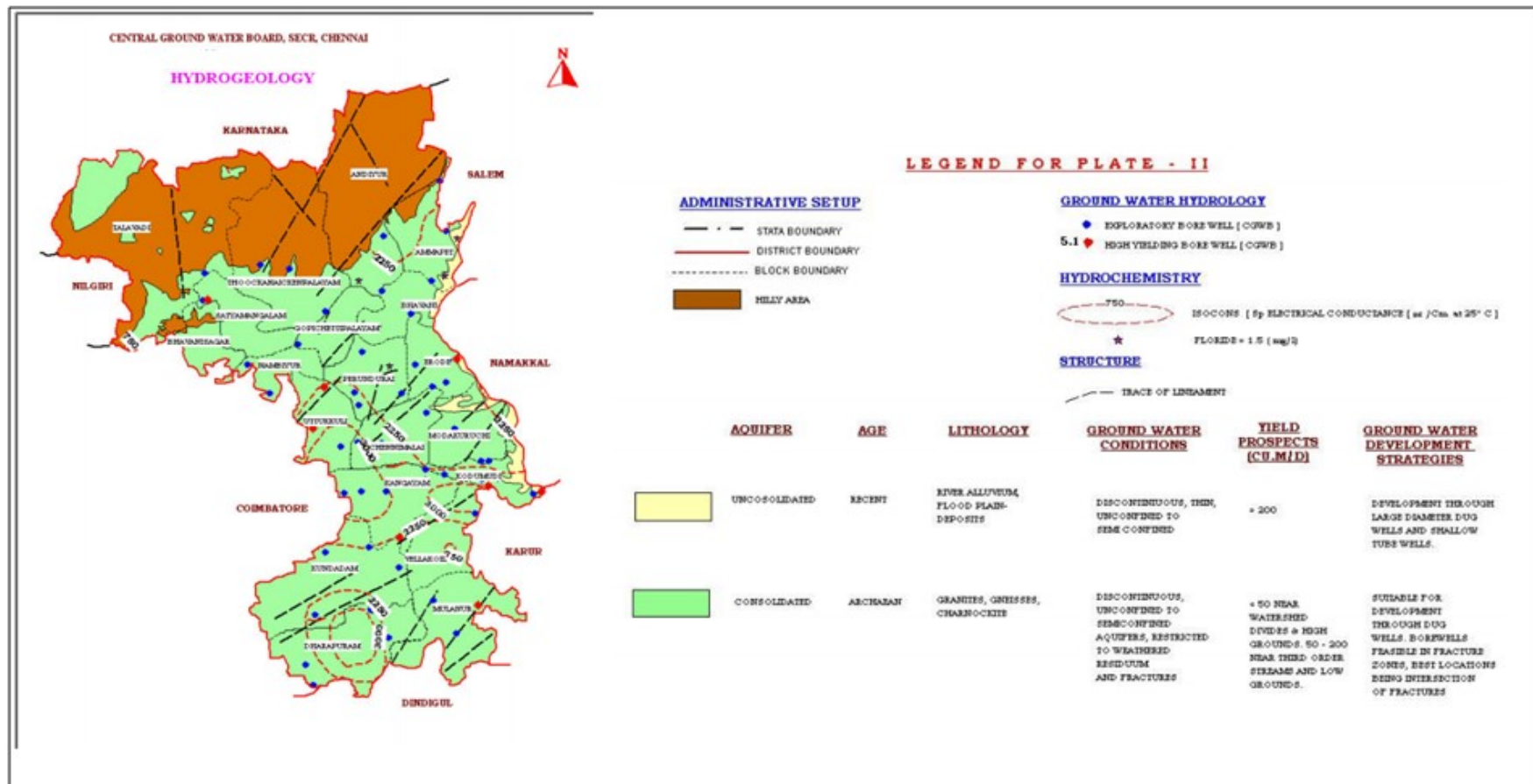


Figure 4-7 Hydrogeology Map of PIA district

4.3.9 Drainage Pattern in PIA District

The river Cauvery flows along the eastern border of the district. Most of the rivers and streams drained the district form the tributaries to the Cauvery river. The Bhavani river, which has its origin in the Silent Valley range of Kerala State, enters the district about 30 km west of Bhavanisagar and flows more or less in an easterly direction and confluences with the river Cauvery at Bhavani town. Moyar river is a major tributary of the river Bhavani. The river Bhavani is tamed by a reservoir namely the Bhavanisagar.

The Palar river originating in the south Bargur forest flows in north-easterly and easterly directions. Maniyar Halla, Tatta Halla, Kathala Halla, Yemahatti Halla and Dinnepattipaliam are the important minor tributaries of the Palar river. The Noyil River draining the southern part of the district has its origin in the Boluvampatty valley of the Vellingiri hills of Western Ghats enter the district flowing from Coimbatore district. The Amaravathi river and its tributaries drain the southern part of the district. It has its origin in Kerala state and passing through the adjoining districts, enters the district at about 5 km south of Salempalayam. The major tributaries to Amaravathi river are the Uppar Odai, Shanmukha Nadi, Nallathangal Odai and Vattamalakkarai. The important streamlets flowing in the northern side are the Bale Halla and Anaikodu Halla, which form tributaries to Suvaranavathi river flowing into Karnataka.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf

4.3.10 Soils in PIA District

The soils of Erode district can be broadly classified into 6 major soils types viz., Red calcareous soil, Red non calcareous soil, Black Soil, Alluvial and Colluvial soils, Brown soil and Forest soil. Major part of the district covered by red calcareous soils. They are mostly sandy to loamy and characterized by the hard and compact layer of lime. The red non-calcareous soils are seen in Erode, Perunthurai and Gopichettioalayam taluks. The black soils are occurring as patches in four taluks. Brown soil occupies only a small portion of Bhavani, Kangayam and Gopichettipalayam taluks. Alluvial soils are found in small patches along the Noyil and Bhavani rivers and the Colluvial soils are found in the foothills of Western Ghats. The Soil Map of PIA District is given in **Figure 4-8**.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf

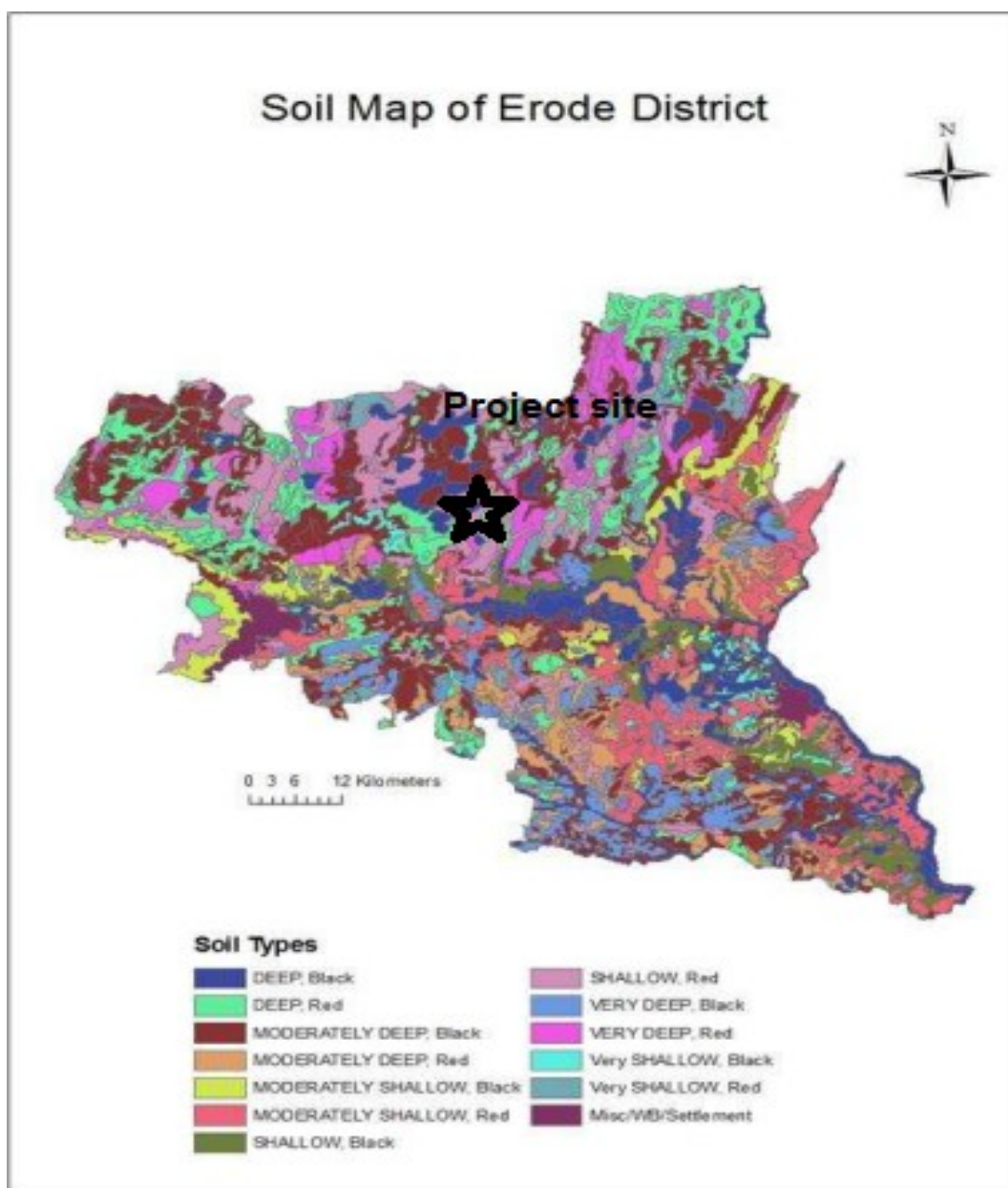


Figure 4-8 Soil Map of PIA district

4.3.11 Seismicity

As per the IS:1893 (Part-1) 2002 of Bureau of Indian Standards (BIS), the project location/study area falls in Zone II, which is categorised as a Least active (as per map) zone. The seismicity map of India is shown in **Figure 4-9**.



Figure 4-9 Seismicity Map of India

Source: *Maps of India*

4.4 Air Environment

Baseline ambient air quality assessment gives the status in the vicinity of site and is an indispensable part of environmental impact assessment studies. Significant changes, in predominant winds and weather conditions are observed in winter, summer and post-monsoon seasons apart from the local topographic influences. The baseline status of air environment in the study area is assessed through a systematic air quality surveillance programme.

4.4.1 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed, wind direction and temperature. The meteorological data is useful for proper interpretation of the baseline data. .

4.4.2 Meteorological Data Collection

Available secondary data pertaining to the meteorological parameters was obtained from the IMD Climatological tables. In addition, baseline meteorological data (primary data) was generated during **April – June 2017**. The methodology adopted for monitoring surface observations is as per the standard norms laid down by Bureau of Indian Standards (BIS) i.e. IS:8829 and Indian Meteorological Department (IMD).

4.4.3 General Meteorological Scenario based on IMD Data

The nearest Indian Meteorological Department (IMD) station located to project site is Coimbatore (Pelamedu). The Climatological data for Coimbatore (Pelamedu) (11° 02' N and 77° 03' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30 year period, is presented in the following sections on the meteorological conditions of the region. The monthly variations of the relevant meteorological parameters are reproduced in **Table 4-1**.

Table 4-1 Climatological Summary –Coimbatore (Pelamedu) Region (1971-2000)

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Station Level Pressure hPa		Mean Wind Speed (m/s)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	30.5	18.2	5.4	0.3	81	41	20.6	16.1	1.92	NE	E
Feb	33.3	19.5	13	1	76	34	21.2	15.5	2.14	NE	E
Mar	35.9	21.3	15.1	1	73	29	23.2	15.2	2.25	NE	E
Apr	36.7	23.4	48	3	75	42	26.7	21	2.50	SW	SW
May	35.2	23.5	71.2	4.2	78	56	27.4	24.9	3.28	SW	SW
Jun	32.2	22.4	27.4	2.7	80	66	26	24.8	4.53	SW	SW
Jul	31.3	21.8	24.7	2.9	83	69	25.4	24.8	4.58	SW	SW
Aug	31.6	21.8	35.5	2.6	83	68	25.4	25	4.58	SW	SW
Sep	32.5	22	74.3	4.6	83	67	25.9	25.4	3.64	SW	SW
Oct	31.6	21.8	123.1	7.4	83	67	25.8	24.8	2.39	SW	SW
Nov	30.1	20.7	122.2	5.8	83	63	24.1	22.7	1.61	NE	NE
Dec	29.3	19	46	2.8	82	55	21.8	19.5	1.72	NE	E
Max.	36.7	23.5	123.1	7.4	83	69	27.4	25.4	4.58	Annual	
Min.	29.3	18.2	5.4	0.3	73	34	20.6	15.2	1.61	Predominant	

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Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Station Level Pressure hPa		Mean Wind Speed (m/s)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Avg/Total.	32.5	21.3	606	38.3	80	54.7	24.5	21.6	2.94	Wind Pattern -South West	

As per the above IMD Climatological data, the observations drawn are the following

- Daily maximum temperature is 36.7°C and the daily minimum temperature is 18.2 °C were recorded in the months of April and January respectively
- Maximum and minimum relative humidity of 83% and 34% were recorded in the months of July and Feb respectively.
- Maximum and minimum rainfall of 123.1 mm and 5.4 mm was recorded in the months of October and January respectively. Annual total rainfall recorded in the region was 606mm.
- Maximum and minimum Mean wind speed during the study period is 4.58 m/s and 1.61 m/s. was recorded in the months of July and November respectively. Wind predominant pattern was observed during study period is South West

4.4.4 Meteorological data during Study Period

The meteorological data of study period was used for interpretation of baseline status and to simulate the meteorological conditions for prediction of impacts in modeling studies. Meteorology Data for the Study Period of **April-June 2017** is presented in **Table 4-2.**

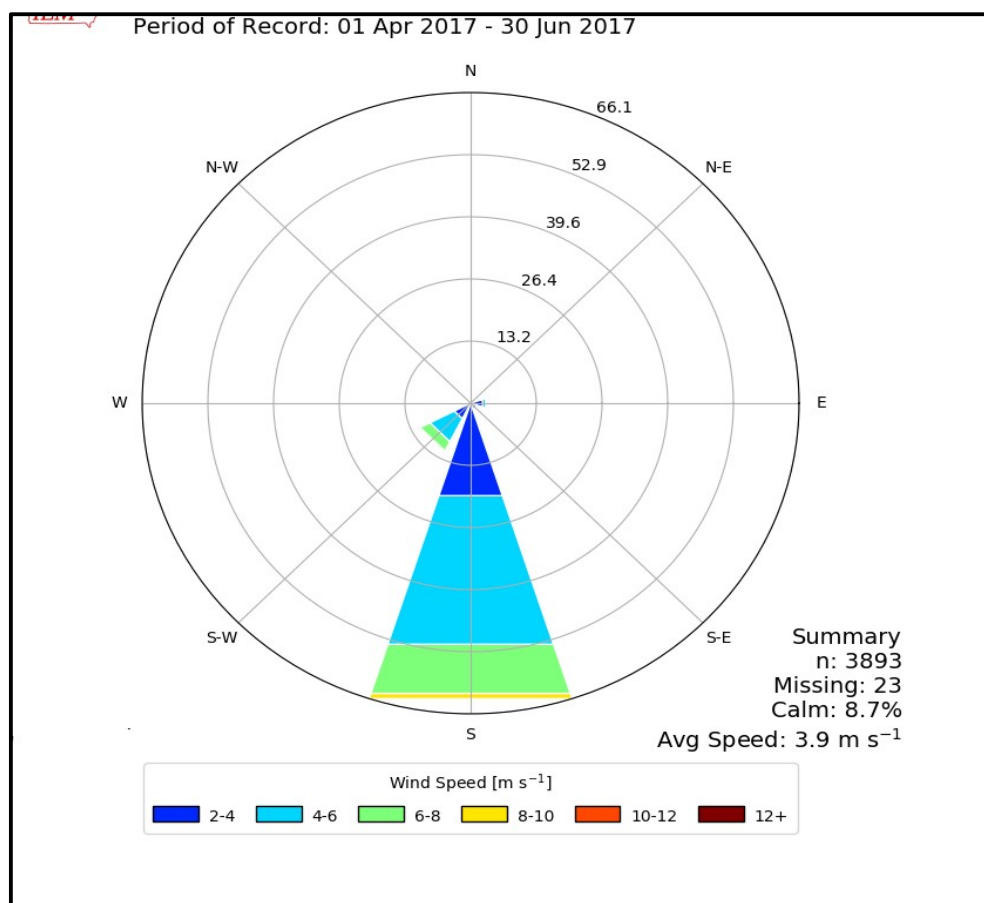


Figure 4-10 Wind Rose during April-June 2017.

Table 4-2 Meteorology Data for the Study Period (April-June 2017)

S. No	Parameter	Observation
1.	Temperature	Max. Temperature : 42 ⁰ C Min. Temperature : 24.0 ⁰ C Avg. Temperature : 32.6 ⁰ C
2.	Average Relative Humidity	55%
3.	Average Wind Speed	3.9m/s
4.	Predominant Wind Direction	South to North

4.4.5 Atmospheric Inversion

Atmospheric inversion level at the project site was monitored; the results observed at the site during the study period are as follows.

- Average atmospheric temperature 32.6⁰C
- Average Relative humidity: 55 %

- Average Wind speed: 3.9 m/s

The daily inversion level calculated based on the average temperature and average wind speed at the project site and the maximum inversion height is derived by the graph plotted based on the average temperature and average wind speed. The daily inversion level at the project site varies from 50 to 1750m during 6 AM to 6 PM, the maximum recorded at 5 PM, April-June 2017. This is shown in the following **Figure 4-11**

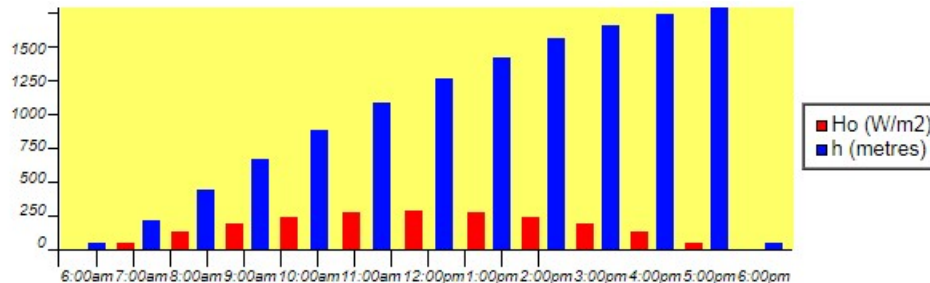


Figure 4-11 Atmospheric inversion level at the project site

4.5 Baseline Environment

The primary baseline data of the project area was monitored during April-June 2017, by M/s. Hubert Enviro Care Systems (P) Ltd, Chennai. The results of the study are provided below:

4.6 Ambient Air Quality

The selection criteria for monitoring locations are based on the following:

- Topography/Terrain
- Meteorological conditions
- Residential and sensitive areas within the study area
- Representatives of regional background air quality/pollution levels and
- Representation of likely impacted areas

Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, **Eight (08)** monitoring locations have been identified as per **April-June 2017**. The wind predominance is from South to North. Wind rose during the study period **April - June 2017** is given in **Figure 4-10**

which depicts the annual wind pattern. Map showing the AAQ monitoring locations is given in and the details of the locations are given in **Table 4-3**.

Table 4-3 Details of Ambient Air Quality Monitoring Locations

S.No	Location	Location Code	Distance in Km	Direction
1	Project Site Perundurai STP	A1	Within site	
2	Chennia Valasu	A2	1.70	N
3	Vailkaalmedu	A3	4.18	NE
4	kummakalipalayam	A4	1.59	SSE
5	Muthu Nagar	A5	1.98	SW
6	Periyavettupalayam	A6	3.12	WSW
7	V.C.V.Nagar	A7	0.97	NNW
8	Perundurai	A8	2.00	NW



Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during Pre-Monsoon season **(April-June 2017)**. PM₁₀, PM_{2.5}, SO₂, NO_x, Pb, O₃NH₃, C₆H₆, C₂₀H₁₂, As, & Ni were monitored for 24 hours and CO & O₃ was monitored for 8 hours. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in **Table 4-4**.

Table 4-4 Analytical Methods for Analysis of Ambient Air Quality Parameters (NAAQ)

S. No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
1	Sulphur Dioxide (SO ₂), µg/m ³	IS 11255 (part 2)/ USEPA method 6	50 (Annual)	80(24 Hours)	24 Hours
2	Nitrogen Dioxide (NO ₂), µg/m ³	IS: 5182 (Part - 6): 2006	40 (Annual)	80 (24 Hours)	24 Hours
3	Particulate Matter (PM _{2.5}), µg/m ³	In house method(Gravimetric Method)	40 (Annual)	60 (24 hours)	24 Hours
4	Particulate Matter (PM ₁₀), µg/m ³	IS:5182 (Part- 23): 2006	60 (Annual)	100 (24 hours)	24 Hours
5	CO mg/m ³	IS:5182(Part- 10):1999 (Reaff:2006)	2 (8 hours)	4 (1hour)	8 Hours
6	Pbµg/m ³	IS:5182(Part- 22):2004 (Reaff:2006)	0.5(Annual)	1(24 hours)	24 Hours
7	O ₃ , µg/m ³	In house method (Spectrophotometric Method)	100(8hours)	180 (1hour)	8 Hours

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8	NH ₃ , µg/m ³	In house method (Spectrophotometric Method)	100(Annual)	400(24 hours)	24Hours
9	Benzene, µg/m ³	GC FID/ GC MS Based on IS 5182: part 11	5 (Annual)	5 (Annual)	24 Hours
10	Benzo (a) pyrene, ng/m ³	In house validated Method by HPLC,UV&GC MS Based on IS 5182: part 12	1 (Annual)	1 (Annual)	24 Hours
11	Arsenic, ng/ m ³	In house method (AAS Method) Based on CPCB guidelines Volume 1.	6 (Annual)	6 (Annual)	24 Hours
12	Nickel, ng/ m ³	In house method (AAS Method) Based on CPCB guidelines Volume 1.	20 (Annual)	20 (Annual)	24 Hours

4.6.3 Results and Discussions

The variations of the pollutants PM₁₀, PM_{2.5}, SO₂, NO₂, CO, Pb, O₃, NH₃, C₆H₆, C₂₀ H₁₂, As & Ni are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data **(April –June 2017)** for the study area is given in **Table 4-5** and trends of measured ambient concentration in the study area were graphically represented in **Figure 4-13**.

Table 4-5 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Chennim a Valasu	Vailkaal medu	Kummaka lipalayam	Muthu Nagar	Periyavet tupalaya m	V.C.V.Naga r	Perundu rai
			A1	A2	A3	A4	A5	A6	A7	A8
PM₁₀ Conc. (µg/m³)	Min.	100 (24 Hours)	37.2	32.6	31.4	36.8	35.0	35.1	36.5	41.8
	Max.		53.0	46.5	44.8	52.4	49.9	50.0	52.0	59.6
	Avg.		44.5	39.6	37.65	44.04	41.9	42	43.7	50.1
	98th 'tile		52.6	46.2	44.5	52.1	49.6	49.7	51.7	59.3
PM_{2.5} Conc. (µg/m³)	Min.	60 (24 Hours)	18.0	16.4	14.9	19.0	17.9	17.3	18.9	23.7
	Max.		25.7	23.3	21.2	27.1	25.5	24.6	26.9	33.8
	Avg.		21.6	19.6	17.8	22.8	21.4	20.7	22.6	28.4
	98th 'tile		25.6	23.7	21.1	27.0	25.3	24.5	26.7	33.6
SO₂ Conc. (µg/m³)	Min.	80 (24 Hours)	8.1	5.7	6.5	6.0	7.9	6.6	6.8	7.7
	Max.		11.5	8.1	9.3	8.6	11.3	9.4	9.8	10.9
	Avg.		9.7	6.8	7.8	7.2	9.5	7.9	8.2	9.2
	98th		11.5	8.0	9.2	8.5	11.2	9.3	9.7	10.9

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Chennim a Valasu	Vailkaal medu	Kummaka lipalayam	Muthu Nagar	Periyavet tupalaya m	V.C.V.Nagar	Perundurai
			A1	A2	A3	A4	A5	A6	A7	A8
	'tile									
NO ₂ Conc.(µg/m ³)	Min.	80 (24 Hours)	19.53	15.19	12.60	13.769	17.702	15.739	17.368	19.53
	Max.		27.84	21.658	17.957	19.623	25.228	22.431	24.752	27.84
	Avg.,		23.4	18.2	15.09	16.49	21.2	18.85	20.8	23.4
	98th 'tile		27.7	21.5	17.9	19.5	25.1	22.3	24.6	27.7
Pb (µg/m ³)	Avg.	1 (24 hour)	BDL(DL 0.05)	BDL(DL 0.05)	BDL(DL 0.05)	BDL(DL 0.05)	BDL(DL 0.05)	BDL(DL 0.05)	BDL(DL 0.05)	BDL(DL 0.05)
CO (mg/m ³)	Avg.	4 (1hour)	0.22	0.4	0.1	0.25	0.34	0.33	0.15	0.23
O ₃ (µg/m ³)	Avg.	180 (1hour)	11.63	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	11.38
C ₆ H ₆ (µg/m ³)	Avg.	5 (Annual)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)
C ₂₀ H ₁₂ (a) , (ng/m ³)	Avg.	1 (Annual)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)	BDL (1)

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Chennim a Valasu	Vailkaal medu	Kummaka lipalayam	Muthu Nagar	Periyavet tupalaya m	V.C.V.Nagar	Perundurai
			A1	A2	A3	A4	A5	A6	A7	A8
As (ng/ m ³)	Avg.	6 (Annual)	BDL (2)	BDL (2)	BDL (2)	BDL (2)	BDL (2)	BDL (2)	BDL (2)	BDL (2)
Ni (ng/m ³)	Avg.	20 (Annual)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)	BDL (DL 10)
NH ₃ (µg/m ³)	Avg.	400 (24hours)	6.1	BDL (DL 5)	BDL (DL 5)	BDL (DL 5)	BDL (DL 5)	BDL (DL 5)	BDL (DL 5)	6.3

Note: BDL (Below detectable limit), DL (Detectable limit)

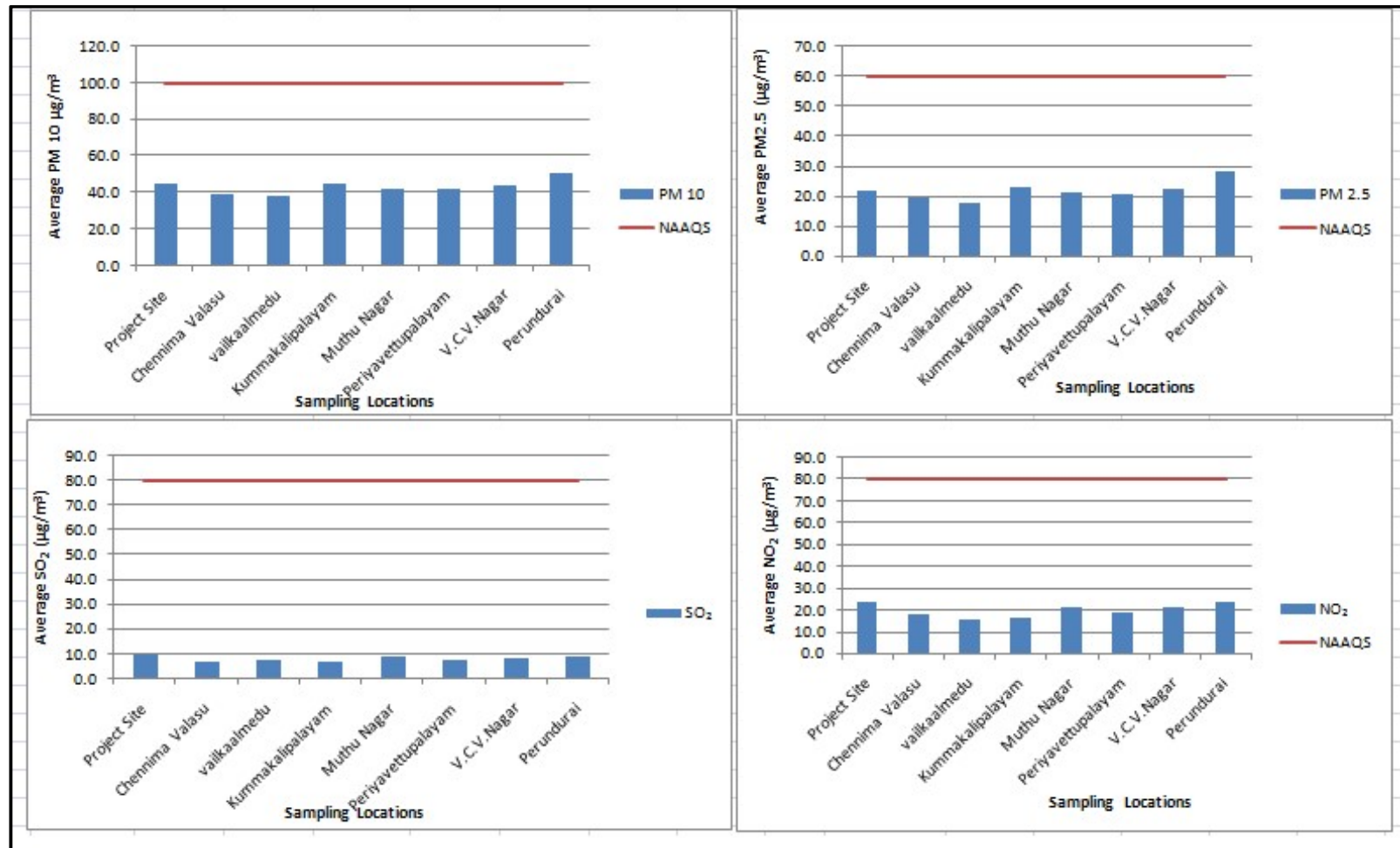


Figure 4-13 Trends of Measured Ambient Concentrations Primary Pollutant in the Study Area

4.6.4 Observations

Ambient Air Quality was monitored at 8 locations within the study area. The particulate matter $PM_{2.5}$ ranged between 17.8 – 28.4 $\mu\text{g}/\text{m}^3$ across the monitoring locations, PM_{10} ranged between 37.65 – 50.1 $\mu\text{g}/\text{m}^3$, SO_2 varied between 6.8-9.7 $\mu\text{g}/\text{m}^3$, NO_2 varied between 15.09 - 23.40 $\mu\text{g}/\text{m}^3$, all the parameters are well within the National Ambient Air Quality Standards during the study period.

4.7 Noise Environment

The prevailing ambient noise level at a particular location is nothing but the resultant (total) of all kinds of noise sources existing at various distances around that location. The ambient noise level at a location varies continuously depending on the type of surrounding activities.

Ambient noise levels have been established by monitoring noise levels at **Eight (08)** locations in and around 10Km distance from project area during the study period using precision noise level meter. The noise monitoring locations in the study area were selected after giving due consideration to the various land use categories. The land use categories include commercial, residential, rural and sensitive areas. Noise levels were recorded on an hourly basis for one complete day at each location using pre-calibrated noise levels. Sampling locations are given in **Table 4-6** and map noise showing the noise monitoring locations are given in **Figure 4-14**.

4.7.1 Results and Discussions

Based on the recorded hourly noise levels at each monitoring location, the day equivalent (L_d) and night equivalent (L_n) were calculated;

- L_d : Average noise levels between 6:00 hours to 22.00 hours.
- L_n : Average noise levels between 22:00 hours to 6.00 hours.

The comparison of day equivalent noise levels (L_d) and night equivalent noise levels (L_n) with the respective CPCB stipulated noise standards for various land use categories are shown in the **Table 4-6**.

Table 4-6 Day and Night Equivalent Noise Levels

S. No	Location	Location Code	CPCB Standard		Noise level in dB(A) Leq		Environmental Setting
			Day	Night	L _{day} (L _d)	L _{Night} (L _n)	
1.	Project Site Perundurai STP	N1	65	55	60.5	51.5	Commercial
2.	Chenniam Valasu	N2	55	45	49.5	40.6	Residential
3	Vailkaalmedu	N3	55	45	53.5	42.0	Residential
4	kummakalipalayam	N4	55	45	51.2	43.6	Residential
5	Muthu Nagar	N5	55	45	49.6	41.6	Residential
6	Periyavettupalayam	N6	55	45	48.6	41.0	Residential
7	V.C.V.Nagar	N7	55	45	52.3	43.2	Residential
8.	Perundurai	N8	65	55	61.5	53.8	Commercial

4.7.2 Observations

It is observed that the day equivalent and night equivalent noise levels at all locations are within prescribed CPCB standards.

- In commercial area time noise levels varied from 60.5 dB(A) to 61.5 dB(A) and night time noise levels varied from 51.3 dB(A) to 53.8 dB(A), which is within prescribed limit by MoEF&CC (65 dB(A)) Day time & 55 dB(A) Night time).
- In residential area day time noise levels varied from 48.6 dB (A) to 53.5 dB (A) and night time noise levels varied from 40.6 dB (A) to 43.6 dB (A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area noise are within the limit prescribed by MoEF&CC (55 dB (A) Day time & 45 dB (A) Night time).

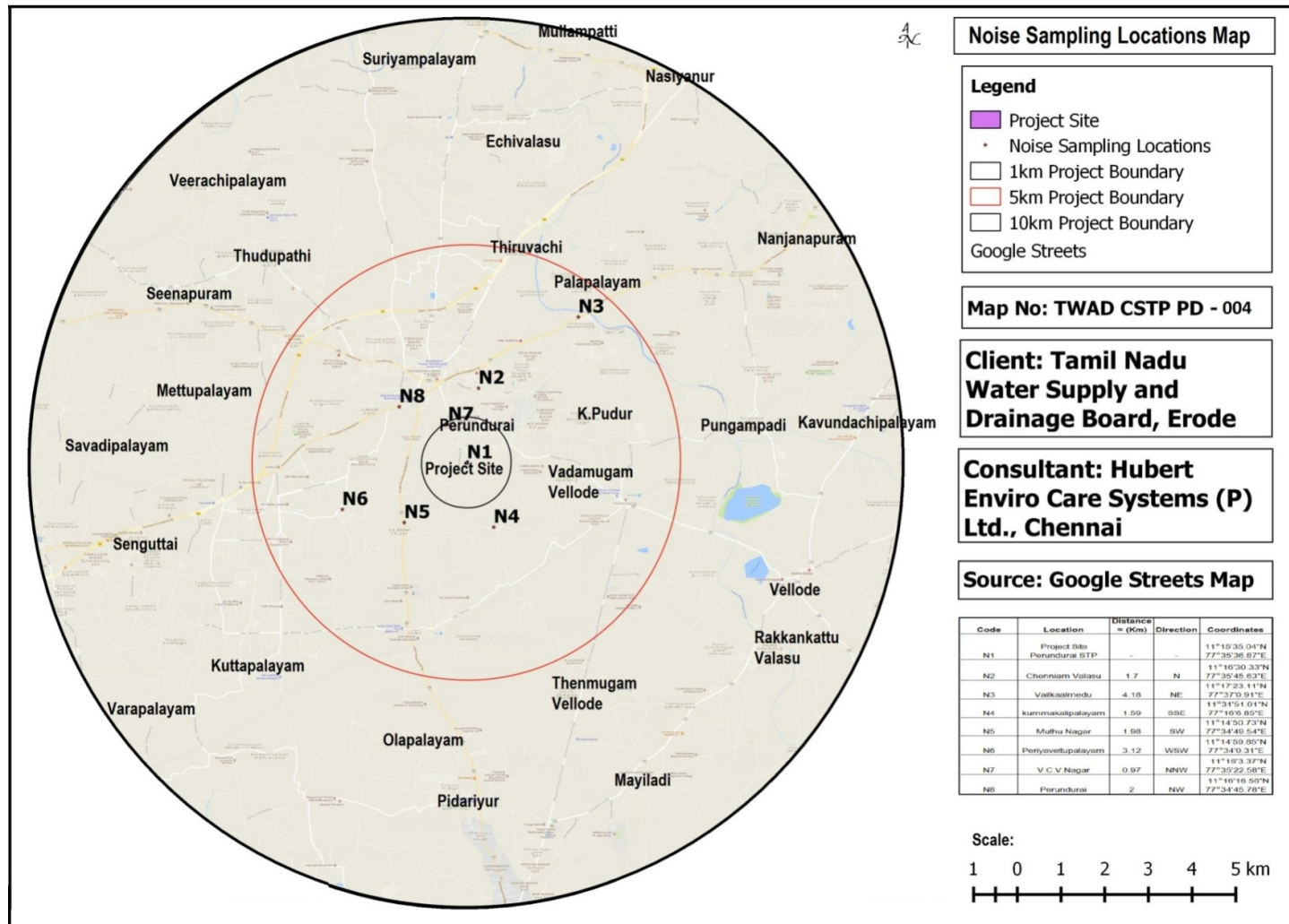


Figure 4-14 Map showing the noise monitoring locations

4.8 Water Environment

4.8.1 Surface Water Resources

Surface water plays major role in irrigation when compared to the ground water source. The assessment of present status of surface water quality within the study area was conducted by collecting water samples from surface water bodies (Lakes, ponds, rivers, canals) during the period of April-June 2017. The sampling locations have been identified on the basis of their importance.

4.8.2 Surface Water Quality Assessment

Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem, or to measure the effectiveness of best management practices being implemented in water system. Monitoring helps to determine the trends in the quality of the aquatic environment and the impact due to the release of contaminants, other anthropogenic activities, and/or by waste treatment operations (impact monitoring). To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in **Table 4-7**. Water sampling location and map of sampling location are given in

Table 4-8 and **Figure 4-15**.

Table 4-7 Test methods used for the analysis of water quality parameters

Sl. No	Parameter Measured	Test Method
1	Colour	IS:3025 (Part- 4) 1983 (Reaff 2006)
2	Turbidity	IS 3025(Part - 10):1984
3	pH	IS:3025 (Part - 11): 1983 (Reaff: 2006)
4	Conductivity	IS:3025 (Part - 14): 1983 (Reaff: 2006)
5	Total Dissolve Solids	IS: 3025:1(Part - 16) 1984 (Reaff 2006)

6	Total Suspended Solids	IS 3025 (Part - 17) 1984 (Reaff 1996)
7	Alkalinity as CaCO ₃	IS:3025,1 (Part - 23) 1986 (Reaff 2009)
8	Total Hardness as CaCO ₃	IS:3025 (Part - 21) 1983 (Reaff 2006)
9	Sodium	IS:3025,5(Part - 45) 1993 (Reaff 2006)
10	Potassium	IS:3025,5(Part - 45) 1993 (Reaff 2006)
11	Calcium as Ca	IS 3025 (Part - 40):1991
12	Magnesium as Mg	IS 3025 (Part - 46) 1994
13	Carbonate	IS 3025, (Pt 23) 1986 (R 2006)
14	Bi carbonate	IS 3025, (Pt 23) 1986 (R 2006)
15	Chloride	IS 3025 (Part - 32):1988
16	Sulphate SO ₄	IS 3025(Part - 24):1986
17	Nitrate as NO ₃	ASTM (Part - 31)1978
18	Phosphate	IS 3025 (Pt 45) 1993 (R 2006)
19	Fluorides as F	IS 3025 (Part - 60):2008
20	Cyanide	IS 3025 (Part-27):1986
21	Arsenic	IS 3025:(Part-37):1988(Reaff 2009)
22	Boron	IS:3025 (Part - 57):2003
23	Cadmium	IS 3025 (Part - 41)1991
24	Chromium, Total	IS:3025 (Part - 52) 2003 (Reaff 2009)
25	Copper	IS:3025 (Part - 42)1992 (Reaff: 2009)
26	Iron	IS 3025 (Part - 53):2003
27	Lead	IS:3025 (Part - 47) 1994 (Reaff 2009)
28	Manganese	IS 3025:(Part - 59):2006
29	Mercury	IS 3025 (Part48):1994 RA 1999
30	Nickel	IS 3025:(Part-54):2003(Reaff 2009)
31	Selenium	IS 3025 Part (56)2003
32	Zinc	IS:3025 (Part - 49) 1994 (Reaff 2009)
33	Dissolved Oxygen	IS:3025 (Part - 38)1989 (Reaff 2009)
34	BOD	5210B APHA22nd Edn 2012
35	COD	IS:3025 (Part-58)-2006

Table 4-8 Details of Surface water sampling locations

S.No	Location	Location Code	Distance in Km	Direction
1	Vellode Pond	SW1	6.92	ESE
2	Lower Bhavani canal (Downstream)	SW2	9.79	SE
3	Sellampatti kulam	SW3	4.03	NNW
4	Lower Bhavani canal (Upstream)	SW4	5.71	NNE

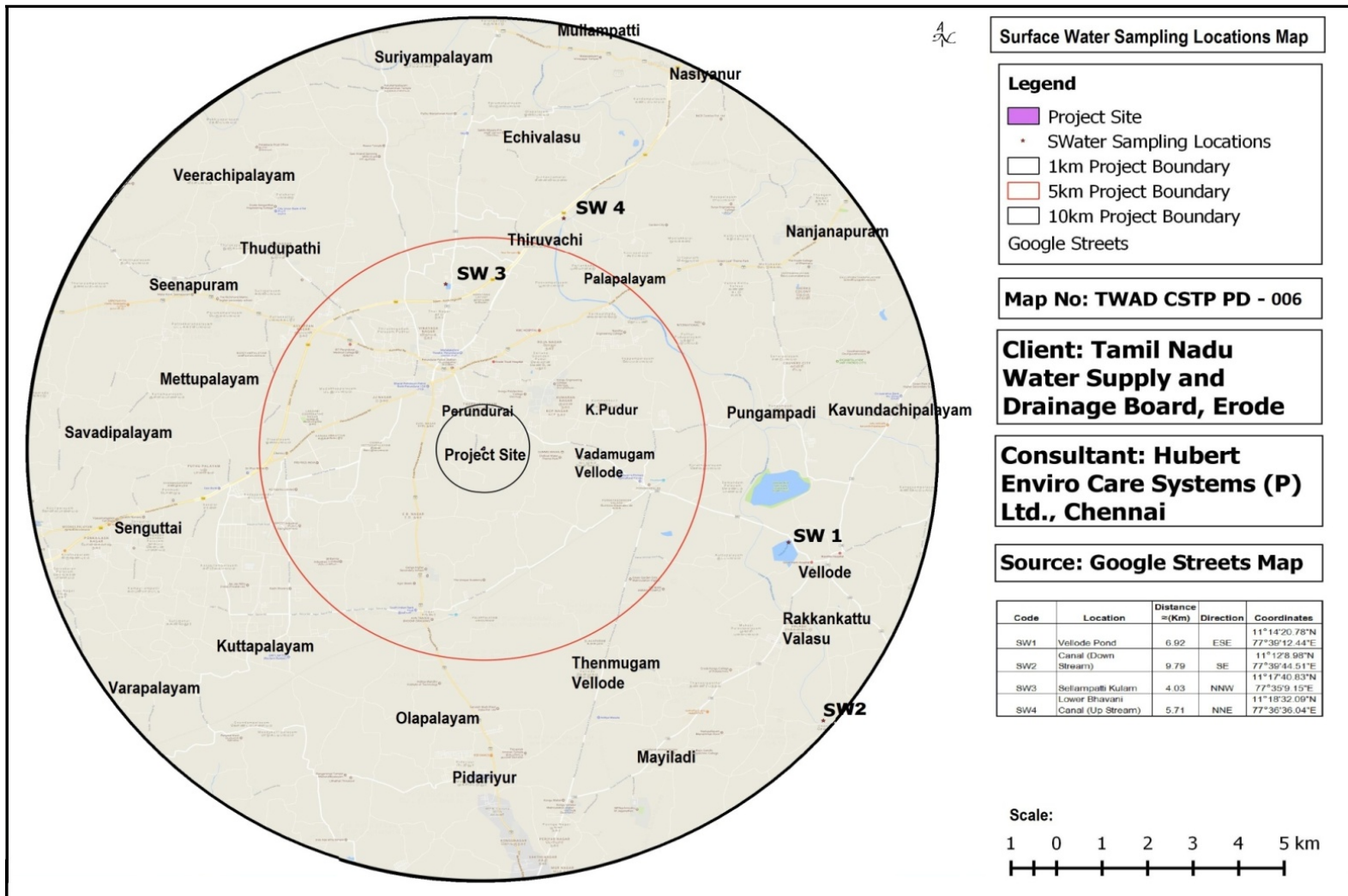


Figure 4-15 Map showing the surface water monitoring locations

Table 4-9 Physicochemical Parameters of Surface water samples from study area

S.No	Parameter	Unit	Surface water Standard (IS 2296 Class-A)	Vellode Pond	Lower Bhavani canal (Downstream)	Sellam patti kulam	Lower Bhavani canal (Upstream)
1	Source			Lake	River	pond	river
2	Turbidity	NTU	1	3.7	3.9	3.8	4.1
3	PH	--	6.5-8.5	7.45	7.32	7.87	7.35
4	EC	µS/cm	...	883	789	751	809
5	Total Dissolve Solids	mg/l	500	578	495	460	565
6	TSS	mg/l		4.5	4.9	4.7	5.3
7	Total Alkalinity	mg/l	-	168.9	136.9	118.9	159.8
8	Total Hardness	mg/l	200	225.2	151.3	124.8	166.8
9	Sodium	mg/l	-	103	74.7	58	91.7
10	Potassium	mg/l	-	21	15.8	13.6	17
11	Calcium ++	mg/l	-	48.1	44.8	36	41.7
12	Magnesium ++	mg/l	....	25.5	9.56	8.45	15.2
13	Carbonate	mg/l	-	0	0	0	0
14	Bi Carbonate	mg/l	-	206.0	167.0	145.0	195.0
15	Chloride	mg/l	250	125	136	98	150
16	Sulphate	mg/l	400	48	38	35	44
17	Nitrate as NO3	mg/l	20	1.52	1.82	1.33	2.18
18	Phosphate	mg/l	-	0.06	0.05	0.04	0.09
19	Fluorides as F	mg/l	1.5	0.24	0.46	0.69	0.69
23	Cyanide	mg/l	0.05	BDL (DL 0.01)	BDL (DL 0.01)	BDL (DL 0.01)	BDL (DL 0.01)
24	Arsenic	mg/l	0.05	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)

25	Boron	mg/l	-	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)
26	Cadmium	mg/l	0.01	BDL (DL 0.01)	BDL (DL 0.01)	BDL (DL 0.01)	BDL (DL 0.01)
27	Chromium, Total	mg/l	0.05	BDL(DL0.01)	BDL(DL0.01)	BDL(DL 0.01)	BDL(DL0.01)
28	Iron	mg/l	0.3	0.11	0.19	0.21	0.14
29	Lead	mg/l	0.1	BDL(DL0.1)	BDL(DL0.1)	BDL(DL 0.1)	BDL(DL0.1)
30	Manganese	mg/l	0.5	BDL(DL0.1)	BDL(DL0.1)	BDL(DL 0.1)	BDL(DL0.1)
31	Mercury	mg/l	0.001	BDL(DL0.001)	BDL(DL0.001)	BDL(DL 0.001)	BDL(DL0.001)
32	Nickel	mg/l	-	BDL(DL0.1)	BDL(DL0.1)	BDL(DL 0.1)	BDL(DL0.1)
33	Selenium	mg/l	0.01	BDL(DL0.005)	BDL(DL0.005)	BDL(DL 0.005)	BDL(DL0.005)
34	Dissolved Oxygen	mg/l	6	5.1	6	5.3	5.8
35	COD	mg/l	...	13.2	10.1	15.2	9.7
36	BOD	mg/l	2	5.2	3.2	5.9	3.8

Note: BDL – Below Detectable Limit, DL – Detectable Limit

4.8.3 Results and Discussions

- In the surface water the pH varied between 7.32 – 7.87 which is meeting the IS: 2296 -1982 for inland surface water. The pH value for all the samples in the study area during study period found to be within the limits.
- The Total Dissolved Solids ranges is varied between 460-578 mg/l for the surface water The TDS value of some of the samples meeting class A and remaining meeting class B standards of IS: 2296 -1982.

- The desirable limit of the chloride content is 250mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area is ranges between 98 mg/l -150 mg/l
- The Sulphate content of the surface water meeting the minimum range of 35 mg/l and maximum range of 48 mg/l. The surface water samples meeting the class A standard of IS: 2296 1982.
- The Total hardness ranges is between 125 – 225 mg/l for ground water its meeting the permissible limit of the IS 2296-1982
- DO, BOD and COD values from the collected water samples varies from 5.1 to 6 mg/l, 3.2 to 5.9 mg/l and 9.7 to 15.2 mg/l respectively.

**Table 4-10- Surface water quality criteria for different uses
(specified by CPCB, 1979 and the Bureau of Indian Standards, 1982)**

S.No	Parameters	Unit	A	B	C	D	E
1	Colour	Hazen	10	300	300	---	---
2	Turbidity	NTU	---	---	---	---	---
3	pH	--	8.5	8.5	8.5	8.5	8.5
4	Conductivity	μS/cm	---	---	---	1000	2250
5	Total Dissolved Solids	mg/l	500	---	1500	---	2100
6	Alkalinity as CaCO ₃	mg/l	---	---	---	---	---
7	Total Hardness as CaCO ₃	mg/l	300	---	---	---	---
8	Calcium as Ca	mg/l	80.10	---	---	---	---
9	Magnesium as Mg	mg/l	24.28	---	---	---	---
10	Sodium	mg/l	---	---	---	---	---
11	Potassium	mg/l	---	---	---	---	---
12	Chloride as Cl	mg/l	250	---	600	---	600
13	Sulphate as SO ₄	mg/l	400	---	400	---	1000
14	Phosphorous	mg/l	---	---	---	---	---
15	Nitrate as NO ₃	mg/l	20	---	50	---	---

16	Fluorides as F	mg/l	1.5	1.5	1.5	---	---
17	Cyanide	mg/l	0.05	0.05	0.05	---	---
18	Arsenic	mg/l	0.05	0.2	0.2	---	---
19	Cadmium	mg/l	0.01	---	0.01	---	---
20	Chromium, Total	mg/l	0.05	0.05	0.05	---	---
21	Copper	mg/l	1.5	---	1.5	---	---
22	Iron	mg/l	0.3	---	50	---	---
23	Lead	mg/l	0.1	---	0.1	---	---
24	Zinc	mg/l	15	---	15	---	---
25	Manganese	mg/l	0.5	---	---	---	---
26	Selenium	mg/l	0.01	---	0.05	---	---
27	Mercury	mg/l	0.001	---	---	---	---
28	Dissolved Oxygen	mg/l	6	5	4	4	---
29	COD	mg/l	---	---	---	---	---
30	BOD	mg/l	2	3	3	---	---

Class A – Drinking water without conventional treatment but after disinfection.

Class B –Water for outdoor bathing.

Class C – Drinking water with conventional treatment followed by disinfection.

Class D – Water for fish culture and wild life propagation.

Class E – Water for irrigation, industrial cooling and controlled waste disposal

4.8.4 Groundwater resources

The development of ground water for irrigation in the district is mainly through dug wells tapping the weathered residum. The yields of dug wells are improved at favorable locations by construction of extension bores, which are 40 to 75 m deep. Bore wells have also become popular as the source for irrigation in the district in recent years. Dug wells with extension bores wherever necessary is ideal for hard rock areas

Source: <http://censusindia.gov.in/2011census/dchb/3309 PART B DCHB ERODE.pdf>

4.8.5 Groundwater Quality

Groundwater is the principal source for domestic and drinking purposes in almost all villages near the study area. The quality of the groundwater received is influenced by

pollution of soil and air, industrial and domestic waste disposal, organic components, pathogenic microorganisms, application of fertilizers and pesticides in agriculture, etc. Total Eight (08) ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 4-11** and **Table 4-12**. Map showing the groundwater monitoring locations are given in **Figure 4-16**.

Table 4-11 Details of Groundwater Quality Monitoring Locations

S. No	Location	Location Code	Distance in Km	Direction
1	STP site	GW1	Within site	
2	Chenniam Valasu	GW2	1.70	N
3	Vailkaalmedu	GW3	4.18	NE
4	kummakalipalayam	GW4	1.59	SSE
5	Muthu Nagar	GW5	1.98	SW
6	Periyavettupalayam	GW6	3.12	WSW
7	V.C.V.Nagar	GW7	0.97	NNW
8	Perundurai	GW8	2.00	NW

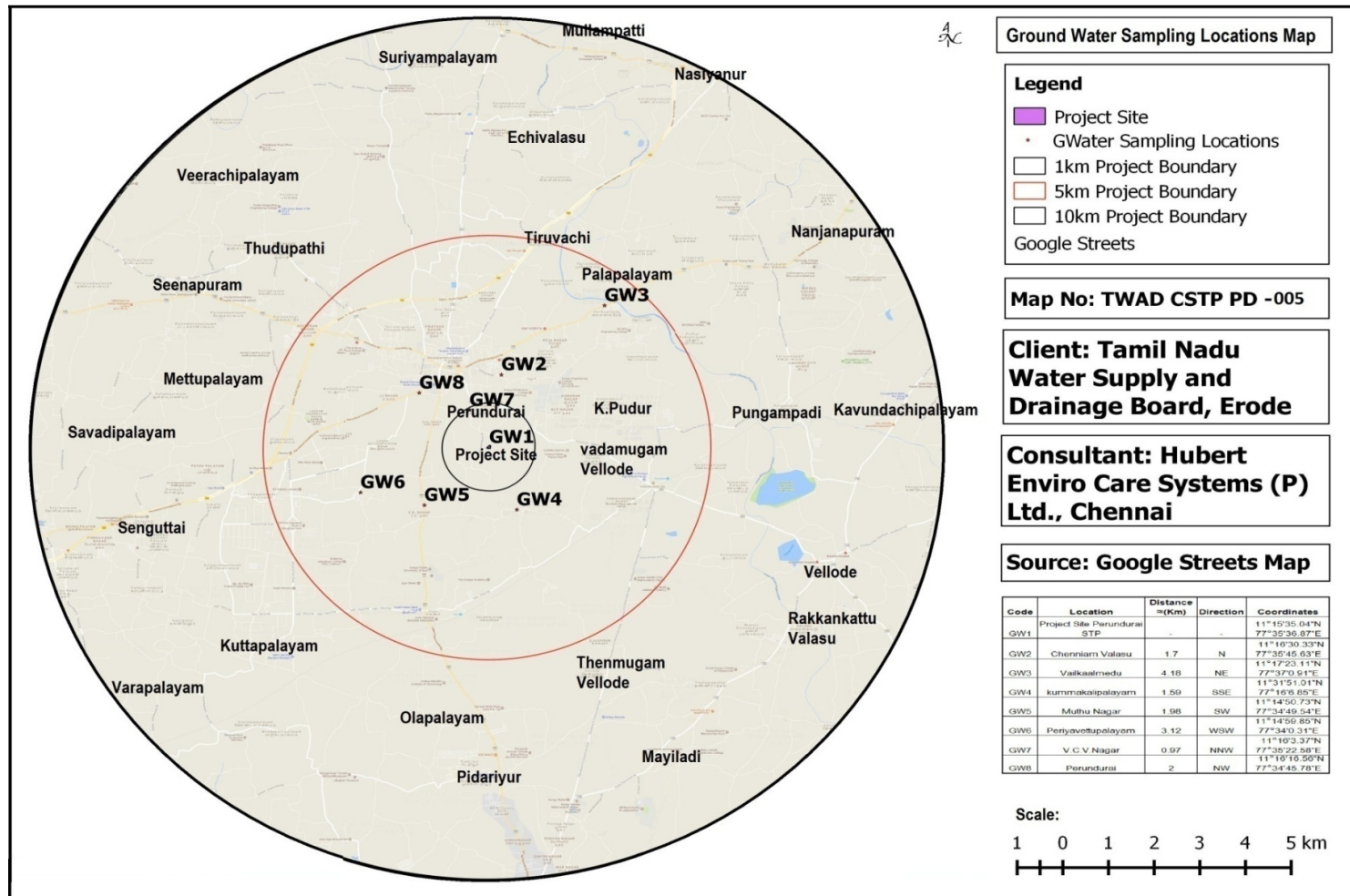


Figure 4-16 Map showing the groundwater monitoring locations

Table 4-12 Physico chemical analysis of Ground water samples from study area

S.No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Project site Perundurai STP	Chenniam Valasu	Vailkaal medu	kummakalipalayam	Muthu Nagar	Periyavettupalayam	V.C.V.Nagar	Perundurai
1	Colour	Hazen	15	5	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)
2	Turbidity	NTU		1	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)	BDL (DL 0.1)
3	pH	--	No relaxation	6.5-8.5	7.65	7.45	7.55	7.55	7.65	7.45	7.81	7.65
4	EC	µS/cm	...	...	1780	1230	1289	1674	1703	1483	1633	1759
5	Total Dissolve Solids	mg/l	2000	500	1174	746	807	1007	1084	892	1003	1166
6	Total		BDL(DL1)	BDL(DL1)	BDL(DL1)	BDL(DL1)	BDL(DL1)	BDL(DL1)	BDL(DL1)	BDL(DL1)

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	Suspended Solids											
7	Alkalinity as CaCO₃	mg/l	600	200	333	245	256	324	336	276	316	340
8	Total Hardness as CaCO₃	mg/l	600	200	533	293	322	443	499	357	426	495
9	Sodium	mg/l		...	153	95.8	108	130	180	127	148	174
10	Potassium	mg/l		...	43.3	23.9	26.6	37.5	45.3	30.8	35.5	41.3
11	Calcium as Ca	mg/l	200	75	134	85	93	122	152	102.0	117.0	129
12	Magnesium as Mg	mg/l	100	30	48.2	19.6	21.8	33.5	28.9	24.8	32.4	42
13	Carbonate	mg/l	...	...	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)	BDL (DL 1.0)
14	Bi carbonate	mg/l	...	...	406	299	312	395	410	337	386	415
15	Chloride	mg/l	1000	250	250	143	159	190	165	167	188	227
16	Sulphate SO₄	mg/l	400	200	107	54	61.7	71.8	70.4	74.9	67	105
17	Nitrate as NO₃	mg/l		45	6.50	8.10	6.20	4.30	8.50	8.40	6.50	7.20
18	Phosphorous	mg/l		-	BDL(DL0.02)	BDL(DL0.02)	BDL(DL0.02)	BDL(DL0.02)	BDL(DL0.02)	BDL(DL0.02)	BDL(DL0.02)	BDL(DL0.02)
19	Fluorides as F		1.5	1	0.26	0.2	0.22	0.24	0.21	0.13	0.25	0.22
23	Cyanide	mg/l		0.05	BDL (DL	BDL (DL	BDL (DL	BDL (DL	BDL (DL	BDL (DL	BDL (DL	BDL (DL

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					0.01)	0.01)	0.01)	0.01)	0.01)	0.01)	0.01)	0.01)
24	Arsenic	mg/l	0.05	0.01	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)
26	Cadmium	mg/l		0.003	BDL (DL 0.001)	BDL (DL 0.001)	BDL (DL 0.001)	BDL (DL 0.001)	BDL (DL 0.001)	BDL (DL 0.001)	BDL (DL 0.001)	BDL (DL 0.001)
27	Chromium, Total	mg/l		0.05	BDL(DL0. 01)	BDL(DL0. 01)	BDL(DL0. 01)	BDL(DL0.01)	BDL(DL0. 01)	BDL(DL0.01)	BDL(DL0. 01)	BDL(DL0. 01)
28	Copper	mg/l	1.5	0.05	0.007	0.008	0.009	BDL (DL0.05)	0.065	0.019	0.007	0.045
29	Iron	mg/l		0.3	0.03	0.025	0.045	0.38	0.45	0.16	0.15	0.71
30	Lead	mg/l		0.01	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)	BDL (DL 0.005)
31	Manganese	mg/l		0.1	BDL(DL0. 05)	BDL(DL0. 05)	BDL(DL0. 05)	BDL(DL0.05)	BDL(DL0. 05)	BDL(DL0.05)	BDL(DL0. 05)	BDL(DL0. 05)
33	Nickel	mg/l		0.02	BDL(DL0. 01)	BDL(DL0. 01)	BDL(DL0. 01)	BDL(DL0.01)	BDL(DL0. 01)	BDL(DL0.01)	BDL(DL0. 01)	BDL(DL0. 01)
34	Selenium	mg/l		0.01	BDL(DL0. 005)	BDL(DL0. 005)	BDL(DL0. 005)	BDL(DL0.005)	BDL(DL0. 005)	BDL(DL0.005)	BDL(DL0. 005)	BDL(DL0. 005)
35	Zinc	mg/l	15	5	0.36	0.25	0.52	0.22	0.32	0.36	0.25	0.22

Note: BDL – Below Detectable Limit, DL – Detectable Limit

4.8.6 Results and Discussions

A summary of analytical results are presented below:

- The ground water results of the study area indicate that the average pH ranges is varied between 7.45-7.81
- The desirable limit of the Total Dissolved Solids is 500 mg/l and permissible limit is 2000 mg/l. Total Dissolved Solids ranges is varied between 746 mg/l - 1174 mg/l for the ground water and its meets the permissible limits of IS 10500: 2012
- The desirable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area is ranges between 143 mg/l -250 mg/l
- The desirable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. the sulphate content of the ground water of the study area is varied between 54 mg/l -107 mg/l meeting the desirable limit of the IS 10500: 2012.
- The Total hardness ranges is between 293-533 mg/l for ground water and all location within the permissible limit of the IS 10500:2012.

4.9 Soil as a resource and its Quality

The soil sampling locations were identified to assess the fertility and agricultural characteristics of the red soil and also to assess the impact of the sludge leachate in the immediate surroundings. The sampling locations were selected within 10 Km around the project site. The identification of the sampling stations is based on the sensitivity of the location, distance and direction with respect to the proposed project site. Soil sampling locations and results are given in **Table 4-13&Table 4-14**.

Table 4-13Soil & Sediment Quality Monitoring Locations

S. No	Location	Location Code	Distance in Km	Direction
1	Project Site Perundurai STP	S1	Within site	
2	Chenniam Valasu	S2	1.70	N
3	Vailkaalmedu	S3	4.18	NE
4	Kummakalipalayam	S4	1.59	SSE

5	Muthu Nagar	S5	1.98	SW
6	Periyavettupalayam	S6	3.12	WSW
7	V.C.V.Nagar	S7	0.97	NNW
8	Perundurai	S8	2.00	NW

Table 4-14 Physico Chemical parameters of soil samples from the study area

S.No	Parameters	Units	S1	S2	S3	S4	S5	S6	S7	S8
1.	Colour	-	Yellowish Brown	Brown	Dark Brown	Red	Reddish Brown	Reddish Brown	Reddish Brown	Yellowish Brown
2.	Texture	-	Clay	Clay	Sandy Loam	Clay	Clay	Clay	Clay	Clay
3.	Sand	%	14	12	63	16	10	22	18	10
4.	Silt	%	11	9	18	11	12	20	18	14
5.	Clay	%	75	79	19	73	78	58	64	76
6.	pH	-	7.46	7.67	7.57	7.21	7.31	6.67	7.24	7.71
7.	Electrical Conductivity	µmhos/cm	440	528	244	395	512	295	326	457
8.	Bulk Density	gm/cc	1.17	1.33	1.36	1.29	1.35	1.33	1.25	1.24
9.	Cation Exchange Capacity	meq/100 gm	28.3	30.6	7.8	27.6	30.4	23.0	26.1	28.8
10.	Moisture content	%	19.04	21.7	8.78	16.6	21.3	12.7	12.34	18.75
11.	Water Holding Capacity	%	26.9	28.5	27.2	20.9	27.3	27.3	21.0	27.8
12.	Organic Carbon	%	0.631	0.787	0.215	0.756	0.845	0.659	0.744	0.619
13.	Organic matter	%	1.09	1.36	0.37	1.30	1.46	1.14	1.28	1.07

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14.	Nitrogen as N	mg/kg	140	241	56.3	173	259	160	228	175
15.	Phosphorus	mg/kg	193	148	97	198	191	180	183	184
16.	Potassium	mg/kg	114	187	53	138	200	129	178	139
17.	Calcium	%	220	316	78	174	271	233	329	243
18.	Magnesium	%	50	112	27	46	95	39	44	69
19	Cadmium	mg/kg	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)
20	Chromium	mg/kg	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)	BDL(DL 0.1)
21	Iron	mg/kg	0.03	0.25	0.18	0.10	0.23	0.16	0.08	0.07

4.9.1 Results and Discussions

Summary of analytical results

- The pH of the soil samples ranged from 6.67 -7.71 indicating that the soils are almost neutral in nature.
- Conductivity of the soil samples ranged from 244-528 $\mu\text{S}/\text{cm}$. As the EC value is less than 2000 $\mu\text{S}/\text{cm}$, the soil is found to be non-saline in nature
- The Moisture Content of the soil samples varied from 8.78-21.7 (%).
- Nitrogen content ranged from 56.3 to 259 mg/ha
- Phosphorous ranged from 97 to 198 mg/ha
- Potassium content ranges from 53 to 200 mg/ha.

4.10 Ecological Environment

Baseline Biological survey was carried out to assess the ecology of the study area. The floral diversity is grouped into trees, shrubs, climbers, herbs, aquatic plants and phytoplankton. Similarly, the faunal diversity is grouped into mammals, birds, reptiles, amphibians and zooplankton. Discussions were held with local people to gather related information on the richness of plant and animal resources, employment opportunities, facilities for education, health and socio-economic condition.

To identify any floral species of conservation importance existing in the study area, the status evaluation of the observed flora has been done as per the IUCN.

4.10.1 Flora

According to primary survey conducted in the study area and the information collected from secondary resources, a diverse species of flora was observed in the study area. List of flora observed/reported in the study area is given in **Table 4-15**.

Table 4-15 Floral species observed within the study area

S. No	Scientific name	Family	Common name	IUCN status
1.	<i>Acacia Nilotica</i>	Mimosaceae	Babool	LC
2.	<i>Acacia planifrons</i>	Mimosaceae	Umbrella Thorn	NA
3.	<i>Aegle marmelos</i>	Rutaceae	Stone apple	NA

4.	<i>Albizia lebbeck</i>	Mimosaceae	Siris tree	NA
5.	<i>Annona squamosa</i>	Annonaceae	Custard apple	NA
6.	<i>Bambusa bambos</i>	Poaceae	Giant thorny bamboo	NA
7.	<i>Carica papaya</i>	Caricaceae	<i>Papaya</i>	DD
8.	<i>Casuarina equisetifolia</i> L.	Casurinaceae	Savukku	NA
9.	<i>Cocos nucifera</i>	Arecaceae	Tennai	NA
10.	<i>Mangifera indica</i> L.	Anacardiaceae	Mango	DD
11.	<i>Murraya paniculata</i>	Moringaceae	Orange Jasmine	NA
12.	<i>Anacardium Occidentale</i>	Anacardiaceae	Kaju	NA
13.	<i>Azadiracta Indica</i>	Meliaceae	Neem	-
14.	<i>Bombax Ceiba</i>	Malvaceae	Cotton Tree	NA
15.	<i>Bauhinia Racemosa</i>	Caesalpiniaceae	Katmauli	NA
16.	<i>Cassia Fistula</i>	Caesalpiniaceae	Amaltas	LC
17.	<i>Dalbergia Latifolia</i>	Fabaceae	Kala Sheesham	VU
18.	<i>Ficus Benghalensis</i>	Moraceae	Kamarup	NA
19.	<i>Mangifera Indica</i>	Anacardiaceae	Aam	DD
20.	<i>Ziziphus Mauritiana</i>	Rhamnaceae	Ber	NA
21.	<i>Syzygium Cumini</i>	Myraceae	Jamun	NA
22.	<i>Moringa Oleifera</i>	Moraceae	Senjana	NA
23.	<i>Lantana Camera</i>	Verbanaceae	Raimuniya	NA
24.	<i>Jatropha Glandulidera</i>	Euphorbiaceae	Jangli Erandi	NA
25.	<i>Cassia Tora</i>	Caesalpiniaceae	Chakunda	NA

IUCN- International Union for Conservation of Nature, LC- Least Concern, NT- near Threatened, EN- Endangered, NA-Not yet assessed, DD -Data Deficient, VU-Vulnerable

4.10.2 Fauna

List of faunal species observed/reported within the study area is given in **Table 4-16**.

Table 4-16 Fauna species observed within the study area

S. No	Scientific name	Common name	IUCN status
-------	-----------------	-------------	-------------

	Birds		
1.	Pseudibis papillosa	Black Ibis	LC
2.	Milvus migrans	Black kite	LC
3.	Haliastur Indus	Brahminy kite	LC
4.	Pavo cristatus	Indian peacock	LC
5.	Vanellus indicus	Red-wattled lapwing	LC
6.	Apus affinis	House swift	LC
7.	Merops orientalis	Green bee eater	LC
	Reptiles		
8.	Calotes versicolor	Garden lizard	--
9.	Eutropis macularia	Common skink	NA
10.	Ophisops leschenaultii	Snake-eyed lizard	NA
	Mammals		
11.	Funambulus palmarum	Squirrels	LC
12.	Rattus sp.	Rat	LC
13.	Herpestes edwardsii	Grey Mongoose	LC
14.	Cynopterus sphinx	Short nosed fruit bat	LC
15.	Megaderma lyra	Indian false vampire bat	LC

IUCN- International Union for Conservation of Nature, LC- Least Concern, NT- near Threatened, EN- Endangered, NA-Not yet assessed, DD -Data Deficient, VU-Vulnerable

4.11 Socio Economic profile

Erode district stands 15th rank among the highest population size of the State. Tamil Nadu. The population of the district is 22,51,744 which comprise of 11,29,868 male and 11,21,876 female populations.

Source: http://censusindia.gov.in/2011census/dchb/3309_PART_B_DCHB_ERODE.pdf

4.11.1 Socio Economic Aspects

A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status in the study area. The study provides information such as demographic structure, population dynamics, infrastructure resources, and the status of human health and economic attributes like employment, per-capita income, agriculture, trade, and industrial development in the study area. The study of these characteristic helps in identification, prediction and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. The parameters are:

- Demographic structure
- Infrastructure Facility
- Economic Status
- Health status
- Cultural attributes
- Awareness and opinion of people about the project and Industries in the area.

The following

Table 4-17 provides the certain important social indicators of Erode district in Tamil Nadu.

Table 4-17 Social Indicators of PIA District

S.No	Social Indicators	Erode
1	Decadal variation %	11.77
2	Urban population %	51.4
3	Sex ratio	993
4	0-6 age group	953
5	Population density (Persons per square Km)	391
6	Scheduled caste population %	16.41
7	Scheduled tribe population %	0.97
8	Literacy rate %	72.60
9	Work Participation rate %	53.10
10	Main Workers %	92.91
11	Marginal Workers %	7.09
12	Cultivators %	14.90

13	Agricultural labourers %	30.96
14	Workers in household industries %	4.54
15	Other workers %	49.60

Source: <http://censusindia.gov.in/2011census/dchb/DCHB A/33/3309 PART A DCHB ER ODE.pdf>

4.11.2 Population and Household Size

The total population of Erode district is 22,51,744 which comprise of 11,29,868 male and 11,21,876 female. Rural population in Erode district is 10,93,768 and Urban population is 11,57,976.

The highest number of inhabited villages (66) is in Sathyamangalam taluk while Bhavani taluk had the lowest number (51) of inhabited villages. Kavandapadi village (L.C. No. 634885) in Bhavani taluk had the highest population of 28590 and Devakiammapuram village (L.C. No. 635075) in Erode taluk had the lowest population of 176 in the district.

The district has recorded 66.3% of rural household having no latrine which ranked the 3rd least among the districts.

Source:

<http://censusindia.gov.in/2011census/dchb/DCHB A/33/3309 PART A DCHB ERODE.pdf>

4.11.3 Sex Ratio

The sex ratio of the population is calculated for number of females for every 1000 males, irrespective of age. The child sex ratio is also calculated in the same manner for the children aged upto 6 years. Likewise, sex ratio in the State has reported 996 whereas the district reported only 993. The child sex ratio in the State has reported 943 whereas the district reported 953.

Source:

<http://censusindia.gov.in/2011census/dchb/DCHB A/33/3309 PART A DCHB ERODE.pdf>

4.11.4 Scheduled Caste (SC) & Scheduled Tribes (ST)

The Scheduled Castes and Scheduled Tribes in the Erode district share sizeable portion of the total population. Majority of them live in rural areas. They are being specially treated under various development schemes for their over all development in the

district. The Scheduled Tribes mostly live in Sathyamangalam taluk, majority of them belong to Sholagas

Source:

http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3309_PART_A_DCHB_ERODE.pdf

4.11.5 Education & Literacy

A person aged 7 and above who can both read and write with understanding in any language has been taken as literate. A person who can merely read but cannot write is not literate. It is not necessary that a person who is literate should have received any formal education or should have passed any minimum educational standard. In 1991 Census, all children of aged 6 years or less are treated as illiterates although they may be going to school and can read and write a few odd words. During 1981 Census this limit was upto the age of 4 years. It has also been decided in the 2011 Census to use only effective literacy rates i.e., the ratio of literates and population excluding the age group of 0-6. Literacy has increased in Erode district while compared to 2001 literacy rate. **Table 4-18** Show the details of education infrastructures.

Table 4-18 Educational Infrastructure in PIA District and State

State/District	Percentage of Literates					
	Persons		Male		Female	
	2001	2011	2001	2011	2001	2011
Tamil Nadu	73.5	80.1	82.4	86.8	64.4	73.4
Erode	65.4	72.6	75.1	80.4	55.5	64.7

Source:

http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3309_PART_A_DCHB_ERODE.pdf

4.11.6 Health Facilities

Primary Health Centers (PHCs) and Health Sub-centers (HSCs) are providing the preventive, curative and rehabilitative health care services to the rural people. The district has good number of public health systems accessible and affordable apart from the private health facilities. The Health Facilities given in **Table 4-19**.

Table 4-19 Socio Economic analysis: Health care

Name of the District	Type	SC	PHC	CHC	SDH	DH	Total
Erode	Public	311	62	14	7	1	395
	Private	0	0	1	0	0	1
	Total	311	62	15	7	1	396

(Source: National Health Mission, as on February 07, 2019)

4.11.7 Economic Activity

The percentage of main workers, marginal workers and non-workers for persons in Erode district were 92.90, 7.10 and 46.90 respectively. The percentage among males for the same category of workers were 94.80, 5.20 and 35.20. The percentage among females for these categories of workers were 90.00, 10.00, 58.70 respectively.

Source:

<http://censusindia.gov.in/2011census/dchb/DCHB A/33/3309 PART A DCHB ERODE.pdf>

4.11.8 Social Economic Profile of the study area

The villages and towns covering less than 10 km radius from the boundary of the project site is taken for the study. **Table 4-20** shows the list of villages and town which comes under the study area. **Table 4-21** shows the socio-economic indicators within the study area

Table 4-20 List of villages and Town in the study area

S.No	Name		
0-5km radius		9.	Mukasi Pulavapalayam
1.	Ingur	10.	Mukasipidariyur
2.	Sullipalayam	11.	Ottaparai
3.	Perundurai	12.	Varapalayam
4.	Poovampalayam	13.	Kambiliyampatti
5.	Pattachampalayam	14.	Moongilpalayam
5-10km radius		15.	Ponmudi
6.	Pungampadi	16.	Kullampalayam
7.	Veppampalayam	17.	Ayegoundampalayam
8.	Thottani	18.	Seenapuram
		19.	Thuduppathi

20.	Nimittipalayam
21.	Chinnamallampalayam
22.	Thiruvachi

23.	Koorapalayam
24.	Rayapalayam
25.	Olapalayam

Table 4-21 Summary of Socio-economic indicators within the study area

S.No	Particulars	Study area		Unit
		0-5 Km	5-10 Km	
1	Number of villages in the Study Area	5	22	Nos.
2	Number of Towns in the Study Area	1	2	Nos.
3	Total Households	28415	18544	Nos.
4	Total Population	95264	61805	Nos.
5	Children Population (<6 Years Old)	7776	4916	Nos.
6	SC Population	15763	8722	Nos.
7	ST Population	89	80	Nos.
8	Total Working Population	53010	34876	Nos.
9	Main Workers	50094	33052	Nos.
10	Marginal Workers	2916	1824	Nos.
11	Cultivators	9867	4684	Nos.
12	Agricultural labours	13089	6326	Nos.
13	Household Industries	2789	2068	Nos.
14	Other Workers	24349	19974	Nos.
15	Literates	62125	40632	Nos.

A walk-through survey was conducted by visiting rural place within the 10 km radius. While doing so, many interactions with various people like farmers, women, labours, teachers, health workers, etc. were conducted.

4.11.9 Employment and Livelihood within study area

The main occupation of the area is agriculture and their related activities. The principal crops in the survey area are Paddy, groundnut, Cotton, Turmeric, Gingelly etc.,

As agriculture cannot be a main sustenance for most of farmers, they have dual professions. Farming is mostly seasonal, they involve in other livelihood activities like business, non-agriculture labour, agriculture labour and other service sectors. Fragmentation of landholding leads to adopt to have additional occupation.

Table 4-22 Summary of Employment and Livelihood within the study area

Sl.NO	Type of workers	Study Area			
		0-5 Km		5-10 Km	
		Main	Marginal	Main	Marginal
1	Cultivators	9867	205	33052	136
2	Agri. Laborers	13089	1194	6326	420
3	Household Industries	2789	37	2068	39
4	Others	24349	172	19974	126

4.11.10 Educational Infrastructure within study area

The district has good primary and secondary education infrastructure in urban and rural areas. The people around the study area have well connected to educational infrastructures. The educational facilities of industry area are in summarized in **Table 4-23**.

Table 4-23 Details of Education facilities within study area

S. No	Type of School	Numbers	
		0-5 Km	5-10 Km
1	Government Pre-Primary school	6	22
2	Private Pre-Primary school	2	1
3	Government Primary school	21	38
4	Private Primary school	5	4
5	Government Middle school	7	12
6	Private Middle school	2	6
7	Government Secondary school	3	3
8	Private Secondary school	2	5
9	Government Senior Secondary school	2	1
10	Private Senior Secondary school	3	3

The following **Table 4-24** shows the literates population and the percentage within the study area

Table 4-24 Literates population and the percentage within the study area

Sl. No	Name	Total Population	Literates Population	% Literates
0-5 Km				
1	Ingur	5986	3970	66.3
2	Sullipalayam	2990	2191	73.3
3	Perundurai	82255	52970	64.4
4	Poovampalayam	846	687	81.2
5	Pattachampalayam	3187	2307	72.4
5-10 Km				
1	Pungampadi	2463	1696	68.9
2	Veppampalayam	2348	1564	66.6
3	Thottani	957	591	61.8
4	Mukasi Pulavapalayam	1020	718	70.4
5	Mukasipidariyur	14143	9791	69.2
6	Ottaparai	9493	6447	67.9
7	Varapalayam	2962	1624	54.8
8	Kambiliyampatti	2465	800	32.5
9	Moongilpalayam	3283	2211	67.3
10	Ponmudi	1219	869	71.3
11	Kullampalayam	3089	2156	69.8
12	Ayegoundampalayam	2772	1852	66.8
13	Seenapuram	2692	1736	64.5
14	Thuduppathi	2781	2099	75.5
15	Nimittipalayam	2004	970	48.4
16	Chinnamallampalayam	1029	606	58.9
17	Thiruvachi	2678	1632	60.9
18	Koorapalayam	485	302	62.3
19	Rayapalayam	638	374	58.6
20	Olapalayam	646	456	70.6

4.11.11 Health facility within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There was no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The local transport facilities and the communication facilities are the main reasons to get immediate medical attention. The incidents of institutional delivery are high due to awareness, education, economic development, proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced. The health facility within the study area are given in **Table 4-25**.

Table 4-25 Health facility within the study area

Sl.No	Type	Numbers	
		0-5 Km	5-10 Km
1	Community health centre	0	0
2	Primary health centre	0	0
3	Primary health sub-centre	2	9
4	Maternity and Child Welfare Centre	1	0
5	TB hospital/Clinic	0	0
6	Hospital Allopathic	0	0
7	Hospital Alternative Medicine	0	0
8	Dispensary	0	0
9	Veterinary hospital	1	2
10	Mobile health clinic	0	0
11	Family Welfare Centre	0	0

4.11.12 Drinking water facilities within the study area

We found that in all the villages, the drinking water connectivity is well established. The bore wells and piped water are main sources of drinking water. **Table 4-26** shows the drinking sources in the study area.

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Table 4-26 Drinking water sources in the study area

Sl. NO	Name	Tap Water-Treated (Status A(1)/NA(2))	Tap Water Untreated (Status A(1)/NA(2))	Covered Well (Status A(1)/NA(2))	Uncovered Well (Status A(1)/NA(2))	Hand Pump (Status A(1)/NA(2))	Tube Wells/Bore hole (Status A(1)/NA(2))	Spring (Status A(1)/NA(2))	River/Canal (Status A(1)/NA(2))	Tank/Pond/Lake (Status A(1)/NA(2))	Others (Status A(1)/NA(2))
0-5 Km											
1	Ingur	1	1	1	1	1	1	2	1	2	2
2	Sullipalayam	1	1	1	1	1	1	2	2	2	2
3	Perundurai	1	1	1	1	1	1	2	2	2	2
4	Poovampalayam	1	1	2	1	2	1	2	2	2	1
5	Pattacharampalayam	1	1	1	1	1	1	2	2	2	1
5-10 Km											
1	Pungampadi	1	1	1	1	1	1	2	2	2	2
2	Veppampalayam	1	1	1	1	1	1	2	2	2	1
3	Thottani	1	1	1	1	1	1	2	2	2	2
4	Mukasi Pulavapalayam	1	1	1	1	1	1	2	2	2	2
5	Mukasipidariyur	1	1	1	1	1	1	2	2	2	2
6	Ottaparai	1	1	1	1	1	1	2	2		2

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7	Varapalayam	1	1	1	1	2	1	1	2	2	1
8	Kambiliyampatti	1	1	1	1	1	1	2	2	2	2
9	Moongilpalayam	1	1	1	1	1	1	2	2	2	2
10	Ponmudi	1	2	1	1	1	1	2	2	2	2
11	Kullampalayam	1	1	2	2	1	1	2	2	2	2
12	Ayegoundampal ayam	1	1	2	1	1	1	2	2	2	2
13	Seenapuram	1	1	1	1	1	1	2	2	2	1
14	Thuduppathi	1	1	1	1	1	1	2	2	2	1
15	Nimittipalayam	1	1	1	1	1	1	2	2	2	2
16	Chinnamallampa layam	1	1	2	1	1	1	2	2	2	2
17	Thiruvachi	1	1	1	1	1	1	2	2	2	2
18	Koorapalayam	1	1	1	1	2	1	2	2	2	2
19	Rayapalayam	1	1	1	1	1	1	2	2	2	2
20	Olapalayam	1	1	1	1	2	1	2	2	2	2



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4.11.13 Summary

The Socioeconomic profile of the study area shows that the majority of people in the study area work in non-agricultural sector. They have good educational infrastructures and the people in the study area are well connected to the educational infrastructures. The average literacy rate of the study area is 64.98% which is less than the district literacy rate of 72.6%. The people in the study area are well connected to Government primary health centres and Primary health sub-centres and also they have emergency ambulance service “108” which is active all over the State.

4.12 Socio-Economic Data

Information about demography and socio-economic profile was collected from the District Census Hand book (2011) (District - Erode, Tamil Nadu). The census data available for different blocks, taluks and towns have been analyzed with respect to demographic profile, community structure, educational facilities, occupation structure and infrastructure facilities.

4.12.1 Demography

The population details in the study area with male & female classification and SC, ST population as per 2011 census are shown in **Table 4-29**. Children’s populations are shown in **Table 4-30**.

Table 4-29 Study Area Population Statistics

S.No	Town	Total Population	Male	Female	SC	ST	General
1	Perundurai Town	24930	12214	12716	2619	17	22294
2	Erode city	157101	78222	78879	17351	230	139520
Total		182031	90436	91595	19970	247	161814

Table 4-30 Study Area Children’s Details

S.No	Town	Total Children	Male	Female
1	Perundurai Town	2240	1154	1086
2	Erode city	14599	7412	7187
Total		16839	8566	8273



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4.12.2 Literacy

The number of literates and Illiterates of the study area is given in **Table 4-31**.

Table 4-31 Study Area Literacy Statistics

S.No	Taluks	Literate	Illiterate
1	Perundurai Town	19498	5432
2	Erode city	66750	63250
Total		86248	68682

4.12.3 Land use Pattern

The total geographical area of the study area was 322.23 Sq. Km. Cropped area accounts for 19.34% of the total area. Forest plantation cover is accounting for about 22.76% of the total area. A significant portion of the land falls under the category of 'non agriculture' or 'fallow lands'. Land use Pattern of the project study area given in **Table 4-32**.

Table4-32 Land use Pattern during 2011-02

S.No	Description	Percentage	Area (Sq.Km)
1	Fallow land	27.08314	87.27
2	Plantation	22.76014	73.34
3	Grasslands/ Grazing Lands	19.51712	62.89
4	Cropland	19.34022	62.32
5	Rural	5.458834	17.59
6	Urban	3.668187	11.82
7	River/ Stream/ Canals	0.946529	3.05
8	Scrub land	0.667225	2.15
9	Reservoirs/ Lakes/ Ponds	0.28551	0.92
10	Mining	0.164479	0.53
11	Barren Rocky Area	0.108618	0.35
Total		100	322.23

S.No	Description	Area (Sq.Km)
1	Urban	6.46
2	Plantation	6.16
3	Grass Lands	5.32
4	Fallow Land	4.19
5	Rural	1.95



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6	Cropland	1.57
7	Scrub Land	0.03

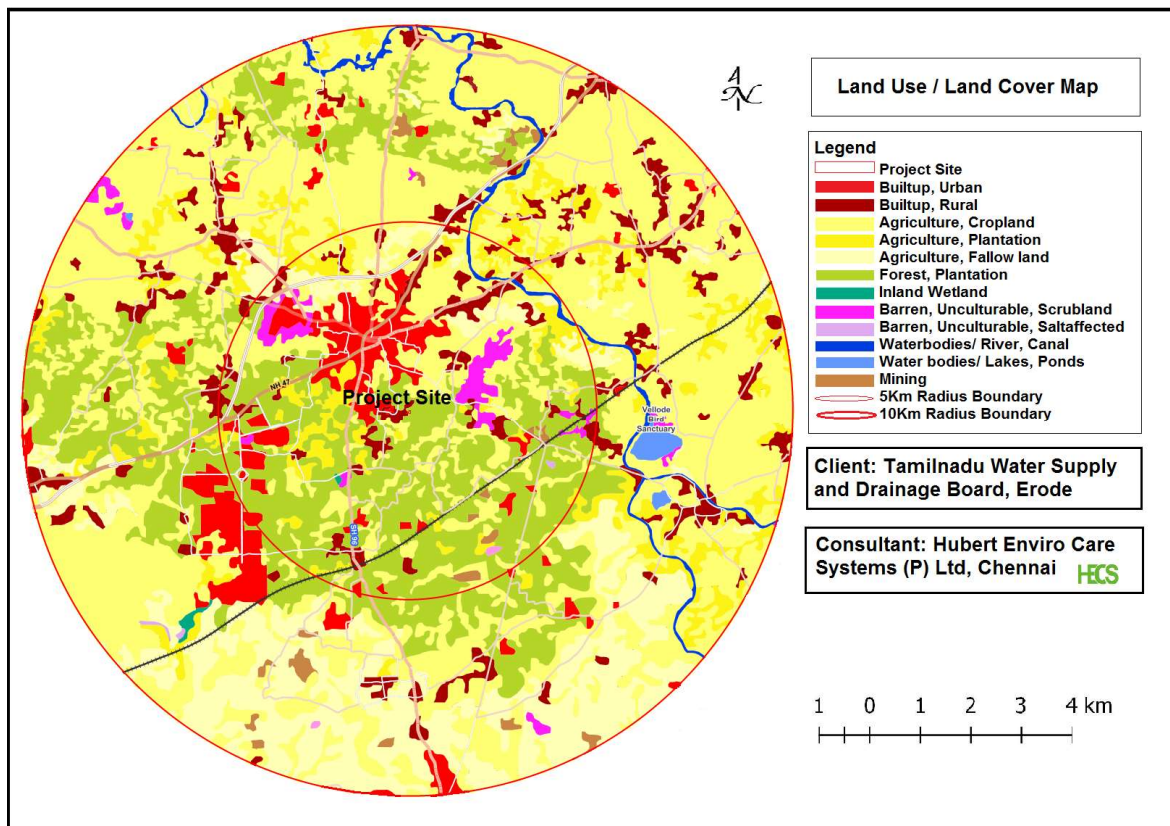


Figure 4-17 Land Use / Land Cover Map of Project Study Area

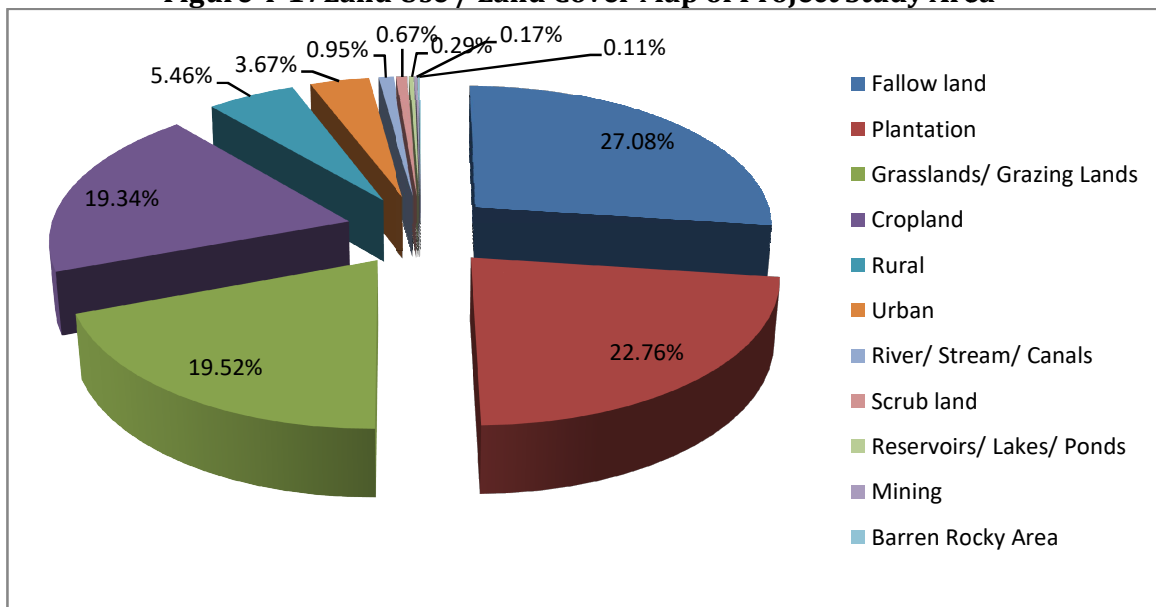


Figure 4-18 Land Use Pattern of Project Study Area



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4.12.4 Agriculture

Since the district is under the hot and dry climatic conditions, the dry land crop is best suited. Agriculture in the district depends on monsoon rains. The average rainfall of the District is below 812 mm. Paddy (69.54% of cultivable area) and Cereals (69.80% of cultivable area) are mainly cultivated in this district. There are ample opportunities to promote new crop varieties and new technologies such as precision farming and System of Rice Intensification as the farmers are now educated on these aspects and willing to adopt the new varieties and technologies.

Table 4-33 Area under principal crops during 2011 -12 in Hectares.

Net Cultivated Area	Hectares	100%
Paddy	33719	21.98
Turmeric	12857	8.38
Banana	5245	3.42
Groundnut	11368	7.41
Coconut	11368	7.41
Sugarcane	31540	20.55
Others	47333	30.85

4.12.5 Irrigation

The main sources of irrigation in Perundurai block are River canal, Tanks and Wells. The main contribution for irrigation in this region is canals, there are 4838 Canals and 938 tube wells and the area under the irrigation is 7276 Ha. There is no coastline in this area.

4.12.6 Animal Husbandry and Fisheries

In agricultural economy, the contribution by Animal Husbandry and fisheries sector is laudable as it goes parallel and depends on agriculture. Of late, cattle development has taken place through setting up of an intensive cattle development project. Apart from the cattle and buffaloes, goats, sheep and pigs are other important livestock found in the district. The livestock census, 2012 is shown in **Table 4-34**.

Table 4-34 Livestock Census 2012 – Erode District

S.No	Livestock	Quantity (No's)
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1	Cattle	2,76,564
2	Buffaloes	1,02,840
3	Sheep	1,65,277
4	Goat	3,09,202
5	Poultry	5661729

4.12.7 Mineral Resources

The limestone is available in this district; it is used for cement manufacturing process.

4.12.8 Industries

The district has limited number of Industries. A list of medium and large scale industries in Perundurai Taluk are given in the table below.

Table 4-35 Industries in Perundurai Town

S.No.	Name of Industry	Location
1	M/s. Inditex Processor (P) Ltd,	P.V.Palayam (Po)
2	M/s. Amudham Food Products (P) Ltd	Olapalayam (Po)
3	M/s. Sri Selvakumaran Textiles	Chengappalli (Po)
4	M/s. Amudham Ind. Products (P) Ltd	Olapalayam (Po)
5	M/s. The Soft Tex Processing Mill	P.V.Palayam (Po)
6	M/s. Shri Hari Processing Unit – I	Panickampalayam (Po)
7	M/s. Gudan Knitwears (P) Ltd	Panickampalayam (Po)
8	M/s. Easwari Knitting Works	P.V.Palayam (Po)
9	M/s. I Tech Metal Industries	SIPCOT
10	M/s. IVAX Paper Chemicals Ltd – Kovai Unit	SIPCOT
11	M/s. Britannia Industries Ltd	SIPCOT
12	M/s. Sree Rengaraj Ispat Industries (P) Ltd	SIPCOT
13	M/s. PRD RIGS india	SIPCOT
14	M/s. Sree DRG Vinyls Industries	SIPCOT
15	M/s. Jay Jay Mills (India) Pvt Ltd	SIPCOT



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4.12.9 Education

The literacy level of Perundurai town panchayat according to 2011 census is 86%. A total literate in is 19423 as of census 2011. The information on the list of educational institutions is given in **Table 4-36**.

Table 4-36 Lists of Educational Institutions in the Study town

S.No	Block name	PUPS	PUMS	MUPS	MUUS	Aid-PS	Aid-MS	HS/Aid-Hs	HSS/Aid-HSS
1	Perundurai	13	2	-	-	-	-	-	4
2	Erode	7	5	-	-	1	-	3	4
Total		20	7	-	-	1	-	3	8

PUPS: Primary/Upper Primary School, **PUMS:** Primary/.Upper Primary/Middle School, **MUPS:** Municipal Primary School, **MUUS:** Municipal Upper Primary School, **Aid-PS:** Aided Primary School, **Aid-MS:** Aided Middle School, **HS:** High School, **HSS:** Higher Secondary School (Source: www.freetutorial.in).

4.12.10 Workforce

Table 4-37, 4-38 presents details on workforce in the Study area taluk's. While the rural workers are employed in agriculture and allied activities, the urban workforce is employed in industries.

Table 4-37 Workforces in the Study Area

Town	Workers	Main Workers	Marginal Workers	Non Workers
Perundurai	10620	10246	374	14310
Erode	66140	63626	2514	90961
Total	76760	73872	2888	105271



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Table 4-38 Gender wise Work Force Details

Town	Work Force	Total	Male	Percentage	Female	Percentage
Perundurai	Workers	10620	6595	62.1	2549	24
	Non Workers	14310	5423	37.9	10876	76
Erode	Workers	66140	41470	62.7	14352	21.7
	Non Workers	90961	33928	37.3	71222	78.3

4.12.11 Medical and Health Facilities

Table 4-39 presents the medical & health care facilities in the Erode district.

Table 4-39 Health care facilities in the Study Area

S.No	Description	Counts
1	District Hospitals	1
2	Sub divisional Hospitals-Siddha	4
3	Municipal Hospital - Siddha	2
4	Government Hospital	2
5	Urban Health	2
6	Approved Nursing Homes	96
7	Nursing Homes	9
8	Siddha- PHC	21
9	Homoeopathy	1
10	CT Scan	1

(Source: www.tnhealth.org)

4.13 Environmental Setting

The ecologically significant systems within the study area of the project site are listed and briefly discussed below:

a) Archaeological monuments:

The project location does not have significant archaeological monuments in nearby 10 km radius.

b) Biological resources:

It was found that the project location is devoid of any endangered flora and fauna within 10 km radius.

c) Core Zone of Biosphere Reserve/ Habitat for Migratory Birds



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There is no biosphere reserve/habitat for migratory birds in the study area.

d) Lakes / Reservoirs / Dams

In the study area there are no major lakes, reservoirs and dams.

e) Sea / Estuary/ Mangroves

There is no sea/ estuary/ mangroves in the study area.


f) Cultural Monuments

This projectsite does not have significant cultural monuments in nearby 10km radius.

4.14 Project Site Features




Features of the selected project sites are presented in the following table

Table 4.40 Site Environmental Features

Infrastructure	Location and Environmental Features	Site Photograph
Lifting Station – 1 LS-1 at Thoppupalayam (Near Alamaram Kovil)	<p>0.05 acres of vacant land belonging to Town Panchayat (S.F.No.1006)in Thoppupalayam (Near Alamaram Kovil) is proposed for constructing Lifting Station.</p> <p>The site is covered partly with shrubs and buses. The site is located away from the commercial and residential area. Also, the nearest receptor i.e., residential place lies at a distance of 250 m from the project site. The green belt will be developed on the boundary of the site.</p> <p>It is located in zone 2 and components of LS are Suction well (dia – 2.5 m & depth – 3.83 m)</p>	
Lifting Station – 2 LS-2 at Beerangimedu	<p>0.05 acres of vacant land belonging to Town Panchayat (S.F.No.901/19) in Beerangimedu is proposed for constructing Lifting Station.</p> <p>The site is located on the road side. The site is located away from the commercial and residential area. Also, the nearest receptor i.e., residential</p>	






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	<p>place lies at a distance of 100 m from the project site. The green belt will be developed on the boundary of the site. It is located in zone 2 and components of LS are Suction well (dia – 2.5 m & depth – 5.53 m)</p>	
<p>Lifting Station – 3 LS-3 at Ashok nagar</p>	<p>0.05 acres of vacant land belonging to Town Panchayat (S.F.No.872/25) in Ashok nagar is proposed for constructing Lifting Station.</p> <p>The site is located on the road side. The site is located away from the commercial and residential area. Also, the nearest receptor i.e., residential place lies at a distance of 100 m from the project site.</p> <p>The odour controlling device is proposed in the site to mitigate the odour problems/ issues. The green belt will be developed on the boundary of the site.</p> <p>It is located in zone 2 and components of LS are Suction well (dia – 2.5 m & depth – 4.15 m)</p>	
<p>Lifting Station – 4 LS-4 at Periyavettuvampalaya m</p>	<p>0.05 acres of vacant land belonging to Town Panchayat (S.F.No.338/18) in Periyavettuvampalayam is proposed for constructing Lifting Station.</p> <p>The site is covered partly with shrubs and buses. The site is located away from the commercial and residential area. Also, the nearest receptor i.e., residential place lies at a distance of 300 m from the project site. The green belt will be developed on the boundary of the site.</p> <p>It is located in zone 3 and components of LS are Suction well (dia – 2.5 m & depth – 5.65 m)</p>	






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<p>Lifting Station – 5 LS - 5 at Panikampalayam</p>	<p>0.05 acres of vacant land belonging to Town Panchayat (S.F.No.1025/7) in Panikampalayam is proposed for constructing Lifting Station.</p> <p>The site is located near by the residential area. Also, the nearest receptor i.e., residential place lies at a distance of 50 m from the project site. The green buffer will be proposed in the site to mitigate the odour. The green belt will be developed on the boundary of the site.</p> <p>It is located in zone 4 and components of LS are Suction well (dia – 2.0 m & depth – 3.85 m)</p>	
<p>Lifting Station – 6 LS - 6 at Kuyavan kuttai.</p>	<p>0.05 acres of vacant land belonging to Town Panchayat (S.F.No.792/2) in Kuyavankuttai is proposed for constructing Lifting Station.</p> <p>The site is located near by the residential area. Also, the nearest receptor i.e., residential place lies at a distance of 50 m from the project site. The green buffer will be proposed in the site to mitigate the odour. The green belt will be developed on the boundary of the site.</p> <p>It is located in zone 1 and components of LS are Suction well (dia – 3.3 m & depth – 6.28 m)</p>	
<p>Main Pumping Station MPS-I at Ayyarkulam</p>	<p>0.5 acres of Government poramboke land of S.F.No.874/16 (Ayyarkulam) available will be used to construct Main Pumping Station. The land was transferred to Town panchayat vide GO No 407/Revenue(LD5(1) Department) dated 17.10.2013. At present the site is vacant and surrounded by vacant land. The nearest residential house lies at 100.0 m from the project site on the Eastern and Southern side of project boundary. It is proposed to construct Compound wall for the entire site. Green buffer is proposed to mitigate the Odour problems. Also Odour control device will be installed in site.</p>	






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	It is located in zone 1 and components of MPS are Screen well (dia – 5.0 m & depth – 5.87 m), Grit well (dia – 3.5 m & depth – 6.75 m) and Collection well (dia-6.5 m & depth- 8.57 m)	
Main Pumping Station - 2 MPS-II at Panikampalayam Compost Yard	The proposed Main pumping station was located at Panikampalayam Compost yard (inside the STP site) in the Town Panchayat land extend of 0.25 acre comprise S.F.No. 1032/2. The Site is located away from residential and commercial areas. The site is dumped with solid waste. The nearest residential unit lies at 300m from the project site. The Components of MPS are Screen well (dia – 2.0 m & depth – 5.22 m), Grit well (dia – 2.0 m & depth – 5.72 m) and Collection well (dia-2.0 m & depth- 6.85 m) and located in Zone 4.	
Sub-Pumping Station SPS-I at Chinnavettuvampalayam	0.1 acre of State Highways comprises Survey No. 533 available in Chinnavettuvampalayam will be used to construct Sub- Pumping Station for Zone-3. The proposed site is vacant & covered with shrubs and bushes, it is located far away from the residential area and industries. The residential lies at distance of 290.0m from the project site. The site has ample space and green buffer will be developed all around the site. The Components of SPS are Screen well (dia – 3.5 m & depth -5.56), Grit well (dia – 2.0 m & depth – 6.96 m) and Collection well (dia-5.0 m & depth-7.67 m)	
Sub-Pumping Station SPS-II at Chennivalasu	The proposed Sub- pumping station was located at Chennivalasu in the Revenue land extend of 0.2 acre comprise S.F.No. 925/3 and located in Zone-2. Site is located within a developed neighborhood with residential and commercial buildings. The nearest residential unit lies at 30m to the southern side from the project site. However, the site is large and SPS will be located within the site maintaining maximum buffer with residential buildings. However, the odour controlling device will be installed in site. The Components of SPS are Screen well	



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	(dia – 3.5 m & depth -5.56), Grit well (dia – 2.0 m & depth – 6.96 m) and Collection well (dia-5.0 m & depth-7.67 m)	
Sewage Treatment Plant (3.14 MLD) at panikampalayam Compost yard	<p>About 2.5 acres (S.F.No. 1032/2) of Town panchayatcompost yard available at panikampalayam will be used to construct STP. This site dumped with soild waste, site is far away from the residential and commercial development. This STP is proposed to treat the sewage from Zones 1, 2, 3 and 4. The residential settlements are far away from the proposed STP (300m).The green belt will be developed on the boundary of the site.</p> <p>The Sewage treated water will be disposed into near by kuttai from where the overflow flows nearby odai. A pipeline of length 50m will be constructed from the outlet of proposed STP upto the kuttai.</p>	 <p style="text-align: center;">In initial Stage</p>  <p style="text-align: center;">At present</p>
Outfall from STP in Panikampalayam	<p>It is proposed to discharge the treated water from STP into the nearby kuttai through the proposed pipeline for a distance of 50m from the STP. The outfall channel is connected to odai at distance of 200m. The width and depth of kuttai is 100m and 5.0m respectively.</p> <p>The capacity of STP at Panikampalayam is 3.14 MLD. The maximum daily discharge from the STP into the channel in the ultimate year is 3.14 MLD.</p> <p>Thus, the channel has the adequate capacity to take the treated water from STP during monsoon and non-monsoon periods. Also, the channel does not have encroachments and household in the downstream.</p> <p>As per the TNPCB NOC letter, the treated sewage will be planned for irrigation.</p> <p>However, a proposal for the use of treated water for irrigation in the nearby future is made.</p>	



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Collection System	<p>Sewer lines will be laid in the centre of road by cutting black top, within the road right of way. In wider roads, like SH, NH, divided 2-way roads etc., sewers will be laid along the edge of the road, but mostly within the black top portion. In the outskirts where adequate land in the road shoulder is available along the blacktop and is clear of any structures or activities, pipes will be laid in this earthen shoulder.</p>	
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Figure 4-19 Satellite Image for Treated Effluent Disposal Point from STP



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4.15 Raw Sewage Characteristics

The sewage collected from various chambers is almost of same type. The domestic wastewater from the local residential area constitutes the raw sewage. The wastewater characterization is presented in **Table 4-41**.

Table 4-41 Raw Sewage Characteristics

S.No	Parameter	Values	Unit of measurement
1	Biological Oxygen Demand	280	Mg/l
2	Chemical Oxygen Demand	540	Mg/l
3	Total suspended solids	564	Mg/l
4	Total Kjeldahl Nitrogen	61	Mg/l
5	Ammonia Nitrogen (as N)	50	Mg/l
6	Total Phosphorous	5	Mg/l
7	Sulphate	288	Mg/l
8	Fecal Coliform	10 ⁶	MPN/100ml
9	Total Coliform	10 ⁷	MPN/100ml
10.	Chlorides	1799	Mg/l
11	pH	7.58	-
12	Oil and grease	50	Mg/l

4.16 Treated Effluent Quality

The STP will be designed in such a way that the treated effluent quality attains the limits or even better so as to attain the standards well below given by the Pollution Control Board. The parameters to be monitored and to maintain within limits are presented in **Table 4-42**.

Table 4-42 Treated Effluent Quality

S.No	Parameter	Values	Unit of measurement
1	Biological Oxygen Demand	Not more than 10	Mg/l
2	Total suspended solids	Not more than 20	Mg/1
3	Chemical oxygen Demand	Not more than 50	Mg/l
4	pH	6.5-9	



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5	Oil and grease	Less than or Equal to 5 mg/l	Mg/l
6	NH ₄ -N	Not more than 5	Mg/l
7	Nitrate Nitrogen as NO ₃	5 or less	Mg/l
8	Total Phosphorous	5 or less	Mg/l

Table-4-43 Salient features of the proposed STP site

S. No	Particulars	Details
1.	Latitude	11.255402 to 11.280655 N
2.	Longitude	77.574283 to 77.592307 E
3.	Site Elevation above MSL	292 m above MSL
4.	Land Available for proposed project	2.5 Acres
5.	Proposed STP Capacity	3.14 MLD
6.	Technology Used	Fluidized Aerobic Bio Reactor Technology (FAB)
7.	Nearest Highway	<ul style="list-style-type: none"> ➤ NH 544 (Salem –Kochi) ≈ 4.3 Km ➤ SH 96 (Erode- Perundurai - kangeyam)≈ 2.32 Km ➤ NH47(Salem – Coimbatore)≈ 2.10 Km
8.	Nearest Railway station	➤ Perunthurai Railway Station ≈ 3.89 km (E)
9.	Nearest Airport	➤ Coimbatore Airport ≈ 65.63 km (WSW)

5 PREDICTED IMPACTS AND MITIGATION MEASURES

5.1 INTRODUCTION

When identifying the potential impacts of a new project on the existing environment, such as the proposed Sewage Treatment Plant situated at Pannikkampalayam, Perundurai. Construction of sewer line with sewage



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treatment plant and there after operation of this system, if undertaken without a proper understanding of the relationships inherent in environmental function, can be accompanied by disruptions to the environment, from which it may take a long time to regain equilibrium. In human terms, this may mean that generations must function in a debilitated environment and suffer many possible associated socio-economic hardships and financial losses.

Some of the major environmental impacts of sewerage system include damage to local ecosystems, loss of productive agricultural lands, demographic change, accelerated urbanization, and introduction of disease. The need of development and growth in the area must be matched with the conservation of the existing natural resources.

In general, construction of a new sewage treatment plant will have a positive environmental impact on the town. It is expected to produce a long term improvement in public health of the residents, as well as to significantly reduce a source of chronic water pollution of an ecologically valuable portion if the water body where the sewerage drains.

5.2 IMPACT EVALUATION

5.2.1 Air Quality

This section presents an assessment of air quality impacts associated with the construction and operation of the proposed STP activity at Perundurai Town Panchayat, Erode District, and Tamil Nadu. Major sources of air pollution have been identified namely construction dust emission and road traffic emissions. The sources of air pollutants at the different phases of the development are categorized as follows;

- **Construction Phase:** Construction works include site clearance, site formation, STP units & administration building works. The major temporary air pollution is dust generated as a result of these construction works. Cutting and welding operation, loading-unloading operation is mainly responsible for the release of PM, SO₂, NO_x, CO etc. However the overall impact may be rated as direct, short-term, adverse, and reversible.



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- **Operational Phase:** The primary emission sources during the operations phase would include compressor and pumping station operations, vehicular traffic, carbon dioxide and a small quantity of Hydrogen sulphide may be produced in Aerobic Tank.

5.2.2 Noise Quality

The noise quality around the proposed site is under the permissible limit.

- **Construction Phase:** The construction of the proposed sewage treatment plant may generate noise during the constructional phase due to activities of loading, unloading of material handling and machine operation equipment & vehicular movement. Impact of noise level may be categorized as direct, short-term, adverse, reversible and of low to moderate magnitude.
- **Operational Phase:** The main sources of noise during the operations phase would include compressor and pumping station, and vehicle traffic. The noise levels from the pumping stations may between 64 - 86 dB(A) or between 58 - 75 dB(A) at about 1 kilometer from the station. Other noise pollution during operation would be generated by other mechanical equipment, and sludge dewatering units. DG will also be a source of noise generation.

5.2.3 Odour Problems

- **Operation Phase** - Inlet chamber, grit channels, screening and grit handling, aeration tanks, and sludge holding and dewatering units are the main sources of odour at the Sewage treatment plant.

5.2.4 Water Quality

- **Construction Phase** - The construction of the proposed sewage treatment plant will facilitate improvement of water quality in and around the site by avoiding the unhygienic disposal of the raw sewage in the vicinity.



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- **Operation Phase** -There will not be any adverse impact on the ground water quality since the treated effluent will be within the standards prescribed by the CPCB / TNPCB.

5.2.5 Solid Waste Handling

- **Construction Phase** - Solid waste generated during site preparation and construction work would include cut vegetation and typical construction waste (Ex. wasted concrete, steel, wooden scaffolding and forms, bags, waste earth materials, etc.). This waste would negatively impact the site and surrounding environment if not properly managed and disposed of at an approved dumpsite.
- **Operation Phase** – Grit, screenings and the sludge generated from the treatment plant will be the major source of solid waste generation.

5.2.6 Cultural and Socio-Economic Impacts

- The construction of proposed sewage treatment plant is a mark beneficial socio-economic aspect since it leads to safe and hygienic disposal of the treated effluent.
- It enhances the existing environment as the untreated raw sewage disposal will be ceased.
- Also, the project will provide employment to the people during the constructional and operational phase hence creating a positive impact due to this project.

5.2.7 Outfall location and design

- The treated sewage is disposed to the nearest kuttai 50m away from the site.
- As the sewage is discharged after treatment, the treated sewage quality will be within the standards prescribed by CPCB/TNPCB.
- Since the quantity of treated sewage is huge, there can be flooding of the nearest kuttai and the same may flow into the odai and reaches a large



kuttai near chennimalaipalayam which has the carrying capacity of 5000 ML.

5.2.8 Existing utility services

The road opening activities may damage the underground water pipelines or electricity poles in the vicinity of the site for the proposed sub-projects. This will lead to water supply interruptions, disruption in electricity supply and will involve expensive repair costs.

5.3 Proposed Mitigation Measures

5.3.1 Air Quality

- The fugitive emissions and dust from the proposed site during construction phase can be reduced by sprinkling of water.
- The release of volatile organic compound, Carbon di-oxide and H₂S may take place during the operational phase which will be mitigated by implementing Environmental Management Plan.
- The power requirement during the operation of STP will be 13.5 KVA/day. DG sets are operated only during power failures and the D.G sets are proposed to provide 20 KVA as required suitable power back up to run the plant. The emissions from the D.G sets will have marginal impact on the existing air quality, however adequate Stack height of 5m will be provided as per the CPCB norms to combat the effect on the air quality and also to facilitate proper dispersion.
- Steps will be taken to create environmental awareness for the commuters so that the vehicles will be maintained properly in turn will not have any impact due to the vehicular emissions.

5.3.2 Noise Quality

a) Collection System and Pumping Stations

Operation of pumps and motors and diesel generators is a major source of noise. The Pumpsets proposed are submersible with the maximum capacity of 25 HP. As the



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

pumping stations are located in the residential areas, with few located very close to the houses, noise generated from pump stations can have continuous negative impacts on the surrounding population. Internal noise level in a room measured at a distance of 1m from these pump sources typically will be in the range of 80 dB(A) to 100 dB(A).

- Procure good quality latest technology high pressure pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1meter.
- (ii) Use appropriate building materials and construction techniques for sewage pumping stations which can absorb sound rather than reflect noise.
- (iv) Procure only CPCB approved generators to meet air emission and noise level requirements.
- (v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors
- (vi) Provide ear plugs designated for noise reduction to workers. Those working in enclosed areas or adjacent to continuous running equipment should be provided with proper noise attenuating equipment.

b) Sewage Treatment Plant

- It can be mitigated by restricting the vehicular movement only during the day time.
- Noise problems shall be reduced to normally acceptable levels by incorporating low-noise equipment in the design and/or locating such mechanical equipment in properly acoustically lined buildings or enclosures.
- Acoustic enclosures will be provided for DG.
- Greenbelt is proposed along the periphery of the site which helps in reducing the noise levels.
- Adequate care will be taken to maintain the noise levels within the prescribed limits by providing ear muffs to the workers.
- The nearest residential development is about 0.5 km from the periphery of the STP and the sensitive areas such as temple and school are located at a distance of more than 2 km. The attenuation by the proposed greenbelt will be more than the adequate to maintain the noise level well within the prescribed standards by CPCB/TNPCB.



5.3.3 Odour Problems

a) PUMPING STATIONS/Lifting Stations :

All the pumping stations are away by minimum 50m from the residences / Sensitive receptors.

Measures proposed for Odour control from Lifting stations/Pumping stations:

- Continuous operation with power back up
- Every day removal of Grit and screens.
- Green belt around the Pumping stations.
- In addition to the above odour monitoring will be carried out during Operation and Maintenance and if need arises other odour control measures like Mechanical methods will be examined and be provided.

b) Sewage Treatment Plant

- Odor can be reduced or prevented through continuous process of the operation. The grit and screenings will be cleaned twice a day to facilitate normal flow of the water. The sludge developed in Clarifier and Aeration tank will be removed and part re-circulated to maintain the MLSS around 3000 mg/L as per field requirements.
- Surplus sludge will be pumped to the Sludge digester and to the Centrifuge for making Sludge cakes and subsequent disposal to the Compost yard.
- Storage of sludge in the STP site will be avoided and be periodically removed.
- Thick shrubs and the trees along the periphery and in between the STP units will help in mitigating the odor from the site.
- Fly and Mosquito breeding is not envisaged since there will not be any stagnation of water inside the plant area.
- The odour impacts to the community are expected to be minimal. There is no significant habitation around the proposed site and there will not be any impact.

5.3.4 Water Quality and Disposal

a) Network and Pumping Stations



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- Adequate care will be taken to the leakages in the plant and leak proof joints are already proposed for the construction.
- All the structure constructed with M30 concrete which is leak proof.
- Continuous operation will be ensured to prevent overflow at Pumping stations.
- All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains
- Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; do not stock earth/material close to water bodies
- Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;
- Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- Place storage areas for fuels and lubricants away from any drainage leading to water bodies; these should be at least 100 m away from water bodies and groundwater wells
- Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management
- Dispose any wastes generated by construction activities in designated sites
- Conduct surface quality inspection according to the Environmental Management Plan (EMP).

b) Sewage Treatment Plant

- Adequate care will be taken to the leakages in the plant and leak proof joints are already proposed for the construction.
- All piping inside the plant will be cast iron double flanged. All pipe work and fittings will be a class rating in excess of the maximum pressure attained in service including any surge pressure.



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- All underground-buried piping will be protected by the application of hot coal tar enamel and fiberglass wrapping. The coating will consist of one coal tar primer one coat, wrapping of fiber glass one more coat of enamel and the final wrap of enamel impregnated fiber glass.
- All sanitary piping will be of UPVC class 4 suitably buried below the ground with a sand cushion of 20 cm all round. The pipes will painted with two coats of anticorrosive bit mastic paint.
- The drained water will be sent back to the inlet for treatment through pipelines.
- Administrative building, chlorine tonner and centrifuge house are provided with rain water harvesting facilities. Pipe culverts will be provided at road crossings for storm water drainage of the area at the required number of places.
- There will not be any impact on the nearby drainage canal downstream usage. However as mentioned above the quality of the treated effluent will meet the standards prescribed by the Central and State pollution control Boards.
- There are few surface water bodies (Chennimalaipalayam lake) located at around 2.0 Km from the site, which will carry water during rainy season only. There will not be any impact due to the proposed STP. To prevent flooding of the disposal to Kuttai, the pipeline should be conveyed at different locations of the site, covering the entire area with an approximate interval of 50m within the disposal site. This will ensure proper dispersion of water and prevent flooding. The carrying capacity of the kuttai near the STP site is nearly 300 ML and then the overflowing water goes through an odai and reaches a large kuttai at Chennimalaipalayam which has carrying capacity of 5000 ML. In the end route there are agricultural fields, the farmers utilizing the water from odai.
- During operation phase the sewage from administration building will be taken to STP. After treated the sewage, the waste will be sent to septic tank which will be cleaned regularly.
- All the structure constructed with M30 concrete which is leak proof.
- Continuous operation will be ensured to prevent any discharge of Untreated effluent



5.3.5 Soil Quality

- Top soils shall be stockpiled to a height of 400 mm in pre – designated areas for preservation and shall be reapplied to site during plantation of the proposed vegetation.
- Top soil shall be separated from sub-soil debris and stones larger than 50 mm diameter. So that, the soil erosion can be prevented and proper construction procedure will be done.
- Heavy metal analysis should be done for disposal site once in 3 months.

5.3.6 Solid Waste Handling

a) Network and Pumping Stations

Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that are taken into consideration during the sewer system design. Measures such as the following are included in sewer system design to ensure that the system provides the benefits as intended:

- Limit the sewer depth where possible
- Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible)
- In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm)
- In unavoidable cases, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided).
- For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes; Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry.
- Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent build-up of solids and hydrogen sulfide generation.



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a) Sewage Treatment Plant

- Grit and screenings will be immediately removed and taken to Town Panchayat solid waste dump site in consultation with the Town panchayat.
- The sludge from the Treatment Plant shall be collected in a sludge sump where it is aerated continuously for mixing. The aerated sludge shall be treated through mechanical dewatering system by aeration, digestion and thickening.
- Before dewatering, the sludge shall be aerated and polyelectrolyte is to be added for best settlement of sludge.
- The sludge cake from the centrifuge pump will be moved to the composting yard through trucks.
- During transportation sludge will be covered in tarpaulin sheets.
- The sludge will be removed at frequent intervals in order to avoid accumulation inside the site.

5.3.7 Mitigation measures for Existing Utility Services

- Identify the common utilities to be affected such as: telephone cables. Electric cables, electric poles, water pipelines, public tabs, etc.
- Affected utilities shall be relocated with prior approval of the concerned agencies before construction starts.
- Provide advance notice (not less than 10 working days) to affected parties. The advance notice shall be in the form of written notice and a grievance redressal cell shall be established for timely addressing of grievances.

5.3.8 Health and Safety

Safety during Construction

- Adequate precautions to be taken to prevent the accidents and from the machineries. All machines used will conform to the relevant Indian Standards Code and will be regularly inspected by the TWAD.
- Shoring and Strutting will be provided to avoid the collapse of the soil in case of loose soil.
- Barricading of Construction Site / Manholes at all times in a day with adequate signage.



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- Protective footwear and protective goggles to all workers employed on mixing of materials like cement, concrete etc.
- Welder's protective eye-shields will be provided to workers' who are engaged in welding works.
- Earplugs will be provided to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation.
- The contractor will supply all necessary safety appliances such as safety goggles, helmets, safety belts, ear plugs, mask etc to workers and staffs.
- The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No.62 as far as those are applicable to this contract.
- The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 and adhered to.
- The contractor will not employ any person below the age of 18 years for any work and no woman will be employed on the work of painting with products containing lead in any form.

Safety during Operation

- The STP, and pumping stations are provided with compound wall of height 3.0m and fencing will be provided in lifting stations for safety purpose.
- The structures will be provided with easy access ladders, and handrails, interconnections between all units with proper safe walkway platforms for movement to avoid falling of human and materials. Electrical cables are laid in cable trenches. Open spaces at height will be covered with parapet walls and handrails.
- The necessary safety measures for the storage and usage of Chlorine will be provided. The chlorine leak detectors will be provided to identify the leakage for immediate remedial actions.
- The emergency repair kit, Personal safety kit like full body cover, Oxygen kit for breathing, face mask, body shower and eye washers would be provided. For all these measures requiring separate items, and for those above in other sections cost provided in the table for EMP cost estimate.

Electrical Safety Provisions



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- Electrical design is done based on the standard practice with all relevance to IEE/IEC/IS standards. All equipment proposed are well advanced.
- Electrical control system for STP is mostly automatic with adoption of PLC system. The one point control given advantage of optimum supervision of the whole system with data logging facility.
- PLC (Programmable Logic Controller) of STP is linked to process control also.
- Drive motors are of TEFC (Totally Enclosed, Fan Cooled) all weather proof. Up to 5 HP the drive controls are proposed with Direct On Line (DOL) starters from 5 HP to 25 HP it is through star/delta starters. Further beyond 25 HP rated motors drive controls is through soft starters.
- These will save more energy, reduce the starting current of the motor and reduce the strain on the motors.
- The PLC and its software interface controls flawlessly the drives to the intended programmed chalked with the process technology and stream route sequence and other requirements during the complete process.
- Each drive will have a standby to maneuver failures if any and to give relief for other motor.
- The system as whole will have manual operation option also from one point or from drive locations itself. These statutory from the view of safety and emergencies. Emergency stop push button stations are provided for all drive points with lockable arrangements for meeting all emergencies.
- For maintaining energy efficiency, the power system will be assisted by static capacitor banks with auto controls so that the power factor shall be maintained at 0.95 PF and optimum energy efficiency is achieved. These capacitor banks are located on LT side of the electrical distribution system.
- Cables are proposed to interconnecting the drives and motors. XLPE (Cross linked Poly Ethylene) cables conforming to IS:1554 has been proposed. Minimum size of the cable is restricted to 4mm^2 to provide mechanical safety and avoid future breakages.
- For control loops and PLC loops 2.5mm^2 copper multi core cables are adopted.
- A mimic panel interfaced with the power and control system gives the status indications of all the drives and associated process controls at a glance in the control room. This is an illuminated board with painted process flow diagram and drive locations.



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- A separate panel has been proposed for each Lifting and Pumping station with an independent DG set for an emergency supply of the rating shown in the SLD. The supply for all the Lifting and Pumping stations shall be taken from Electricity Board source.
- Double earthing system is adopted for providing better equipment safety using GI strips for more than 7.5 HP drives and 8G GI wire for lesser rated drives. The earth stations proposed are of conventional type with 50 mm GI pipe as per 3043-1987. Copper Plate earthing has been proposed for transformer and DG neutral earthing.
- Outdoor and Indoor lighting are planned to give good light at all the area and in particular at drive/inspection points. These are timer controlled with manual operation option. Street lights are metal halide type mounted on tubular points of 5.0 m height. As a statutory requirement 10% of street lights shall be solar operated lamps.

Training for Operation staff

Periodical training would be provided to the staffs and operators involved in the STP Operation, O&M, Chemical Handling, Emergency, Line Maintenance, Valve Operations, Electrical & Mechanical Operations, Cleaning Of Pumping And Lifting Stations.

Facility for Workers

Basic facilities such as toilet, drinking water, electricity health, eye shower, first aid facility and safety gadgets, personal protective equipments (Safety Glasses, Splash-proof Goggles, Gloves, Hearing Protection, Safety Shoes or Boots and Respirators) for chemicals and sludge handling will be provided at the Treatment Plant.

Other item of safety equipment should include

- (a) First aid kits (b) stretchers (c) fire extinguishers, (d) Gas and fire alarms, (e) portable combustible gas indicators, (f) hose and gas makes, (g) emergency portable lights, (h) an oxygen efficiency indicator.

5.3.9 Green Belt Development

With a view to mitigate the adverse environmental effect on surroundings and to provide an environmental cover from emissions, green belts are developed in and around the project site.



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The main objective of the green belt is to provide a barrier between the source of pollution and the surrounding areas. The green belt helps to capture the emission and to attenuate the noise generated apart from improving the aesthetics. Development of green belt and other forms of greenery shall also prevent soil erosion and washing away of topsoil besides helping in stabilizing the functional ecosystem, make the climate more conducive and restore water balance. The area along the plant boundaries shall be used to plant various trees and shrubs. While making choice of plant species for cultivation in green belts, importance has to be given to the natural factor of bio-climate. It is also presumed that the selected plants will be grown as per normal horticultural (or forestry) practice given above and authorities responsible for plantation will also make adequate provision for watering and protection of the saplings.

Total area of 1155 m² is proposed for green belt development. The area is 15 to 25 m on each side of the proposed STP.

Approximately, 46 trees can be grown in the area with a distance of 5 m between each tree. No. of saplings required would be around 50

The main purpose of green belt development is to contribute to the following factors:

- To attenuate noise level generated from the plant;
- To improve the aesthetics of the plant area;
- To trap the vehicular and fugitive dust emissions;
- To act as a pollution sink for gaseous emissions;
- To maintain ecological balances;
- To prevent soil erosion and to protect the natural vegetation;
- To utilize the treated effluents.

Table 5-1 Trees proposed for Green Belt Development

S.No	Botanical Name	Family	Common Name	Vern. Name	Habitat	Tree Height
	Trees					
1.	Acacia auriculiformis	Fabaceae	Australian Wattle	Pencil maram	Evergreen	15-30 m



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2.	Azardirachta inidca	Meliaceae	Neem	Vembu	Semi Deciduous	15-20 m
3.	Bambus bambos	Poaceae	Bamboo	Moongil	Evergreen	30 m
4.	Bawhinia variegata	Fabaceae	Mountain Ebony	Sivappu mandharai	Deciduous	10-12 m
5.	Borassus flabellifer	Arecaceae	Palmyra palm	Panaimaram	Evergreen	30 m
6.	Cassia fistula	Fabaceae	Amaltas	Sarakkondrai	Deciduous	10-20 m
7.	Cassia roxburghii	Fabaceae	Red Cassia	Senkondrai	Evergreen	10-20 m
8.	Millingtonia hortensis	Bignoniaceae	Indian cork tree	Maramalligai	Evergreen	18-25 m
9.	Mimusops elengi	Sapotaceae	Maulsari	Magizhamaram	Evergreen	9-18 m
10.	Muntingia calabura	muntingiaceae	Jamaica cherry	Seeni pala maram	Evergreen	7-12 m
11.	Couropita guianensis	Lecythidaceae	Cannon Ball Tree	Naagalingamar am	Evergreen	Upto 35 m
12.	Eucalyptus tereticornis	Myrtaceae	Forest red gum	Thaiyalam	Evergreen	20-50 m
13.	Vitex negundo	Lamiaceae	Chinese Chaste tree	Nochi	Evergreen	-
14.	Pongamia pinnata L.	Fabaceae	Indian beech	Pungai	Evergreen	-
Shrubs (Ornamental plants)						
15.	Hibiscus rosa sinensis	Malvaceae	Rose mallow	Sembaruthi	-	1.5-3m
16.	Ixora singaporensis	Rubiaceae	Jungle flame	-	-	-
17.	Nerium oleander	Apocynaceae	Oleander	Arali	-	2-6 m
18.	Tecoma stans	Bignoniaceae	Yellow bells	Manjarali	-	-
19.	Ocimum tenuiflorum	Lamiaceae	Indian basil	Tulasi	-	30-60 cm



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

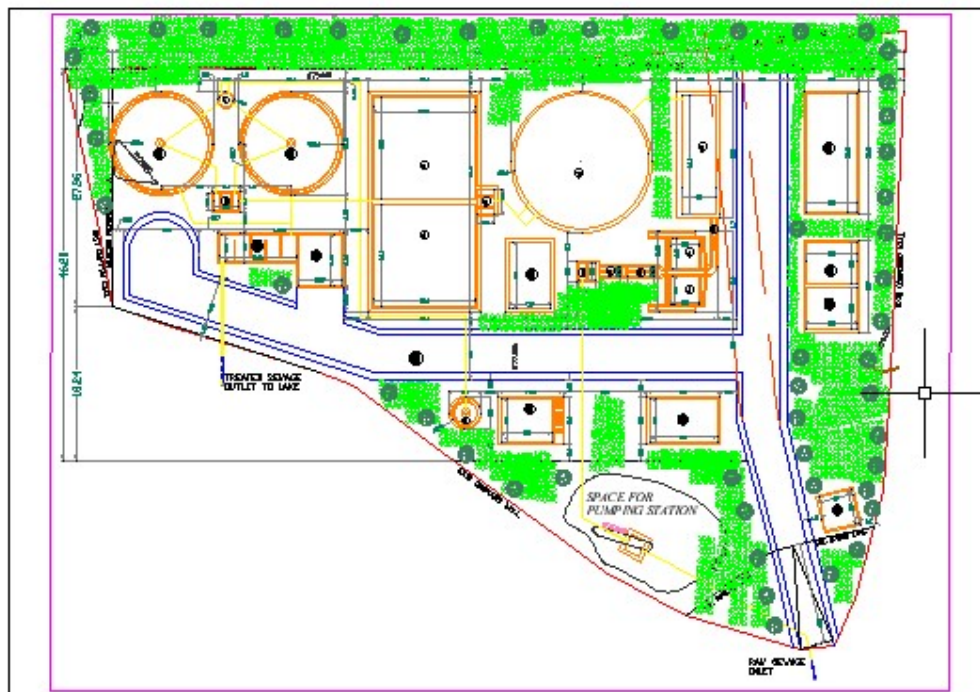


Figure 5.1 – STP Layout with Green Belt

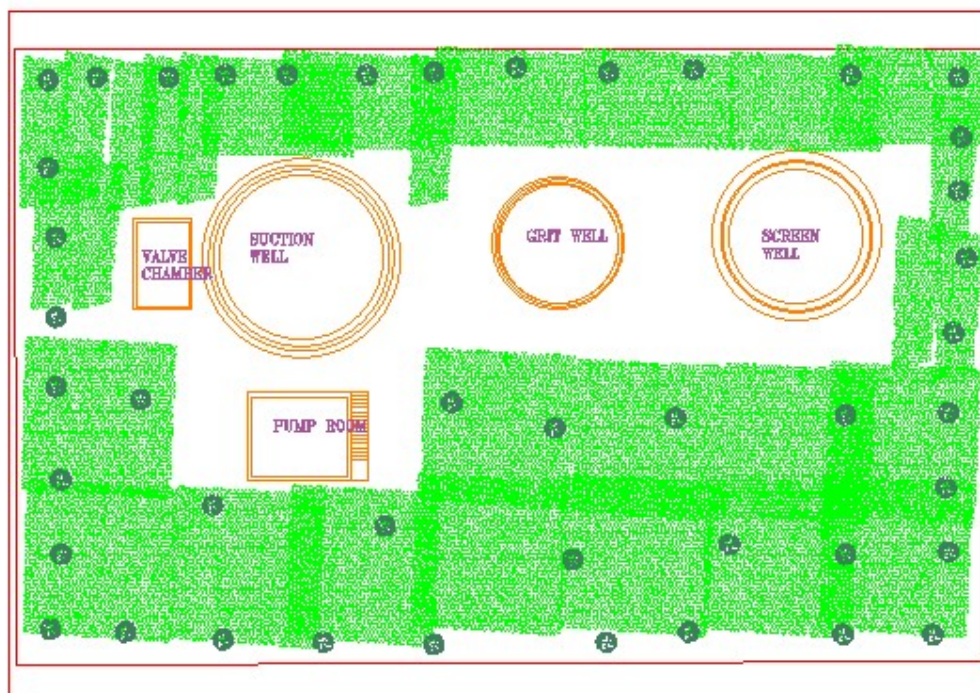




Figure 5.2 – Pumping Station Layout with Green Belt

5.3.10 Energy Efficiency

Project area is mostly plain and gently sloping ground, it is therefore not technically feasible or economical to design a completely gravity system to collect sewage from individual houses and transfer the same the STP on the outskirts of the city. It necessitated provision of pumping stations, which are optimized to the extent possible to minimize the overall pumping. In the current design, sewage will be collected from the houses via sewer network and conveyed by gravity to the pumping station. From the Sub pumping station, collected sewage will be pumped into Main Pumping station and subsequently from Main pumping station accumulated sewage will be pumped into the designated sewage treatment plant. This optimized the energy consumption.

To optimize the power consumption, the hydraulic design shall follow optimal approach, and the following also considered in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed by Beaurau of Energy Efficiency (BEE) and International Finance Corporation in 2008), energy savings, at minimum, of 25% to 40% is possible with appropriate measures. The following measures shall be considered and incorporated into the project designs:

- Using low-noise and energy efficient pumping systems
- Efficient Pumping system operation
- Installation of Variable Frequency Drives (VFDs)
- Ensuring maintenance of high power factor through use of Capacitor Banks
- By providing Green belt around the Lifting stations, Pumping stations and STP the carbon content released may be controlled.
- By using the treated water for irrigation purpose helps to reduce the use of Ground water for irrigation.



6 PUBLIC CONSULTATION

As part of the UGSS to Perundurai Town Panchayat, STP of capacity 3.14 MLD (base year) was proposed at Panikampalayam, adjacent to solid waste dumping yard. Based on the instruction of the Executive Engineer, TWAD Board, Erode, there is no alternate site selected for this project. The finalized site Sy.No: 1032/2 for a total area of 2.5 Acres.

It was envisaged that the treated water could be used for irrigation purpose in nearby villages.

The public consultation was conducted at Perundurai Town Panchayat on 16.05.2018.



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**UNDERGROUND SEWERAGE SCHEME FOR
PERUNDURAI TOWN PANCHAYAT – EIA**

நீரோடு மாவட்டம், பெருங்குறை பேரூராட்சி 3.14 மது பாதாள
சாக்கடை திட்டம் பொதுமக்கள் கருத்து கேட்பு திட்டம்

திடம் : பெருங்குறை பேரூராட்சி

நாள் : 16.05.2018

பெயர்	கையெழுத்து
1. R. Leelavathi	
2. M. நல்லசீமன்	
3. R. Visalochi	R. Visalochi
4. A. சந்திரா	A. சந்திரா
5. V. மகேசுவரன்	V. மகேசுவரன்
6. P. மது	P. Poojith
7. கீதா மணி	கீதா மணி
8. சுமதி	சுமதி
9. S. மதுங்குமார்	S. மதுங்குமார்
10. S. முருகதீபன்	S. முருகதீபன்
11. M. கோமதி	M. கோமதி
12. S. ஜானகி	S. ஜானகி
13. P. முருக	P. முருக
14. K. கண்ணன்	K. கண்ணன்
15. P. வெங்கட்	P. வெங்கட்
16. S. சாமி	S. சாமி
17. J. Deepa	J. Deepa
18. M. Jayaraman	M. Jayaraman
19. K. கிருஷ்ணமணி	K. கிருஷ்ணமணி
20. பி. மணிமணி	பி. மணிமணி
21. கார்த்திகேயன்	M. Karthikeyan



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA





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பெருந்துறை பேரூராட்சி
நாள் : 21.07.2018

கூட்ட நடவடிக்கைகளின் குறிப்பு

2018-ம் ஆண்டு ஆகஸ்டு மாதம் 21-ம் தேதி செவ்வாய்கிழமை அன்று மாலை 4.00 மணியளவில் நடைபெற்ற கருத்துக் கேட்பு கூட்டத்தில் மாண்புமிகு பெருந்துறை சட்டமன்ற உறுப்பினர் திரு. தோப்பு வெங்கடாசலம், பேரூராட்சி செயல் அலுவலர் குடிநீர் வடிகால் வாரிய பொறியாளர்கள் ஆகியோர் கலந்து கொண்டனர்.

பெருந்துறை பேரூராட்சியில் பாதாள சாக்கடை திட்டம், அரசாணை வழங்கப்பட்டு, பணிகள் ஆரம்பிக்கப்பட்டுள்ளது. இத்திட்டத்தில் ஆழ்துழைக்கிணறுகள், மண் பைப்கள் பதிக்கப்பட உள்ளது. நீர் உந்து நிலையங்கள் அமைக்கப்பட்டு கழிவு நீர் சுத்திகரிப்பு நிலையம் பணிக்கம்பாளையம் குப்பை கொட்டும் இடத்தில் சுத்திகரிக்கப்பட்டு சுத்திகரிக்கப்பட்ட நீரினை அருகில் இருக்கும் குட்டையில் விடவுள்ளது.

பாதாள சாக்கடை திட்டத்தை பற்றி விரிவான விளக்கம் கலந்து கொண்ட பொதுமக்களுக்கு அளிக்கப்பட்டது. இத்திட்டத்தின் பயன்பாடு குறித்தும், இத்திட்டம் செயல்படுத்தும் பொழுது ஏற்படும் சுற்றுப்புற சூழல் மேம்பாடு அடையும் என்பது குறித்தும் விரிவான விளக்கம் அளிக்கப்பட்டது. பொதுமக்கள் கேட்கப்பட்ட கேள்விகளுக்கு தகுந்த விளக்கம் அளிக்கப்பட்டது. இவ்விளக்கங்களை கேட்ட பொதுமக்கள் இத்திட்டத்திற்கு முழுமையான ஒத்துழைப்பு தருவதாக உறுதியளித்தனர்.


செயல் அலுவலர், 21/7/18
பெருந்துறை பேரூராட்சி,
ஈரோடு மாவட்டம்.



7. ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

Environmental Management Plan (EMP) is aimed at mitigating the possible adverse impact of a project and ensuring the existing environmental quality. The EMP converse all aspects of planning, construction and operation of the project relevant to environment. It is essential to implement the EMP right from the planning stage continuing throughout the construction and operation stage. Therefore the main purpose of the Environmental Management Plan (EMP) is to identify the project specific activities that would have to be considered for the significant adverse impacts and the mitigation measure required.

7.2 Environmental Management Plan

Environmental Management Plan (EMP) during Pre – Construction, Construction and operation Phase is given under Table 7.1.

**Table 7.2 : Environmental Management Plan for Pre- Construction, Construction and
Operation**

S. No	Potential Negative Impacts	Mitigation Measures	Time frame	Responsible agencies
Pre – Construction				
1	Clearances	TNPCB, Highway & Railway Department clearance and labour working license required during construction will be ensured and made available before start of work. Permissions will be obtained from the concerned authority.	Before start of construction	TWAD
2	Utility Relocation	Common utilities to be affected such as: telephone cables, electric cables, electric poles, water pipelines, public water taps etc. will be identified and will be relocated with prior approval of the concerned agencies before construction starts	Before start of construction	TWAD Board / Contractor
3	Storage of materials	Temporary use of land for construction sites / storage of construction materials done at sites identified by the contractor.	Before start of construction	TWAD Board / Contractor
4	Tree Plantation	Tree plantation is proposed for STP and Main pumping station. If any	During Construction	TWAD Board / Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		tree cutting activity in project site, Compensatory plantation will be 10 times to the number of trees bring cut.		
Construction Phase				
1	Design of Proposed STP	<p>Design process to meet the CPCB disposal standards of inland water disposal including: BOD: less than 15 mg/l, suspended solids less than 20 mg/l, Faecal coliform less than 200/100 ml</p> <ul style="list-style-type: none"> • Ensuring continuous uninterrupted power supply, including a back-up facility (such as generator) • Providing operating manual with all standard operating procedures (SOPs) for operation and maintenance of the facility • Necessary training to ULB staff dealing with STP. • Extended contractor period for O and M, proper transfer of facility to ULB with adequate technical know-how on O and M and hands-on training to ULB staff • Prepare sludge management plan to ensure safe collection, adequate treatment prior to reuse / disposal • Conduct periodic testing of sludge to check its quality according to set standards for reuse as manure/soil conditioner • Provide training on safe handling of sludge, along with proper apparatus and personnel protection equipment (PPEs) to workers • Providing green belt for reduction of odour and noise. 	During Construction	TWAD Board / Contractor
2	Baseline parameters	Adequate measures will be taken and checked to control the Baseline parameters of Air, Water and Noise pollution. Base line parameters recorded will be used for monitoring and conformance be ensured.	During Construction	TWAD
3	Construction of labour camps	Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other	During construction	Contractor



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		<p>Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp).</p> <ul style="list-style-type: none"> • The location, layout and basic facility provision of each labour camp will be submitted to Engineer prior to their construction. • The construction will commence only upon the written approval of the Engineer. • The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the Engineer. • All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be planned. Adequate health care is to be provided for the work force. The layout of the construction camp and details of the facilities provided will be prepared and will be approved by the Engineer. • Awareness about HIV/AIDS will be provided, grievance Redressal mechanism for the camps. 		
4	Sewer network	<p>Limit the sewer depth where possible</p> <ul style="list-style-type: none"> • Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); • In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm) • For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes; 	During Construction	TWAD



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		<ul style="list-style-type: none"> • Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry • Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation 		
5	Pumping stations	<ul style="list-style-type: none"> • Provision of passive gas ventilation arrangement by providing a take-off vent from top of well by positioning vent in such a way that cover slab fitment / movement / drawl if required for maintenance purposes is not compromised. • Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings. • Provision of odor control / mitigation system as per site conditions / requirements • Compound wall of 2.0 m height shall be provided • Submersible sewage pumps of suitable rating, minimum submergence requirements, open impeller with cutting-tearing arrangement and high strength-corrosion resistant heavy duty construction shall be proposed. • Provide training to the staff in emergency procedures and Conduct periodic H₂S monitoring. • Level control sensor will be provided for the continuous flow of sewage in pumping stations. 	During Construction	TWAD



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6	Sewage lifting stations	<ul style="list-style-type: none"> • Provide closed wells fitted with necessary ventilation and odor abatement systems such as GAC air filters fitted to the ventilation shaft outlet(s). • Level control sensor will be provided for the continuous flow of sewage in lifting stations. • Using low-noise and energy efficient pumping systems • Efficient Pumping system operation • Installation of Variable Frequency Drives (VFDs) 	During Construction	TWAD
7	Disposal of construction debris and excavated materials	A suitable site identified for safe disposal, in low lying areas within the project area as approved by the Engineer in charge and to other low lying area in consultation with local body.	Pre-construction and Construction	Contractor
8	Protection of top soil	The top soil to be protected and compacted after completion of work, where the pipelines run, including open lands and agricultural lands.	During construction	Contractor
9	Laying of sewer system	Adequate precautions should be taken while laying the sewer lines to avoid the possibility of cross connection with water supply lines. Pipes should be laid as per IS specifications and joints leak proof to prevent seepage. Water Supply line (bottom of pipe) crossing to be 0.5 m above sewer line.	During Construction	TWAD/Contractor
10	Temporary flooding due to excavation.	Proper drainage arrangements to be made in consultation with the Engineer in charge, to avoid the overflowing of existing drains due to excavation during the laying of sewer mains	During Construction	TWAD/Contractor
11	Using of modern machineries	Usage of Modern machineries to minimize construction period and its impacts.	During construction	Contractor
12	Laying of Pumping main	Sewer crossing a water line should be laid 0.5 m below bottom of WS line. Joining the pipes and pressure test to ensure strength of pipes to avoid soil contamination due to	During construction	Contractor



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		seepage of sewage. Any shifting of cable should be attended with minimum period of disturbance. Provision of temporary crossings / bridges across the trench wherever necessary to facilitate normal life and business.		
13	Planning of temporary traffic arrangements	The activities are limited to the project sites and right of way. Hence does not require any traffic arrangements. In case of any need in the site, necessary permissions for temporary diversion will be obtained. Signings and safety measures including flagmen are provided at the site.	During construction	Contractor
14	Barricading site	The activities would be restricted to project sites and right of way for alignment. Barricading with adequate marking, flags, reflectors etc. will be provided along the alignment for safety of restricted traffic movement and pedestrians.	During construction	Contractor
15	Pollution from Construction Wastes	All waste arising from the project is to be disposed off in the manner in consultation with TWAD Engineer	During Construction	Contractor
16	Storage of chemicals and other hazardous materials	Site identified for safe storage and handling of chemicals and other hazardous materials provided with proper display of requirements and marking as protected area.	During Construction	Contractor
17	Informatory signs and Hoardings	The contractor will provide, erect and maintain informatory/ safety signs hoardings written in English and local language, wherever required or as suggested by the Engineer	During Construction	Contractor
18	First Aid	<p>The contractor will arrange for:</p> <ul style="list-style-type: none"> • A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone. • Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital 	During Construction	Contractor



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19	Risk from Electrical Equipment	<ul style="list-style-type: none"> The contractor will take all required precautions to prevent danger from electrical equipment and ensure that- no material will be so stacked or placed as to cause danger or inconvenience to any person or the public All necessary fencing and lights will be provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standard (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer 	During Construction	Contractor
20	Waste Disposal	<ul style="list-style-type: none"> The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Engineer. Unless otherwise arranged by local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Engineer will have to be provided by the contractor 	During Construction	Contractor
21	Clearing of construction camps and restoration	<ul style="list-style-type: none"> Contractor to prepare site restoration plans, the plan is to be implemented by the contractor prior to demobilization 	After completion of Construction	Contractor



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		<ul style="list-style-type: none"> On completion of the works, all temporary structures will be cleared away, all rubbish cleared, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor's expenses, to the entire satisfaction of the engineer. 		
22	Pollution from Fuel and Lubricants	<ul style="list-style-type: none"> The contractor will ensure that all construction vehicle parking location, fuel / lubricants storage sites, vehicle, machinery and equipment maintenance and re fuelling sites will be located at least 500m from rivers and irrigation canal / ponds All location and layout plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Engineer Contractor will ensure that all vehicle / machinery and equipment operation, maintenance and re fuelling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to Engineer) and approved by the Engineer. All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines. 	During Construction	Contractor
23	Safety Aspects	<ul style="list-style-type: none"> Adequate precautions will be 	During construction	Contractor



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		<p>taken to prevent the accidents and from the machineries. All machines used will conform to the relevant Indian standards Code and will be regularly inspected by the TWAD.</p> <ul style="list-style-type: none"> • Where loose soil is met with, shoring and strutting will be provided to avoid collapse of soil. • Protective footwear and protective goggles to all workers employed on mixing of materials like cement, concrete etc. • Welder's protective eye-shields will be provided to workers' who are engaged in welding works. • Earplugs will be provided to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation • The contractor will supply all necessary safety appliances such as safety goggles, helmets, safety belts, ear plugs, mask etc to workers and staffs. • The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No.62 as far as those are applicable to this contract. • The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 and adhered 		
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		to. <ul style="list-style-type: none"> The contractor will not employ any person below the age of 18 years for any work and no woman will be employed on the work of painting with products containing lead in any form. 		
24	Protection of sites	The STP, and pumping stations are provided with compound wall of height 2.0m and fencing will be provided in lifting stations for safety purpose. .	Construction Phase	Contractor and TWAD
25	Accessibility to sites	Adequate road facilities have been provided in LS, PS and STP for movement of vehicle and unloading of chemicals without disturbing of existing features and activities.	Construction Phase	Contractor and TWAD
26	Environmental Monitoring	The water, air, soil and noise quality will be monitored in pre-construction and Construction phase as detailed in Table 7.2.	Pre-construction & Construction	TWAD & Contractor.
Construction of Pumping / Lifting Stations / Sewage Treatment Plant				
27	Protection of top soil	The top soil to be protected and compacted after completion of work, where the pipelines run.	During construction	Contractor
28	Storage of construction material	Site for storage of construction materials to be identified in consultation with Engineer in charge, without affecting the nearby the residents, traffic and other common utilities	During construction	Contractor
29	Disposal of silt / sludge	A suitable site to be identified for safe disposal of silt /sludge generated at the pumping / lifting station sites, in consultation with the Engineer.	During construction	Contractor
30	Contamination of ground water quality	Groundwater quality may get contaminated due to leaching of waste water. So, the treated water quality shall comply with the standards laid down by the PCB for disposal onto land, water body or for irrigation use. Regular monitoring is required for the treated sewage quality and also	During construction and operation	Contractor and TWAD



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		the ground water quality in the nearby areas and ensures compliance with PCB standards.		
31	Water Pollution From Construction Wastes	The Contractor shall take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. All waste arising from the project is to be disposed off in the manner that is acceptable by the Engineer.	During construction	Contractor and TWAD
32	Impact of Surrounding areas	To avoid the problems of foul smell polluted air, insects, noise pollution and other problems buffer zones to be provided in the form of green belt around the STP site, has to be strictly ensured.	During construction	Contractor and TWAD
33	Disposal of treated waste water.	<ul style="list-style-type: none"> The treated water quality shall comply with the standards of TNPCB before let out into the stream / nallah /open land /irrigation purposes, and necessary permission to be obtained from the concerned department. Ensure efficient working condition of treatment plant. Prevent the pollution of stream water and other water bodies receiving STP discharge. 	During construction and operation	Contractor and TWAD
Operation Phase				
1	Noise Management	<ul style="list-style-type: none"> The pumps will adhere to the standards of noise. Regular maintenance will be carried out to restrict the noise levels. Provided noise control measures and Staffs entering the pump room will be provided with PPEs. Noise monitoring will be carried out at treatment plant and Pumping / lifting stations. Acoustic enclosure D.G set will be provided for reduction of 	During operation	Contractor /TWAD



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		noise. • Green belt is provided in STP for reduction of noise level.		
2	Air Management	<ul style="list-style-type: none"> • Diesel generators will be operated only for emergency power backup. The emission source diesel generators will have adequate stack height as per the norms of CPCB and regular maintenance of diesel engines has to be ensured in the Treatment Plant. • Three chlorine cylinder per month will be used for disinfection process in STP plant. Automatic chlorine leak detection and related alarm equipment to be installed at chlorine storage room in STP Plant, It is connected to a remote audible and visual alarm system and checked on a regular basis to verify proper operation. • Chlorination room will be constructed separately (3.00 m x 3.00 m x 3.50 m) and full, partial, or empty chlorine cylinders will be stored in separate area in chlorination room. • Ventilation and duct work within a chlorine storage room shall be separated from domestic building ventilation systems. All chlorine room duct work should be gas tight and not pass through other rooms or areas of the building. • Chlorine room location will be on the prevailing downwind side of the building, away from entrances, windows, louvers, walkways, etc. 	During operation	Contractor /TWAD



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		<ul style="list-style-type: none"> • Tree plantation would be provided to control and reduce odour in STP, Lifting & Pumping station and nearby localities. • Deodorizer (odour control chemicals) is the alternative method for control of odour problem, which will be used only during odour generation at the STP and all Pumping stations. • Lifting and Pumping stations sumps will be closed by lid and vent pipe will be provided for 1 m height for gas ability to move gases and air out of the tank when it fills up with waste and liquid volume. 		
3	Sludge Management	<ul style="list-style-type: none"> • The centrifuged sludge will be stored in the premises of the Sewage Treatment Plant then used for agricultural purposes. • Sludge will be monitoring twice in a year. • Conduct periodic testing of dried sludge /compost to check presence of heavy metals and confirming the concentrations to use as compost. 	During operation	Contractor/TWAD
4	Transportation and storage of hazardous chemicals	Guidelines and procedures in Motor vehicle Act 1986 for transportation; Manufacture, Storage and import of Hazardous Chemicals Rules 1989 to be followed for storage and handling of Hazardous chemicals: Insurance covers to be taken for accidents and cost of clean-up operations.	During operation	Contractor
5	Other Management measures at Sites	<ul style="list-style-type: none"> • Providing equipment like ear plugs to workers near the noise source. • Providing PPEs for safe working of personnel in critical areas like chlorination plant will be ensured. 	During operation	TWAD & Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		<ul style="list-style-type: none"> • Display boards on safety measures and emergency measures to be installed. • Regular training for the staffs operating the LS, PS and STP with various aspects of maintaining sewage quality and safety. • PPEs for the workers exposed to high noise. • The odour produced from STP, Pumping and Lifting Stations, Level control sensor will be provided for the continuous flow of sewage in pumping and lifting stations. • Regular maintenance of the greenbelt and landscaping made at the project sites with watering, manuring, pruning etc. 		
6	Training for staff	Periodical training would be provided to the staffs and operators involved in the project O&M for chemical handling, emergency, line maintenance, valve operations, electrical & mechanical operations,	During Operation	TWAD/Contractor.
7	Sewage Treatment Plant	<ul style="list-style-type: none"> • Adequate road facility has been provided inside of treatment plant for movement vehicles and heavy vehicles for unloading of chemical. • Rain water harvesting will be provided for recharging of ground water through pit. • Display boards on safety measures and emergency measures to be installed. • Regular training for the staffs operating the units of PS and STP with various aspects of maintaining safety. • Providing equipment's like ear plugs to workers near the noise source. • Provide flow measurement devises at inlet and outlet, and maintain flow records • Provision of appropriate training and personal protection 	During Operation	TWAD/Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		<p>equipment to the workers and staff.</p> <ul style="list-style-type: none"> • Conduct periodic testing of dried sludge /compost to check presence of heavy metals and confirming the concentrations to use as compost. • Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with TNPCB. No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers 		
8	Environmental Monitoring	<ul style="list-style-type: none"> • The water, air noise and soil quality will be monitored periodically. • The treated sewage effluent quality will be monitored at various points at STP, Disposal point etc., • Monitoring of noise levels will be carried out at, Pumping/ Lifting station and STP. • Detailed monitoring record will be maintained. Periodical report will be send to the Engineer. The frequency and parameters for Environmental Monitoring detail is given in Table 7.3 of the EIA report. 	During Operation	TWAD/Contractor
9	Disposal of treated waste water	<ul style="list-style-type: none"> • STP operations shall take place only after Consent to Operate certificate is accorded by the TNPCB and treated water quality shall be meet the CPCB discharge standards • Performance standards shall always be maintained, ensuring efficient working condition of treatment plant. 	During Operation	TWAD/Contractor
10	Odour Management	<ul style="list-style-type: none"> • Tree plantation would be provided in STP and Main pumping station to control and 	During Operation	TWAD/Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		<p>reduce odour in nearby localities.</p> <ul style="list-style-type: none"> • The odour produced from STP, Pumping and Lifting Stations, Level control sensor will be provided for the continuous flow of sewage in pumping and lifting stations. • Inlet sump, primary treatment units in STP, Lifting & pumping stations would be maintained clean by suitably disposing off all generated grit waste on daily basis. • Tree plantation would be provided to control and reduce odour in STP, Lifting & Pumping station and nearby localities. • Deodorizer (odour control chemicals) is the alternative method for control of odour problem, which will be used only during odour generation at the STP and all Pumping stations. • Lifting and Pumping stations sumps will be closed by lid and vent pipe will be provided for 1 m height for gas ability to move gases and air out of the tank when it fills up with waste and liquid volume. • The odour produced from STP, Pumping and Lifting Stations, Level control sensor will be provided for the continuous flow of sewage in pumping and lifting stations. 		
11	Handling of Chemicals	<ul style="list-style-type: none"> • The unit will be provided necessary safety measures for the storage of coagulant (Alum or polyelectrolyte) & Chlorine cylinders and provide emergency repair kit and personal safety kit 	During operation	TWAD/Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		<p>like full body cover, face mask, body and eye shower etc. at the site.</p> <ul style="list-style-type: none"> • Eye showers one number each will be provided in chlorine cylinder storage place of STP plant (total of 2 Nos). The unit will install Chlorine gas leak detector system (Chlorine Gas Sensor) at the site. 		
12	Disposal of Sludge	<ul style="list-style-type: none"> • Treated sludge will be used for agricultural purposes. • Contractor shall be prepare a sludge management plan and adhere to the same. • Sludge will be monitoring twice in a year. • Conduct periodic testing of dried sludge /compost to check presence of heavy metals and confirming the concentrations to use as compost. 	During operation	TWAD/Contractor
13	Safety Aspects of O&M	<ul style="list-style-type: none"> • The STP, and pumping stations are provided with compound wall of height 3.0m and fencing will be provided in lifting stations for safety purpose. • The structures will be provided with easy access ladders, and handrails, interconnections between all units with proper safe walkway platforms for movement to avoid falling of human and materials. Electrical cables are laid in cable trenches. Open spaces at height will be covered with parapet walls and handrails. • Educate local communities to report immediately to municipality whenever they notice any malfunction of the sewerage system • Regular inspection of the entire 	During Operation	TWAD/Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

		<p>sewer system to check for blockages/vandalism etc. This should be followed by regular repairs and servicing of the plant whilst addressing cause of failure.</p> <ul style="list-style-type: none">• Label all inflammable materials and store them appropriately• Provision of adequate firefighting equipment capable of fighting all classes of fire• Put “ No Smoking Signs” in areas where inflammables are stored• Train workers on the use of firefighting equipment.		
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UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

7.3 Environmental Monitoring Plan

Environmental Monitoring Plan of construction and operation phase is given in Table 7.2 & 7.3.

Table 7-2 Environmental Monitoring Plan Pre-Construction & Construction Phase

Attributes	Parameters	Frequency	Location	Responsible Agency
Pre-Construction & Construction Phase				
Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO and Pb (standards as per CPCB)	Seasonal Sampling	Sewage Treatment Plant, Pipe laying work, pumping / lifting station locations and other places of work	Contractor through approved monitoring agencies
Water Quality	Treated Water standards as per CPCB.	Seasonal Sampling	Sewage Treatment Plant, pumping / lifting station locations and other places of work	Contractor through approved monitoring agencies
Noise Level	Noise level on dB (A) scale noise levels on dB (A) scale (as per MoEF Noise Rulers, 2000)	Seasonal Sampling	Sewage Treatment Plant, Pumping /Lifting stations	Contractor through approved monitoring agencies
Soil Quality	Monitoring of Pb, SAR and Oil & Grease (standards as per TNPCB)	Seasonal Sampling	Sewage Treatment Plant, Pumping /Lifting stations	Contractor
Health	All relevant parameters including HIV	Regular check-ups as per Factories Act	---	Contractor



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Table 7- 3 Environmental Monitoring Plan Operation Phase

Attributes	Parameters	Frequency	Location	Responsible Agency
Operation Phase				
Air & Odour Emissions	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO, H ₂ S and Pb (standards as per CPCB)	Seasonal Sampling (3 times a year)	Sewage Treatment Plant, Pipe laying work, pumping / lifting station locations	TWAD
	Stack monitoring for D.G.Sets			
	Stack Monitoring for D.G.Sets			
Water Quality		Seasonal Sampling (4 times a year)	STP - Inlet, Outlet and point of disposal/ receiving water body. Ground water samples from surrounding STP and disposal point.	TWAD
Treated Effluent	COD, BOD, pH, NH ₄ -N, N-total and Total Suspended Solids, Coliform, etc. (standards as per CPCB)			
Surface Water	As Per CPCB (Standard Indian Standard (IS : 2296 – 1982))			
Ground Water	Drinking water standards as per IS 10500:2012.			
Noise Level	Noise level on dB (A) scale noise levels on dB (A) scale (as per MoEF Noise Rules, 2000)	Seasonal Sampling (4 times a year)	Sewage Treatment Plant, Pipe laying work, pumping / lifting station locations	TWAD



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Soil quality	Monitoring of Pb, SAR and Oil & Grease	Seasonal Sampling (4 times a year)	Sewage Treatment Plant, Pipe laying work, pumping / lifting station locations	TWAD
Health	All relevant parameters (BP, Sugar, chest X-ray, Eye vision, etc.)	Regular checkups as per factories act.	---	TWAD
Safety Monitoring	First Aid, replacement of PPE	Yearly	Sewage Treatment Plant	TWAD
Green Belt Development	No. of plants, species, survival status	Half yearly	Sewage Treatment Plant	TWAD
Sludge	NPK values and Heavy metal traces	Half yearly	Sewage Treatment Plant	TWAD



7.4 Budgetary Allocation For Implemetation Of Environmental Aspects During The Construction & Operation Phase Of The Project

The environmental monitoring and other mitigation measures as proposed in the above sections shall be implemented during the construction and operation period. For the same budget has been allocated. A cost break up which will be required to be included in the project cost towards the environmental protection, control & mitigation measures and implementation of the EMP given in **Table 7-4**.

The cost to be incurred for various activities for the proposed project to safeguard the environment is detailed below.

Table 7-4: EMP Cost of the Project

S No	Description	Amount In Lakhs	Remarks
1	Sewage Treatment Plant		
a	Provision for landscaping and greenbelt	3.52	Included in BOQ
b	Development of green belt	1.40	Included in BOQ
c	Construction of Compound Wall	17.87	Included in BOQ
d	Pipe connection works	26.88	Included in BOQ
e	Formation of internal road	14.42	Included in BOQ
f	Sludge Management		Included in O&M cost
2	Collection System, Pumping Station and others		
a)	Provision for shifting of utilities	15.83	Included in project estimate
b)	Disposal of excavated excess earth and construction debris	28.75	Included in BOQ
3	Monitoring as per Table 6.2 & 6.3	3.0	Included in O&M cost estimate
4	Energy Efficient Lightings	2.8	Included in O&M cost estimate
5	Odour Control	30	Will be analysed at each locations and suggest for provision wherever required and cost may be met out from general savings

UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

பெருந்துறை பேரூராட்சி

ஈரோடு மாவட்டம்

கூட்ட நடவடிக்கைகளின் குறிப்பு

2012-ம் ஆண்டு பிப்ரவரி மாதம் 10-ம் தேதி வெள்ளிக் கிழமை காலை 10.00 மணிக்கு பெருந்துறை பேரூராட்சி அலுவலகத்தில் நடைபெற்ற அவசாக் கூட்டத்தில் நிறைவேற்றிய தீர்மான நடவடிக்கைக் குறிப்பு:

தலைவர் : திருமதி. டி. சாஸ்வதி, தலைவர் அவர்கள்.

உறுப்பினர்கள் வருகை : தலைவர் உட்பட 16 பேர்கள்.

<p style="text-align: center;">பொருள்</p>	<p style="text-align: center;">தீர்மானம் எண். 76 / 2012, நாள். 10.02.2012.</p>
<p><u>பொருள் எண். 1</u></p>	
<p>பெருந்துறை பேரூராட்சிப் பகுதிகளில் பாதாள சாக்கடைத் திட்டம் செயல்படுத்தித் தமிழ்நாடு குடிநீர் வடிகால் வாரியத்தின் மூலம் திட்ட மதிப்பீடு ரூபாய். 52.70 கோடிக்கு தயாரிக்கப்பட்டுள்ளது. மேற்படி திட்டத்தினை ஜெர்மன் மேம்பாட்டு நிதி (KFW) மூலம் செயல்படுத்திட மன்றத்தின் அங்கீகாரம் கோருதல்.</p>	<p style="text-align: center;">அங்கீகரிக்கப்பட்டது.</p>

// உண்மை நுகல் //

செயல் அலுவலர்,
பெருந்துறை பேருராட்சி.
1.8.19



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Environmental screening Form

PART A (to be prepared by Urban Local Body for each sub – project loan)

Name of the applying urban local body : Tamil Nadu Water Supply and Drainage Board
Project location : Perundurai
Sub project :UGSS to Perundurai Town panchayat with 3.14 MLD
sewerage treatment plant

Project Components		
S.No	Component	Remarks
1	Brief description of the project proposal	Name of the Project : Conducting Environmental Impact Assessment (EIA) Study and submitting report for the UGSS to Perundurai Town panchayat with construction of 3.14 MLD Sewerage Treatment Plant with FAB Technology for in Erode District, Tamilnadu. Project Town :Perundurai Town, Erode District, Tamil Nadu. STP Capacity :3.14 MLD Technology used :Fluidizes Aerobic Bio Reactor Technology (FAB) Project cost: INR. 5478 lakhs
2	Number of project sites and Project components	Project Site- 1 & Project Components: 1. House connections and local sewerage. 2. Main and trunk sewers. 3. Pumping station. 4. Pumping main. 5. Sewage Treatment plant



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

3	Alignment length	The scheme contains provisions for sewer line laying for a total length of 47.497k m
4	Location of the Project Sites & Current Use	1. Perundurai Town, Erode District, Tamil Nadu 2. Government Poramboke.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

5	<p>Nearby landuses and distance – residences, schools, hospitals, drinking water source, upstream and downstream uses of rivers etc</p>	<p>Schools & Colleges</p> <ul style="list-style-type: none"> • Sri Durga matriculation higher school≈3.06Km towards SSW • Kongu Polytechnic college≈1.55km towards NE • Kongu Velalar Polytechnic College ≈6.69km towards WNW • Kongu Engineering College≈1.93 Km towards NE • M.P Nachimuthuu M.Jaganathan Engineering College≈8.88Km towards SSE • Maharaja college for women ≈2.95km towards NE • Nandha Engineering College ≈4.04Km towards NE • National Management College≈5.68Km towards NW • Palaniswamy College of Art≈2.9 Km towards NNE • Perundurai Medical College≈3.65km towards NW • Vidhya Mandhir Institute of Technology ≈ 5.44 km towards SSW <p>Religious Places</p> <ul style="list-style-type: none"> • Chennimalai Lord Murugan Temple ≈ 11.23 Km towards S <p>Hospital</p> <ul style="list-style-type: none"> • Shree Shanti Hospital ≈ 2.04 km towards NNW • MNP Nursing Home ≈ 3.17 Km towards NW <p>Tourist Places</p> <ul style="list-style-type: none"> • Vellode Bird • Sanctuary≈6.08Km towards E <p>Others</p> <ul style="list-style-type: none"> • SIDCO ≈ 4.36 Km towards WSW • Perundurai Railway Station ≈ 3.89 Km towards E
Proximity of the Site to Water Bodies		
S.No	Component	Remarks



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

6	Distance of sites from Sea	<ul style="list-style-type: none"> Bay of Bengal \approx 246.63 km towards E Arabian Sea \approx 192.00 km towards W
7	MSL of Project Sites	\approx 278 m approx
8	Distance from nearest Water Body (River, Canal, Lake, Stream etc.,)	Noyyal River \approx 14.98 km towards SSE
9	MFL of the Project Sites	Nil
10	Distance of nearest drinking water source	Noyyal River \approx 14.98 km towards SSE

Climate Change related Parameters (General)

S.No	Component	Remarks
10	Mean Temperature in the project town	29.5 °C
11	Annual Rainfall in the project town	606 mm

Project Components

S.No	Component	Remarks
12	Monsoon Period in the project town	June - August
13	Nearest Weather Warning System	Pelamedu

Biological Environment

S.No	Components	Yes	No	Remarks / Identified Problems
1	Are there according to background research / observations any threatened / endemic species in the project area that could be affected by		No	Nil



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

2	Will the project directly or indirectly affect: 1.1 Natural forest types? 1.2 Mangroves / wetlands / Estuaries 1.3 Other SEC's as Listed in ECSMF		No No No	Nil
3	Will the project involve tree cutting?		No	Nil
4	Will there be any potential risk of habitat fragmentation due to the clearing activities? (eg. Hindrance to the local bio diversity like disturbing the migratory path of animals/ birds		No	Nil
Physical Environment				
S.No	Components	Yes	No	Remarks / Identified Problems
5	Water quantity? Estimated usage of water quantity for the project	Yes		4.618 MLD

Direct impacts are those which are induced directly by the project (e.g. Impact on water quality, air and noise etc...) whereas the indirect impacts are those which are indirectly induced by the project (e.g. Traffic diversion during project construction etc...)

Project Components				
S.No	Component	Remarks		
6	Will the project affect the River flow pattern, stream pattern or any other irrigation canal?		No	Nil
7	Is the project area free from flood prone area/low-lying area, if yes what is the average flood level recorded for recent years?		No	Nil
Geology / Soils				



**UNDERGROUND SEWERAGE SCHEME FOR
PERUNDURAI TOWN PANCHAYAT – EIA**

S.No	Components	Yes	No	Remarks / Identified Problems
8	Does the project activity involve cutting and filling/ blasting etc...?		No	Nil
9	Will the project cause physical changes in the project area (e.g., changes to the topography) due to excavation, earthwork etc.?	Yes		Since the underground structure will be constructed so there will be change in topography.
10	Will local resources, such as rocks, sand, gravel, or groundwater be used? Estimated quantity of materials required?			Nil
Pollution				
S.No	Components	Yes	No	Remarks / Identified Problems
11	Will the project use or store dangerous substances (e.g., large quantities of hazardous materials like Diesel, Petroleum products etc.)?		No	Less quantity (20 litres approx) of diesel will be used only during power failure.
12	Will the project produce solid or liquid wastes?	Yes		Solid waste and sludge will be generated during treatment of waste water but it will be taken to municipal solid waste dump yard and composting site.
13	Will the project cause air pollution?	Yes		Since it is an STP, no major air pollutions will be occur. But Only during power failure 20 KVA DG set will be operated, however 5m stack height will be provided as per CPCB norms to combat the effect on the air quality.



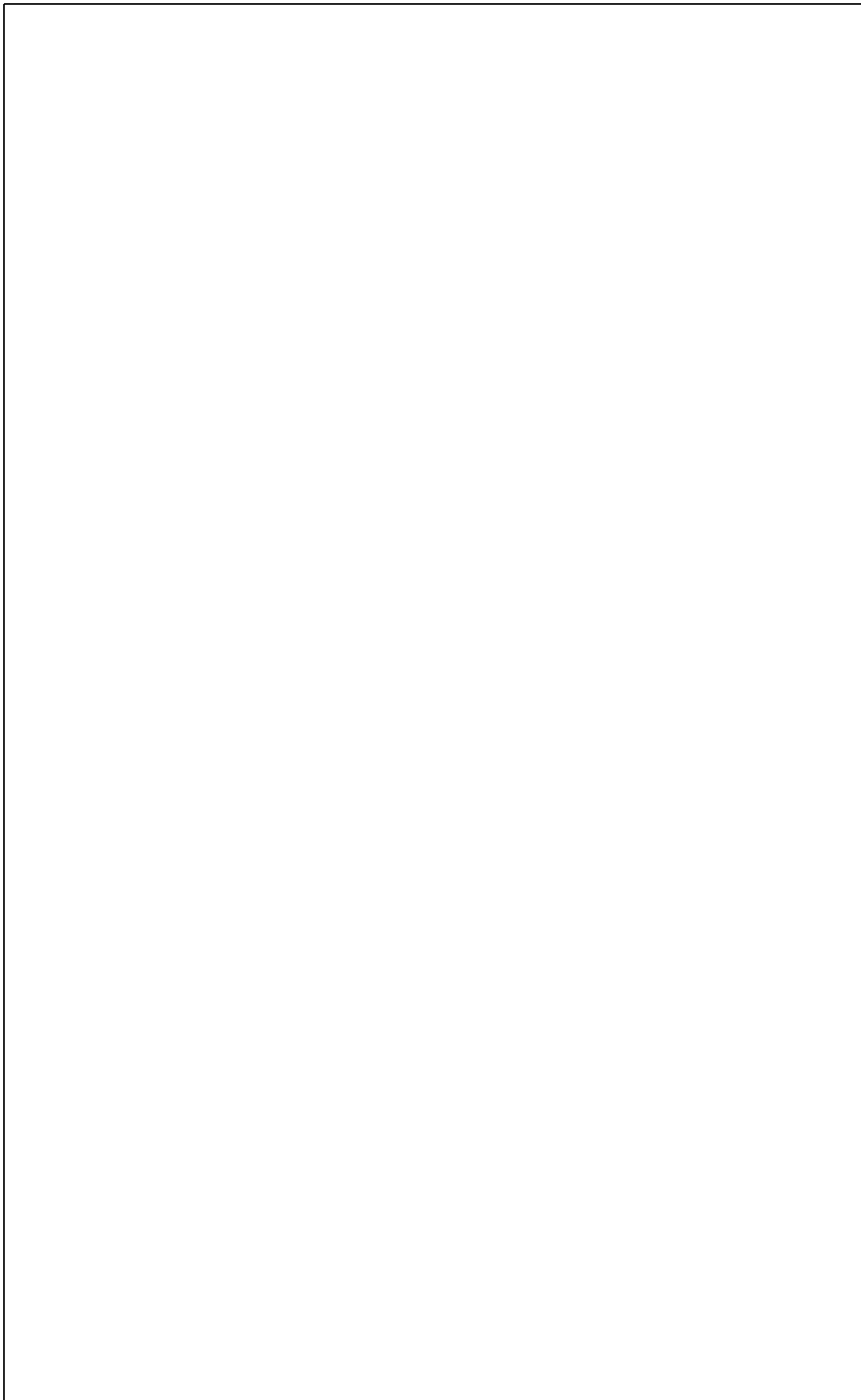
UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

14	Will the project generate noise?	Yes	<p>1. By incorporating low-noise equipment in the design and/or locating such mechanical equipment in properly acoustically lined buildings or enclosures.</p> <p>2. Acoustic enclosures will be provided for DG.</p> <p>3. Greenbelt is proposed along the periphery of the site which helps in reducing the noise levels.</p>
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S.No	Componen	Remarks
15	Will the project generate water pollution (water bodies/ groundwater)?	<p style="text-align: center;">No</p> <p>This is the Sewage Treatment Plant, so no water pollution will be generate.</p>
16	Will the project cause construction Hazard to workers/residents	<p style="text-align: center;">Yes</p> <p>The environmental impact during the construction phase will be of short term and reversible nature and will gradually eliminate after the construction activity is over. Further the area of the unit is small in size.</p>



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA





UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA





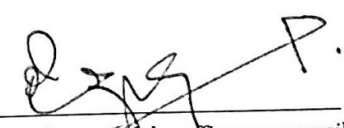
**UNDERGROUND SEWERAGE SCHEME FOR
PERUNDURAI TOWN PANCHAYAT – EIA**

Climate Change Adaptation and Mitigation Measures				
S.No	Components	Yes	No	Remarks / Identified Problems
10	Energy Consumption during operation phase	Yes		13.5 KVA/day
12	Is the project design included use of energy saving machineries, equipments for the sub-project,		No	
13	Is the project design included energy saving measures in the distribution/collection systems		No	
14	Is the project considering energy recovery options?		No	
15	Is the project considering waste minimization or waste reuse/recycle options?	Yes		Waste water will be recycled through Sewage Treatment Plant (STP).
14	Is the project structures are designed considering the maximum flood levels of the project site?	Yes		This project structures are designed by considering the maximum flood levels of the project site.
15	Is the project design has considered RWH structures.	Yes		1 lakh budget has been allocated for Rain water harvesting.
16	Is the project design has considered extreme events, drought, flood, natural disasters	Yes		This project design considered extreme events, drought, flood and natural disasters.

Any other features of the projects that could influence ambient environment:

Has any Environmental Assessment (EA) been carried out (if yes, please provide the EA documents along with the form)

Date: 18.04.2019.


Signature and name of the officer responsible

P.T. MANIVANNAN
(Executive Engineer)

EXECUTIVE ENGINEER
TWAD Board, Sewerage Division,
Perundurai.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Note:

1. Environmental Screening sheet must be completed by all Urban Local Bodies/ Government Department applying for a loan from Tamil Nadu Urban Development Fund (TNUDF).
2. Provide maps with the geographical location of the project; and an appropriately-scaled map clearly showing the project area and project sites with land use, existing buildings, infrastructure, vegetation, adjacent land use, utility lines, access roads and any planned construction.

Screening Form

PART A (to be prepared by Urban Local Body for each sub – project loan)

Name of Applying Urban Local Body: Perundurai Taluk

Name of the Sub-component: Perundurai Taluk

Name of Sub-project: 3.14 MLD sewerage treatment plant

Geographical area covered by Sub Project: - Perundurai

Implementing Agency: Tamil Nadu Water Supply and Drainage Board

Name and address of Officer responsible:

Land Use, Resettlement, and/or Land Acquisition				
S.No	Components	Yes	No	If Yes provided details
1	Does the sub-project involve acquisition of private land?		No	
2	Alienation of any type of Government land including that owned by Urban Local Body?	Yes		
3	Clearance of encroachment from Government/Urban Local body Land?		No	
4	Clearance of squatting from Government/Urban Local Body Land?		No	
5	Number of structures, both authorized and/or unauthorized to be acquired/cleared/		No	
6	Number of household to be displaced?		No	



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

7	Detailsofvillagecommonproperties tobealienatedPasture Land(acres) Cremation/burialground andothers specify?		No	
8	Describeexisting landusesonand around theprojectarea(e.g., community facilities,agriculture, tourism,privateproperty)?	Yes		1. Agricultural property 2. Industrial property 3. Residential property
9	Willtheprojectresult in construction workersorotherpeoplemovinginto orhaving accesstothearea(foralong timeperiodandinlarge numbers comparedtopermanentresidents)?	Yes		The construction workers are basically migrant workers involving different type of skill required for each of the stage of the project.
10	Arefinancialcompensationmeasures expectedtobeneeded?		No	
Lossof Crops,FruitTrees,HouseholdInfrastructureandlivelihood				
S.No	Components	Yes	No	If Yesprovidedetails
11	Will the project result in the permanentortemporarylossof			
11.1	Crops?		No	
11.2	Fruittrees /coconutpalms? Specify withnumbers		No	
11.4	Loss of Agriculture Land? Specify with numbers		No	
11.5	PettyShops		No	
11.6	Vegetable/Fish/Meatvending		No	
11.7	Cyclerepairshop		No	
11.8	Garage		No	
11.9	Teastalls		No	
11.10	LossofGrazing		No	
11.11	Lossofaccesssto forestproduce (NTFP)		No	
11.12	Anyothers-specify		No	



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Welfare, Employment, and Gender				
S.No	Components	Yes	No	If Yes provide details
12	Is the project likely to provide local employment opportunities, including employment opportunities for women?	Yes		Temporary employment will be provided during construction and semi scaled laborers will employed during operation.
13	Is the project being planned with sufficient attention to local poverty alleviation objectives?		No	
14	Is the project being designed with sufficient local participation (including the participation of women) in the planning, design, and implementation process?	Yes		Public consultation has been conducted during pre-implementation of project at Perundurai Panchayat office. Photos has been enclosed in the EIA report.

Historical, Archaeological, or Cultural Heritage Sites				
S.No	Components	Yes	No	If Yes provide details
Based on available sources, consultation with local authorities, local knowledge and/or observations, could the project alter:				

15	Historical heritage site(s) or require excavation near the same?		No	
16	Archaeological heritage site(s) or require excavation near the same?		No	
17	Cultural heritage site(s) or require excavation near the same?		No	
18	Graves, or sacred locations or require excavations near the same?		No	

Date: 18.04.2019,

Signature and name of the officer responsible

EXECUTIVE ENGINEER
TWAD Board, Sewerage Division,
Perundurai,

Note:

1. Social screening sheet must be completed by all urban local bodies/ government department applying for a loan from Tamil Nadu Urban Development Fund (TNUDF) for

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R



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Note:

1. Social screening sheet must be completed by all urban local bodies/government department applying for a loan from Tamil Nadu Urban Development Fund (TNUDF) for any sub-projects involving land alienation of any Government land under different tenure including “Poramboke” land “owned” by the Urban Local Body or any other Government institution/department/organization which are alienated in favour of project activity, when encroachments/encroachers are cleared and when community assets such as places of worship, burial/cremation ground etc., are required to be cleared from the execution of project activity.
2. The land details for the project components shall be annexed with details such as location, survey numbers, extent available and required, land use classification, current land use, land ownership, alienation/acquisition status along with FMB extracts while submitting the Social Screening Form.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

8. IMPLEMENTATION AND INSTITUTIONAL ARRANGEMENTS

The proposed project is to provide an Underground Sewerage Supply Scheme to Perundurai. This project will be implemented by TWAD under the scheme of Tamil Nadu Sustainable Urban Development Project (TNSUDP) at an estimating cost of **Rs.54.78 Crores.**

The project is proposed to be implemented by TWAD through Prospective contractor. The environmental management plan identified for the construction will be included in the bid documents for ensuring implementation of the environmental safeguards. Implementation of the management measures by the contractor will be ensured by TWAD Board and report on ESMF compliance will be submitted to TNUIFSL periodically.

The management measures identified for operation phase will be taken up by the Prospective contractor upto maintenance period and beyond that by TWAD Board.

8.1 Grievance Mechanism

TWAD Board has proposed to provide Underground Sewerage Supply Scheme to Perundurai town and treat the Sewage in Sewage Treatment Plant of 3.14 MLD using Fluidized Aerobic Bio-Reactor Technology. The management measures identified for the operation phase will be taken up by the TWAD Board upon completion of construction activities. The TWAD Board will have Grievance Redressal mechanisms to handle the grievances of the project. A project level grievance Redressal committee will be set up and the members are as follows (preferably one of them as women)

- Executive Engineer (Projects –TWAD Board)
- Executive Officer (Perundurai town panchayat)
- A person who is publicly known in the local area

TWAD Board will submit monthly reports on the status of compliance with the ECSMF requirements to TNUIFSL.

8.1.1 Grievance Redressal Committee

The GRC shall convene meetings of the committee as necessary at such place or places in the Project Implementation Agency as he considers appropriate; and Conduct



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

the proceedings in an informal manner as he considers appropriate with the object to bring an amicable settlement between the parties.

Step by step approach will be followed for redressing grievances. First, the aggrieved Project Affected Person to approach the GRC in the first stage and the grievance committee will look into the grievances and resolve the issues. The proceedings of GRC will be documented. If not satisfied with the resolution provided by GRC, then the complainants can appeal to the grievance redressal mechanisms available at the office of Executive Engineer at Perundurai.

The complaints will be acknowledged to the complainant. Efforts will be made by TWAD to ensure closure of complaint within a maximum period of 30 days from the date of its receipt. Serious issues shall be attended as early as possible. If not satisfied with the resolution provided by GRC, the complaints shall be handled at higher level i.e, Chief engineer of TWAD.

If there is any grievance, it involves a process of consultation and negotiation with the committee. The grievances relating to the problem will be recorded and each step in the resolution process also will be recorded and each step in the resolution process also will be recorded. The elected representative will be involved in representing the issue and act as communication link between the persons involved. When the problems are identified, it will be taken to the personnel who respond and pass the information to the committee immediately. It is then the role of the committee to investigate and consult with the persons to evaluate the seriousness of the issues and work with the management to resolve the problem. TWAD shall submit monthly reports on the status of compliance with the ECSMF requirements to TNUIFSL.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

9. PROJECT BENEFITS

The main objective of the project is to provide adequate sewage disposal facilities to the residents of Perundurai Town. On implementation of the present project, the health and sanitation situation of the town will be improved significantly thereby reducing the incidence of water borne diseases and associated medical expenses of the consumers. Besides, there will also be reduction in loss of productive man – days as a result of reduced incidence of health problems and subsequent improvement or economic conditions of Perundurai Town. Due to high ground water table in Perundurai Town, the provision of an effective sewerage system will have permanent positive impact on the ground water quality of the town.

- Perundurai Town Hygienic will be improved
 - Mixing of Sewage water into Land, Canals, Lakes & Ponds will be reduced
 - Ground Water degradation will be reduced
 - Soil contamination will be reduced
 - Sewage odour can be reduced in the open area Overall Water pollution and soil pollution due to Sewage will be reduced and the safe environment will be improved in and around the project area i.e., Perundurai Town.
-



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

10. CONCLUSION

- The impact on environment will be minimum and can be further reduced by implementing various mitigating measures and regular monitoring programs.
 - The proposed sewage treatment Plant have beneficial impacts in terms of hygienic and safe disposal of treated effluent with incidental benefits like employment opportunities both in the construction stage and operation stage. Also the modernized installation will facilitate greater level of operating safety.
 - Due to the proposed project the socio economic activities will be developed in and around the project area.
 - The monitoring program on various environmental parameters will be undertaken for the continual improvements towards protecting the environment to achieve the above requirements.
 - Proper methods have been planned to safe and secured disposal of treated effluent and handling of solid waste. Hence the project has been strongly recommended.
-



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Quality Policy of HECS

Hubert Enviro Care Systems (P) Ltd

HECS

IMS POLICY

We are committed to achieve customer satisfaction in our activities of provision of environmental services such as Project Engineering/ Consultancy / EIA services/ Laboratory and site monitoring / testing services / operations and maintenance of Pollution control systems with best quality, on time service and value for their money by

- ❖ *Meeting the ever-changing Customer requirements and their latent expectation so as to focus on customer delight through proactive measures using latest technology and team work.*
- ❖ *Conserving resources, reducing waste generation and prevention of pollution through respecting nature*
- ❖ *Minimizing the Occupational health and safety hazards and prevention of injury and ill health at work place.*
- ❖ *Complying with all applicable legal & other requirements.*
- ❖ *Enhancing total quality in all aspects of management, environmental & safety responsiveness and Mind set among the work force.*
- ❖ *Continually improving the overall organizational performance by adopting the integrated Management system through appropriate planning, implementing and reviewing the objectives and targets and there by achieve, sustain and improve over all organizational development.*

Date: 01-02-2013



Place: Chennai

J R Moses
CEO



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

QCI-NABET - EIA Accreditation



Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

Hubert Enviro Care Systems (P) Ltd.


A-21, III Phase, Behind Lions Club School, ThiruViKa Industrial Estate,
Guindy, Chennai – 600 032

Accredited as **Category - A** organization under the QCI-NABET Scheme for Accreditation of EIA
Consultant Organizations: Version 3 for preparing EIA-EMP reports in the following Sectors:

Sl. No.	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast / underground mining	1	1 (a) (i)	A
2	Onshore oil and gas exploration, development & production	2	1 (b)	A
3	Thermal power plants	4	1 (d)	A
4	Metallurgical industries (secondary metallurgy only)	8	3 (a)	B
5	Cement plants	9	3 (b)	B
6	Petroleum refining industry	10	4 (a)	A
7	Petro-chemical complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics)	18	5 (c)	A
8	Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes)	20	5 (e)	A
9	Synthetic organic chemicals industry	21	5 (f)	A
10	Isolated storage & handling of Hazardous chemicals	28	6 (b)	B
11	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes.	31	7 (c)	A
12	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
13	Building and construction projects	38	8 (a)	B
14	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RA AC minutes dated Nov. 03, 2017 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/18/0566 dated Feb. 16, 2018. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems (P) Ltd., Chennai following due process of assessment.



Sr. Director, NABET
Dated: Feb. 16, 2018

Certificate No.
NABET/ EIA/1619/ RA 0083

Valid till
13.10.2019

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

பெருந்துறை பேரூராட்சி அலுவலகம்

ஈரோடு மாவட்டம்

கூட்ட நடவடிக்கைகளின் குறிப்பு

2011-ம் ஆண்டு ஆகஸ்ட் மாதம் 12-ம் தேதி வெள்ளிக் கிழமை காலை 11.00 மணிக்கு பெருந்துறை பேரூராட்சி அலுவலகத்தில் நடைபெற்ற அவசரக் கூட்டத்தில் நிறைவேற்றிய தீர்மான நடவடிக்கைக் குறிப்பு:

தலைவர் : திருமதி.எஸ். துளசிமணி, தலைவர் அவர்கள்.

உறுப்பினர்கள் வருகை : தலைவர் உட்பட 13 பேர்கள்.

பொருள் : 1	தீர்மானம் எண். 117 / 2011, நாள். 12.08.2011.
தமிழ்நாடு குடிநீர் வடிகால் வாரிய செயற் பொறியாளர், ஈரோடு அவர்களின் கடித எண்.1000/JDO/FUGSS/2011 நாள்.01.07.2011ல்	தமிழ்நாடு குடிநீர் வடிகால் வாரியம் மத்திய / மாநில அரசு நிதியின் கீழ் பாதாள சாக்கடைத் திட்டத்தினை நடைமுறைப்படுத்தி விரிவான நிலக்கை கையாள் செய்ய

பெருந்துறை பேரூராட்சி

ஈரோடு மாவட்டம்

கூட்ட நடவடிக்கைகளின் குறிப்பு

2012-ம் ஆண்டு ஜூலை மாதம் 25-ம் தேதி புதன் கிழமை காலை 11.00 மணிக்கு பெருந்துறை பேரூராட்சி அலுவலகத்தில் நடைபெற்ற அவசரக் கூட்டத்தில் நிறைவேற்றிய தீர்மான நடவடிக்கைக் குறிப்பு:

தலைவர் : திருமதி.டி. சரஸ்வதி, தலைவர் அவர்கள்.

உறுப்பினர்கள் வருகை : தலைவர் உட்பட 16 பேர்கள்.

பொருள்	தீர்மானம் எண். 261 / 2012, நாள். 25.07.2012.
<u>பொருள் எண். 1</u> ஈரோடு மாவட்டம், பெருந்துறை தேர்வுநிலை பேரூராட்சியில் 2012-2013ம் ஆண்டில் பாதாள சாக்கடைத்திட்டம் செயல்படுத்தப்பட உள்ளதால் பெருந்துறை பேரூராட்சிக்குச் சொந்தமான பணிக்கம்பாளையம் பெருந்துறை கிராமம்-A ரீ.ச.எண் 1032/2ல் உள்ள 1.42.0 ஹெக்டேர் (3.51 ஏக்கர்) நிலத்தில் 2.50 ஏக்கர் இடத்தில் நீர் உந்து நிலையம் (Pumping Station) மற்றும் நீர் சுத்திகரிப்பு நிலையம் (Treatment Plant) அமைப்பதற்கு மன்றத்தின் அங்கீகாரத்திற்கு.	அங்கீகரிக்கப்பட்டது. (ஒப்பம்) திருமதி.டி. சரஸ்வதி, தலைவர், பெருந்துறை பேரூராட்சி.

// உண்மை நகல் //

செயல் அலுவலர்,
பெருந்துறை பேரூராட்சி.
20.11.18

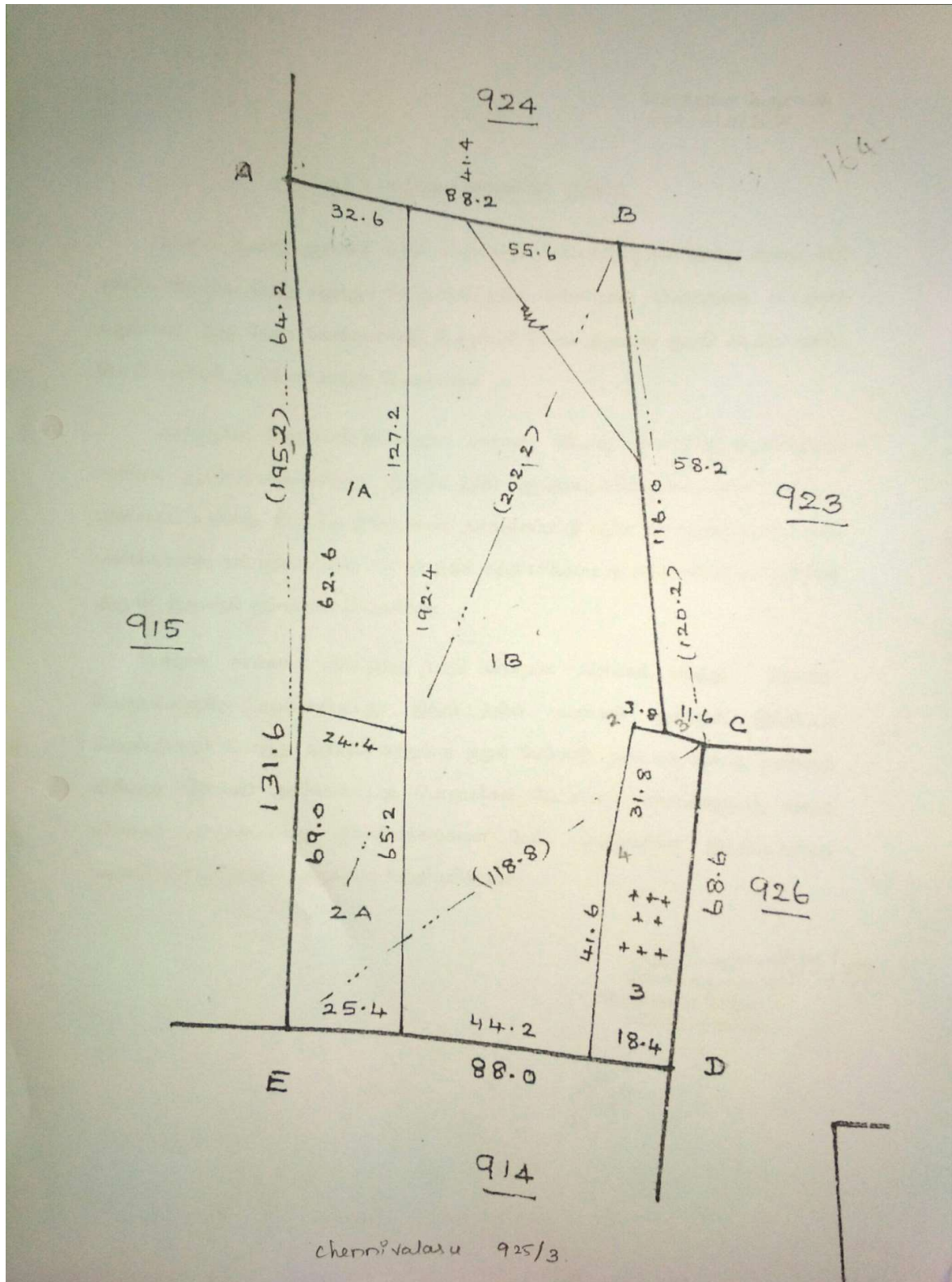


UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Annexure - 1



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA



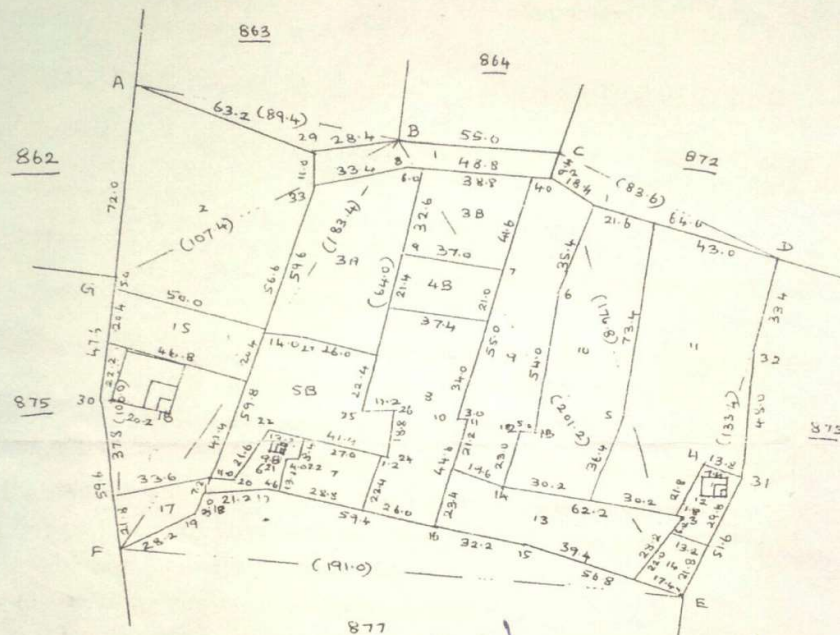


மாண்புமிகு : ஈ.ஜெ.பாபு

[illegible]

பெயர் : குருக்கண்ண

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16/8/16

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கிராம நிர்வாக அலுவலர்
பெருந்துறை 'அ'
பெருந்துறை வட்டம்.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Annexure -2



Abstract

Announcement 2012-13 – Town Panchayats Administration – Administrative Sanction for implementation of Under Ground Sewerage Scheme in 5 Panchayats at an estimated cost of Rs 166.38 crores - Orders issued

Municipal Administration and Water Supply (TP.2) Department

G.O. (D) No. 24

Dated: 17 -01-2013.
(Thiruvalluvar Aandu 2043,
Nandana, Thal - 4)

Read:

G.O. (D) No.225, Municipal Administration and Water Supply (MA.II) Department, Dated 05.04.2012.

From the Director of Town Panchayats Letter Roc No.2869 / 2012 / E4, Dated 12.09.2012 and 24.09.2012.

Order:-

While moving the Demand No.34 for the year 2012-13, Hon'ble Minister for Municipal Administration and Rural Development has made an announcement on the floor of the Legislative Assembly as follows:-

“அனைத்து பேரூராட்சிகளிலும் படிப்படியாக பாதாள சாக்கடைத் திட்டத்தை செயல்படுத்த மாண்புமிகு முதலமைச்சர் அவர்கள் ஆணையிட்டுள்ளார்கள். ஆகவே 2012-13 ஆம் ஆண்டு, மாமல்லபுரம் (விடுவாக்கப் பகுதி), திருப்பேரேலூர், கெடும்பட்டி, ஆலங்காயம், செங்கம், பெண்ணாகும், காவேரிப்பட்டினம், ஐலகண்டாபுரம், ஆலங்காயம், பெருந்துறை, குன்னத்தூர், பெரியநாயக்கன்பாளையம், பெண்ணாடம், உருந்தூர், பைவல்லம், வேளாங்கண்ணி, நீடாமங்கலம், மண்ணச்சநல்லூர், குரும்பலூர், ஆபக்குடி, தமிழ்நாடு காகித ஆலை புகளூர், பரவை, பழனிச்செட்டிப்பட்டி, முதுகுளத்தூர், கானாடுகாத்தான், சேத்தூர், சாம்பவார்வடகரை மற்றும் ஆழ்வார்திருநகரி ஆகிய பேரூராட்சிகளில் ரூ.755.98 கோடி மதிப்பீட்டில் பாதாள சாக்கடைத் திட்டம் மேற்கொள்ளப்படும்”.

p.t.o.,



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

- 2 -

2 As a sequence to the above announcement, the Director of Town Panchayats has sent a proposal for execution of Under Ground Sewerage Scheme in 5 Town Panchayats viz Chengam, Perundurai, Pennadam, Velakanni Palanichettipatty with the following funding pattern:-

No	Name of the District	Name of the Town Panchayat	Estimate cost without road relaying	Relaying of roads for entire width	Estimate cost with road relaying (4+5)	As per G.O. No.225 amount allotted under IUDM 50% (with road relaying)	50% met out from KfW	KfW			Relaying of roads for entire width 50% (amount will be met from other schemes)
								Loan 70%	Grant 30%	Total	
(Rupees in crores)											
1	Thiruvannamalai	Chengam	31.04	3.22	34.26	17.13	17.13	10.86	4.65	15.52	
2	Erode	Perundurai ✓	32.3	22.48	54.78 ✓	27.39	27.39	11.31	4.85	16.15 ✓	
3	Cuddalore	Pennadam	20.15	2.76	22.91	11.455	11.455	7.05	3.02	10.08	1.38
4	Nagapattinam	Velakanni	17.33	6.56	23.89	11.945	11.945	6.07	2.60	8.67	3.22
5	Theni	Palanichettipatty	21.34	9.2	30.54	15.27	15.27	7.47	3.20	10.67	4.6
Total			122.16	44.22	166.38	83.19	83.19	42.76	18.32	61.08	22.11

The Director of Town Panchayats has also requested to sanction 50% amount, on the estimate cost of Rs.166.38 crore i.e. Rs.83.19 crore, excluding road relaying cost as 70% loan and 30% grant under KfW and the amount of Rs.22.11 crore for relaying of roads which would be met out either from TURIF or IUDM in the subsequent years.

3. in G.O read above, the Government have accorded administrative sanction for a sum of Rs.244.22 crore in respect of Town Panchayats Department for implementation of various projects including Under Ground Sewerage Scheme in the above 5 Town Panchayats at an estimated cost of Rs.166.38 crore and out of this amount, a sum of Rs.13,884 crore has been sanctioned for the above Under Ground Sewerage Scheme in 5 Town Panchayats under IUDM for the year 2012-13.

4. The Government after careful consideration, accord administrative sanction for implementation of Under Ground Sewerage Scheme in 5 Town Panchayats including the road laying cost at an estimated cost of Rs.166,38,00,000/- (Rupees one hundred and sixty six crore and thirty eight lakhs) as detailed in paras 2 – 3 above with the funding pattern of KfW.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

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Rs. 83.19 crore under IUDM and 50% amount of Rs. 83.19 crore under Kfw funding which is in the pattern as 70% loan and 30% grant and the amount of Rs.22.11 crore as detailed in para 2 above for laying of roads would be met out either from TURIF or IUDM in the subsequent years.

5. This order issues with the concurrence of Finance Department vide its U.O. No.62905/ Finance/ MAWS/2012, dated; 14.11.2012

(BY ORDER OF THE GOVERNOR)

C. V. Sankar,
Principal Secretary to Government.

To:

✓ The Director of Town Panchayats, Chennai -600 108.
The Chairman and Managing Director, TUFIDCO, Chennai – 600 35.
The Chairperson and Managing Director, TNUIFSL, Chennai – 600 17
The Accountant General, Chennai – 600 18.
The Pay and Accounts Officer, (North), Chennai – 600 001.

Copy to:

The Secretary to Chief Minister, O/o. the Hon'ble Chief Minister, Chennai – 600 003.
The Senior Private Secretary to Additional Chief Secretary to Government,
Municipal Administration and Water Supply Department,
Chennai – 600 009.
The Private Secretary to Principal Secretary to Government,
Finance Department, Chennai – 600 009.
The Finance (M.A. & W.S.) Department, Chennai – 600 009.
The Municipal Administration and Water Supply (Budget / OP.2/ MA.II) Department,
Chennai – 600 009.
SF/SCs.

// forwarded by order //

H. P. Pushkar
Section Officer
MAWS



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Document-3

POSSIBLE ENVIRONMENTAL AND SOCIAL ISSUES IN URBAN INFRASTRUCTURE PROJECTS

Urban infrastructure projects aim to improve the standard of living within an urban locale and hence have associated positive impacts. However, possible negative impacts of urban infrastructure projects are as shown below:

Project	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I) Water Supply & Sewage																
A. Water Supply																
1. Water supply lines & taps		v		v					v							
2. Water tankers		v		v	0				0			v				
3. Overhead tanks		0													0	
4. Water treatment plants		v		v				v				v			0	
5. Head works						0										0
6. Generators					v	v										
7. River Intake works		v	0					v								
B. Storm water Drainage																
1. Open drains		v		v	v				v			v	v			
2. Closed/Underground drains		v		v					v							
C. Sewerage / Sanitation																
1. Public conveniences		v	v	v			0						v		0	
2. Pay & use latrines		v	v	v			0						v		0	
3. Sewage network								o								
4. Pumping Station						v	v				v				o	v
5. Sewage treatment Plants		v	v	v	v		v					0	v		0	
6. Septic tanks		v	v	v									v		0	
II) Solid Waste Management																
A. Land fill site		v	v	v	v	0		v				v	v		v	
B. Compost Yard						0	0									
C. Collection / Transportation						o										
III) Transportation																
A. Roads																
1. Widening of roads		0				v	v		v	v						0
2. Improvement of surface						0			v							
3. New roads		v				v	0		v	0					v	
4. Traffic islands		v				0			v	0						
5. Road divider		v				0			v	0						
6. Footpaths		v	v						v	v	0					
B. Street Furniture																
1. Traffic signals						v	v		v							
2. Street lights									v							
3. Sign boards									v		0					

- 1: Landuse change
2: Hydrology and Drainage Patterns
3: Surface and Ground Water Quality
4: Water Logging
5: Air Quality

- 6: Noise
7: Solid Waste
8: Destruction of habitat/
9: Disturbance to Other
10: Urban Congestion
11: Urban Acsthetics

Vegetation
Services

- 12: Public Health and Safety
13: Smell and Smoke
14: Fire Hazards
15: Resettlement and Rehabilitation
16: Insect menace

Note : v Major Negative Impact ; 0 Minor Negative Impact



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Project	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C. Road Structures																
1. Subways																
- Pedestrian	v	v		v					0	0					0	
- Cycle	v	v		v					0	0					0	
- Fast moving	v	v		v					0	0					0	
2. ROBs	v	v							0						0	
3. Culverts		v							0							
4. Small Bridges		v							0						0	
D. Terminals / Shelters																
1. Bus Shelters					0	0			v						0	
2. Bus Terminals/Stands					0	0			v	v					0	
3. Truck Terminals					0	0			v	v					0	
4. Workshops					0	0			v						0	
5. Carparking Complexes	v				v			v	v	v					0	
E. Fleet Expansion						v	v			v			v			
F. Construction & Maintenance equipment					0	0										
G. Inland Water Ways	v	v	v													v
IV. Commercial Complexes																
A. Shopping/office complexes							v							0	v	
B. Vegetable/Fish markets							v		0						v	
C. Slaughter houses							v					v	v		v	
D. Marriage halls		v					v		v						v	
E. Lodge / Dormitory															v	
F. Municipal community complexes		v					v	v	v	v				v	v	
V. Non Comm./Community Amenities																
A. Parks	v	v														v
B. Playgrounds	v	v														v
C. Maternity and Child center								v								v
D. Hospitals						0	v			0		0				v
E. Educational Institution/ Reading rooms								v								v
F. Burial Grounds		v										v	v	v		v
G. Electric crematoriums			0		v							v	v	v		v
VI. Integrated Area Development																
A. Housing (Sites & Services)	v	v						v	v	v	v				v	v
B. Guided Urban Development	v	v						v	v	v	v				v	v
C. TRAMP	v	v							v	v	v				v	v

- 1: Landuse change
- 2: Hydrology and Drainage Patterns
- 3: Surface and Ground Water Quality
- 4: Water Logging
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- 6: Noise
- 7: Solid Waste
- 8: Destruction of habitat/ Vegetation
- 9: Disturbance to Other Services
- 10: Urban Congestion

- 11: Urban Aesthetics
- 12: Public Health and Safety
- 13: Smell and Smoke
- 14: Fire Hazards
- 15: Resettlement and Rehabilitation
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Note : v Major Negative Impact : 0 Minor Negative Impact



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Annexure 3



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

அனுப்புதல்

திருமதி.ஜி. உஷா,
செயல் அலுவலர்,
பெருந்துறை பேரூராட்சி,
ஈரோடு மாவட்டம்.

பெறுதல்

நிர்வாகப் பொறியாளர்,
தமிழ்நாடு குடிநீர் வடிகால் வாரியம்,
கழிவுநீர் அகற்றும் கோட்டம்,
பெருந்துறை.

ந.க.எண். 370/2011 நாள். 12.11.2018

அய்யா

பொருள்: நிலம் – ஈரோடு மாவட்டம் – பெருந்துறை பேரூராட்சி — பெருந்துறை கிராமம் – பாதாள சாக்கடைத்திட்டம் – பெருந்துறை பேரூராட்சி யில் கழிவு நீர் சுத்திகரிப்பு நிலையத்திற்கு புல எண் 1032/3,1033/3ல் கழிவு நீரை விட தடையின்மை சான்று வழங்குதல் – தொடர்பாக.

- பார்வை: 1. ஈரோடு மாவட்ட ஆட்சித்தலைவர் அவர்களின் கடித ந.க.எண் 29770/2018/உ.4,நாள் 26/10/2018.
2. நிர்வாகப் பொறியாளர்,தமிழ்நாடு குடிநீர் வடிகால் வாரியம்,கழிவுநீர் அகற்றும் கோட்டம்,பெருந்துறை அவர்களின் கடித ந.க.எண் 1011/கோ,பெருந்துறை/இவ அ/க.கோ/2018,நாள் 10.11.2018.

* * *

பார்வை 1ல் காணும் மாவட்ட ஆட்சித்தலைவர் அவர்களின் கடிதத்தின் படி ஈரோடு மாவட்டம், பெருந்துறை பேரூராட்சியில், பாதாள சாக்கடைத்திட்டத்தின் கீழ் சுத்தகரிக்கப்பட்ட கழிவு நீரினை பெருந்துறை கிராமம் ரீ.ச.எண் 1032/3 மற்றும் 1033/3 ஆகிய இடங்களில் விட பேரூராட்சியின் கட்டுப்பாட்டிலும்,பயன்பாட்டிலும் உள்ள குட்டையில் விட பெருந்துறை பேரூராட்சியில் தடையின்மைச்சான்று பெற்றுக்கொள்ளுமாறு தெரிவிக்கப்பட்டுள்ளது.

இதனை தொடர்ந்து பார்வை 2ல் காணும் நிர்வாகப் பொறியாளரின் கடிதத்தில் தடையின்மைச்சான்று கோரப்பட்டதற்கு பெருந்துறை பேரூராட்சியில், பாதாள சாக்கடைத்திட்டத்தின் கீழ் சுத்தகரிக்கப்பட்ட கழிவு நீரினை பெருந்துறை கிராமம் ரீ.ச.எண் 1032/3 மற்றும் 1033/3 ஆகிய இடங்களில் விட தடையின்மைச்சான்று இதன் மூலம் வழங்கப்படுகிறது என்பதையும் அன்புடன் தெரிவித்துக் கொள்கிறேன்.

செயல் அலுவலர்,
பெருந்துறை பேரூராட்சி,
ஈரோடு மாவட்டம்.
12.11.18

நகல்

- 1) மாவட்ட ஆட்சித்தலைவர் அவர்களுக்கு தகவலுக்காக பணிந்து அனுப்பப்படுகிறது.
- 2) பேரூராட்சிகள் உதவி இயக்குநர் ஈரோடு அவர்களுக்கு தகவலுக்காக பணிந்து அனுப்பப்படுகிறது.



UNDERGROUND SEWERAGE SCHEME FOR PERUNDURAI TOWN PANCHAYAT – EIA

Examined by C.A. RAJESH

TWAD BOARD

PROGRAMME SCHEDULE FOR PERUNDURAIUGSS

Sl No	Description of work	BOQ Qty	Mile stone I (6 Months)						Mile stone II (12 Months)						Mile stone III (18 Months)						Mile stone IV (24 Months)																													
			Jun'18	Jul'18	Aug'18	Sep'18	Oct'18	Nov'18	Dec'18	Jan'19	Feb'19	Mar'19	Apr'19	May'19	Jun'19	Jul'19	Aug'19	Sep'19	Oct'19	Nov'19	Dec'19	Jan'20	Feb'20	Mar'20	Apr'20	May'20																								
1	Surveying and Levelling		From 11.06.2018 to 24.06.2018																																															
2	Construction of Manholes (Brick & RCC MH)	1932 Nos	475 Nos												470 Nos												1696 Nos												1922 Nos											
3	Sewage collection system which includes stoneware Pipe Line (150mm to 300mm)	41121 M	12336 M												24872 M												37008 M												41121 M											
4	Sewage collection system which includes RCC pipe Line (200mm to 450mm)	6375 M	1912 M												3424 M												8736 M												6375 M											
5	House Service Connection	34200 M													8500m												23000m												34200m											
6	Main Pumping Station MPS-1 (Zone - I)	1 No																																																
	Main Pumping Station MPS-2 (Zone - IV)	1 No																																																
7	Sub Pumping Station SPS-1 (Zone - III)	1 No																																																
	Sub Pumping Station SPS-2 (Zone - II)	1 No																																																
8	Lift station's	5 No																																																
9	Sewerage Treatment Plant STP (3.14 MLD)	1 No																																																
10	Road Relaying CC & BT																																																	
11	Pumping Main																																																	
a	150mm CI LA Class pipe	1194 M																																																
b	200mm CI LA Class pipe	1560 M																																																
c	350mm CI LA Class pipe	2100 M																																																
12	Testing, commissioning and trial run	100%																																																

For ANCHOR CERAMIC CO (P) LTD.

PPR
DIRECT