ENVIRONMENTAL IMPACT ASSESSMENT
&
ENVIRONMENTAL MANAGEMENT PLAN

For the proposed

35.0 MLD CAPACITY
SEWAGE TREATMENT PLANT

At

MANKUTTAI
SALEM CITY MUNICIPAL CORPORATION
TAMILNADU

CONTRACTOR

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EXECUTIVE SUMMARY

Salem Municipality was formed in 1998 and later the Centurion Municipality was declared as the SALEM CITY MUNICIPAL CORPORATION from 1.6.1994 under Salem Corporation Act. The Salem City Municipal Council celebrated its Centenary in 1966. The Municipality was upgraded into a special grade Municipality with effect from 1.4.79. Salem City Municipal Limits were further extended by the inclusion of Suramangalam Municipality, Jarikondalampatty Town Panchayat, Kannankurichi Town Panchayat and 21 other Village panchayats with effect from 1.4.94, with an extent of 91.34 sq.kms and a total population of 6,97,061(2001 Census). Salem is the Headquarters of Salem District.

Salem Corporation consists of 60 wards categorized under 4 Zonal Offices namely Suramangalam Zonal, Hasthampatty Zonal, Ammapet Zonal, Kondalampatty Zonal. Each Zonal Office has its own Zonal Chairman and an Asst. Commissioner to take care of Zonal Activities.

Salem District is one of the land locked Districts in Tamil Nadu. It is bounded on the North by Dharmapuri district, on the South by Namakkal district, on the West by Erode district and, on the East by Villupuram district. The elevation of landscape generally ranges from 500 ft to 1200 ft. above MSL with the exception of Yercaud which is at 5000 ft. above MSL. The Geographical area of the district is 520530 Ha. The district has 4 Revenue divisions, one corporation and 3 municipalities

NEED OF SEWERAGE SCHEME

Salem is also an important business center in Tamil Nadu. A number of textile industries, Sago Industries and some Major Industrial units such as the integrated Salem steel plant, burn and Co., Dalmia Magnesite Ltd., Tamil Nadu Magnesite Ltd., are located here. Salem is also famous for body building for lorries, trucks and buses. Salem district is also having rich mineral deposits such as Magnetite, Bauxite, Iron ore and Limestone.

An Underground sewerage scheme has been proposed for the City and funded by World Bank. Apart from the collection system and restoration work, it is proposed to construct individual sewage treatment plant for each Zone as no suitable site was available for the construction of a Common Sewage Treatment Plant. For Zone III coming under Package is proposed to provide a Sewage Treatment Plant at Mankuttai with capacity of 35 MLD for treating the sewage generated from Zone. The treated effluent is proposed to be let into the Thirumanimutharu river course. The battery limit for this contract commences near the receiving chamber. The contract includes disposal of treated effluent into the river as shown in the layout.

SEWAGE COLLECTION AND DISPOSAL

The sewage is collected through Under Ground Sewerage Scheme system which reaches the receiving chamber of the STP for treatment. The treated sewage from the STP will be disposed through NP3 R.C.C pipe in to Mankuttai Odai which in turn leads to Thirumanimutharu River. The existing canal has adequate cross section and slope to carry the treated sewage.

BASELINE ENVIRONMENTAL STATUS

AIR

The Ambient Air Quality has been monitored around the surrounding areas of the site. At all location, the SPM, RPM, SO_2, NOx and CO values are found to be well within the limit.

NOISE

The noise levels are observed near the site and it varied at different sampling stations. The noise levels are found to be within the prescribed limits for an industrial area but above the limits for a residential area.

GROUND WATER

The ground water samples are analysed in and around the site, mainly the source was bore well samples located near the site (1.0 km) At all locations, pH values were in the range with agreeable colour, taste and odour. Sulphates, Calcium and Iron were found to be within the limit in all sites except the site of the STP. The maximum total coliforms were found to be 8 MPN/100 ml which is below desirable limit (IS -10500).

SOIL

At all locations, pH ranges from 7.8 to 9.4. The Macro nutrients like Nitrogen, Phosphorus, Potassium and Micro nutrients like Iron, Manganese, Zinc where analyzed in all location in and around the site

BIOLOGICAL ENVIRONMENT

The area of 1.0 km on either side along the proposed alignment is surrounded with settlements and open fields. They include a few open scrub forest pockets; private farm lands, built up and cultivated areas. No places with thick vegetation fall under the impact zone but there are several areas of open scrubs. The site was previously used as Eri which holds excess water and diverts storm and drainage into the canal. Water from surrounding areas collected in this area and was diverted via a canal out to the Thirumanimutharu river course. There is no destruction of natural environment in the proposed site area. The diversion of water is done through drain located near by the site and reaches Odai.

SOCIO ECONOMIC STUDY

The area within the first 1.0 km radius of the site falls mostly in Salem taluk. The population of the area according to the 2001 census was 6,96,760, out of which 3,53,933 (50.79%) were males and 3,42,827 (49.20%) were females. Majority the people in the study area belong to Hindu religion. The study area also contains Scheduled Castes (SC) and Scheduled Tribes (ST). Among the total population, 23.25% belonged to the scheduled castes (SC) and 0.19 % scheduled tribes (ST).

The study area experiences a moderate literacy rate of 69.78 %. The male literacy (i.e.) the percentage of literate males to the total males of the study area is observed as 54.89% while female literacy rate, which is an important indicator for social change, is observed as 45.10 % in the study area.

The occupational pattern in the study area shows that majority (62.24%) of the population in the villages belongs to the non-workers category, 16.20% is marginal workers, and the remaining 36.75 % are main workers. About 0.62% of

the workers are engaged in agricultural labour (Category II), and about 0.28 % are cultivators (Category I).

PREDICTION OF IMPACTS

As the existing air quality measured during the season reveals the air quality is well within the limit and no new source will be added due to the proposed activity.

The proposed facility will only provide Sewage Treatment Plant to treat the waste water generated in Salem town and near by area. The transportation activities will not be increased as the sewerage collection and disposal system is planned as per underground distribution system.

The sludge generated will not be stored in the plant site and same will be disposed to the municipal solid waste composting yard.

There is no anthropogenic noise source. Pump sets would be mostly submersible and other pumps would be placed inside enclosures to prevent noise nuisance. D.G. Sets comes with acoustic hoods and hence the impact is insignificant being controlled at the source.

The proposed facility is to treat the sewage generated. The treated sewage characteristics will meet all the statutory norms prescribed according to the receiving body. The treated sewage will be disposed to the near by Odai with sufficient holding capacity to receive a flow of 35 MLD of treated water.

ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan is derived for construction and operational stage of the project. The green belt development plan and the funds for environmental protection measures along with Post Project Monitoring Plan is also given in the EMP. The entire system is designed with minimum impacts on the environment. Any impacts that may be generated will be prevented at the source. In addition, the following are added. Green belt was developed in available area all around the site to minimize noise and odor. All noise producing equipments will be placed in acoustic hoods to prevent noise pollution. Control of vibrations will be done at the source. The treated sewage will be within prescribed limits of TNPCB and finally drained out of the site.

CONCLUSION

Identification, estimation/quantification of possible impacts over baseline status of water quality, biodiversity, air quality, noise levels and soil profile at the proposed locations during the month of May 2011, reveals that:

1. The proposed site is free of pollution sources.
2. There are no critical habitats in the vicinity of the project locations.
3. The project does not require clearing of any trees.
4. There is no endemic and rare floral species are identified in the study area
5. The aquatic environment will not have direct negative impact
6. Better housing and sanitation facilities for the local residents of the municipality.
7. Better employment opportunities and in turn better living standards.
8. The project does not involve any displacement of habitations. Thus no negative impact to the socio-economic segment could be viewed.
9. The solid waste generated will be treated and used as manure.

The potential environmental, social and economic impacts of the project have been assessed and comprehensive mitigation and community developmental plans have also been developed.

Environmental Management Plan will be exercised at design stage, construction stage and operational stage to meet all the consent norms of TNPCB With their expertise, experience, commitment and dedication, Salem City Municipal Corporation along with M/s. Subaya Construction Company limited, Chennai, the contractors for this project, will Design, Construct, Commission and Operate the 35 MLD capacity Sewage Treatment Plant (STP) with modern technology at Mankuttai, Bodinaickenpatti village in Salem Municipality of Salem district in Tamil Nadu.

CHAPTER – I

INTRODUCTION

1.1 PREAMBLE

The growth and survival of any township area depends on its basic infrastructure facilities like roads, power supply, water supply, drainage and sewage treatment and solid waste disposal systems. However, any infrastructure development brings along with it a number of environmental problems. Many of these problems can be avoided, if during conceptual stage of the project, adequate environmental control considerations are thought of. Once the infrastructural developments are completed, it becomes very expensive to install pollution control equipment and implement other environmental control measures, if the same are not considered in the conceptual stage. Thus any development exerts both positive and negative environmental impacts. Negative impact cause environmental degradation, it is the responsibility of Planners, Scientists and Environmentalists to document these impacts separately so that these can be identified, quantified and attempts may be made to minimize negative impacts and maximize the positive impacts for better development with least environmental degradation. Salem is a city and a corporation in Salem district in the Indian state of Tamil Nadu. Salem City Municipal Corporation, Salem division has under taken the task of providing 35.0 MLD capacity Sewage Treatment Plant (STP) with modern technology at Mankuttai in Salem Municipality. Location maps of the project site are given in Figure 1.01, 1.04. The total land allotted for the project is 2.44 Acres. The collection system will be underground and salient features of Under Ground Sewerage Scheme are mentioned in Annexure – I.

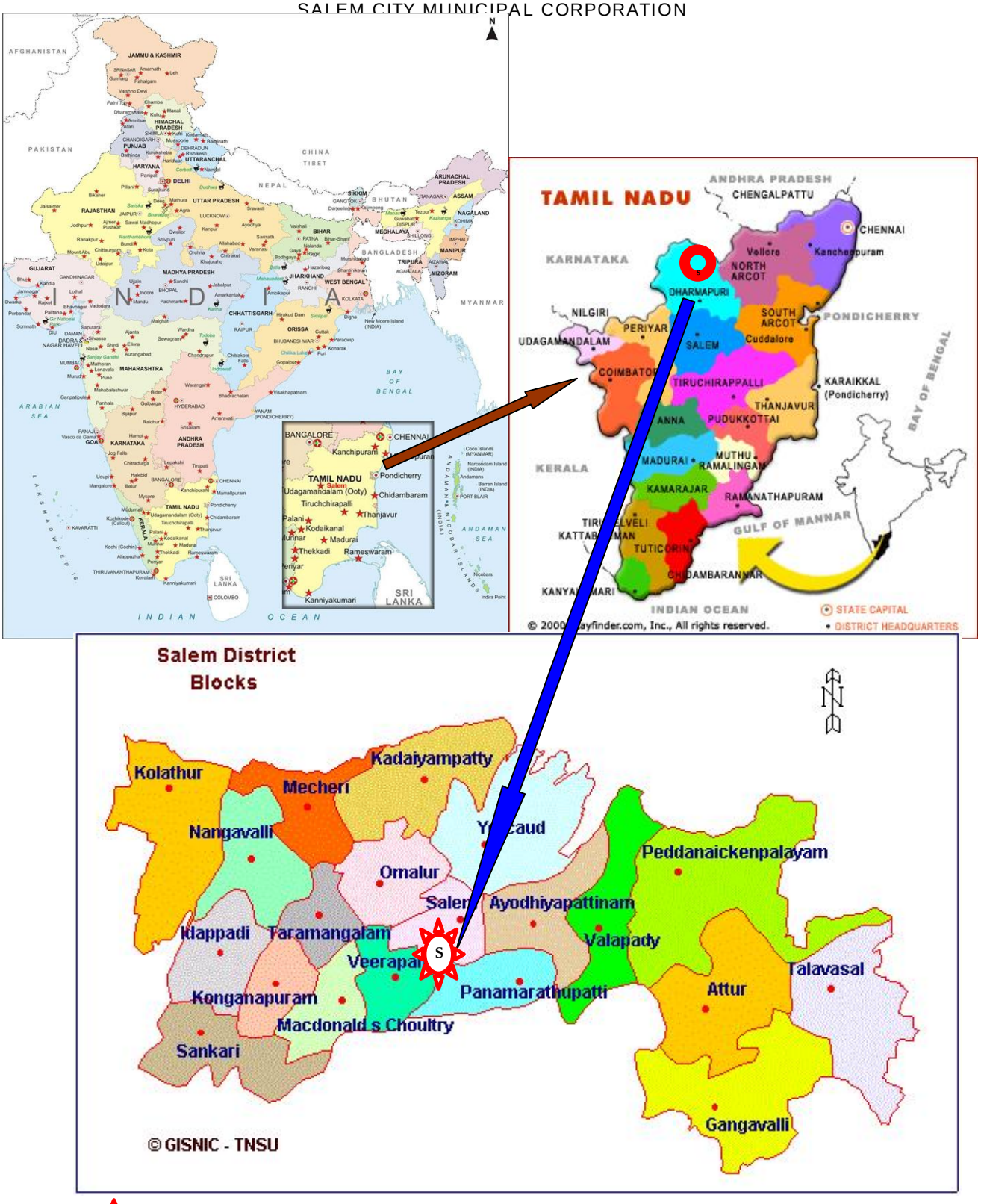


Figure 1.01 – Site Location in Map

1.2 NEED FOR SEWERAGE SCHEME

Salem is also an important business center in Tamil Nadu. A number of textile industries, Sago Industries and some Major Industrial units such as the integrated Salem steel plant, burn and Co., Dalmia Magnesite Ltd., Tamil Nadu Magnesite Ltd., are located here. Salem is also famous for body building to lorries, trucks and buses. Salem district is also having rich mineral deposits such as Magnetite, Bauxite, Iron ore and Limestone.

An Under Ground Sewerage Scheme has been proposed for the Salem City as attached in the Annexure - 1 which is funded by World Bank. The Tamil Nadu Government has sanctioned a new Under Ground Drainage Project for Salem City at an estimated cost of Rs149.39 Crores vide G.O. No.63 (D) M.A & W.S. Department, Dt: 23.2.2006.

The Salem city is divided into four zones namely Zone I, II, III and IV for the execution of UGSS as shown in Figure – 1.02. Apart from the collection system and restoration work, it is proposed to construct individual Sewage Treatment Plant for each Zone as no suitable site was available for the construction Common Sewage Treatment Plant. As advised by the Honourable Minister for Local Administration and Honourable Minister for Agriculture, it is proposed to construct four numbers of Sewage Treatment Plants within the City itself with advanced technology, relevant DPR and detailed estimate are being prepared for the proposal. For Zone III coming under Package III is proposed to provide sewage Treatment Plant at Mankuttai with capacity of 35 MLD for treating the sewage generated from the Zone. The UGSS for Zone III is as shown in Figure – 1.03. The treated effluent is proposed to be let into the Thirumanimutharu river course. The details of site location with site measurements, spot levels of the site, sewage entry direction is discussed in chapter – 2. The battery limit for this contract commences near the receiving chamber. The contract includes disposal of treated effluent into the river through the near by drain.

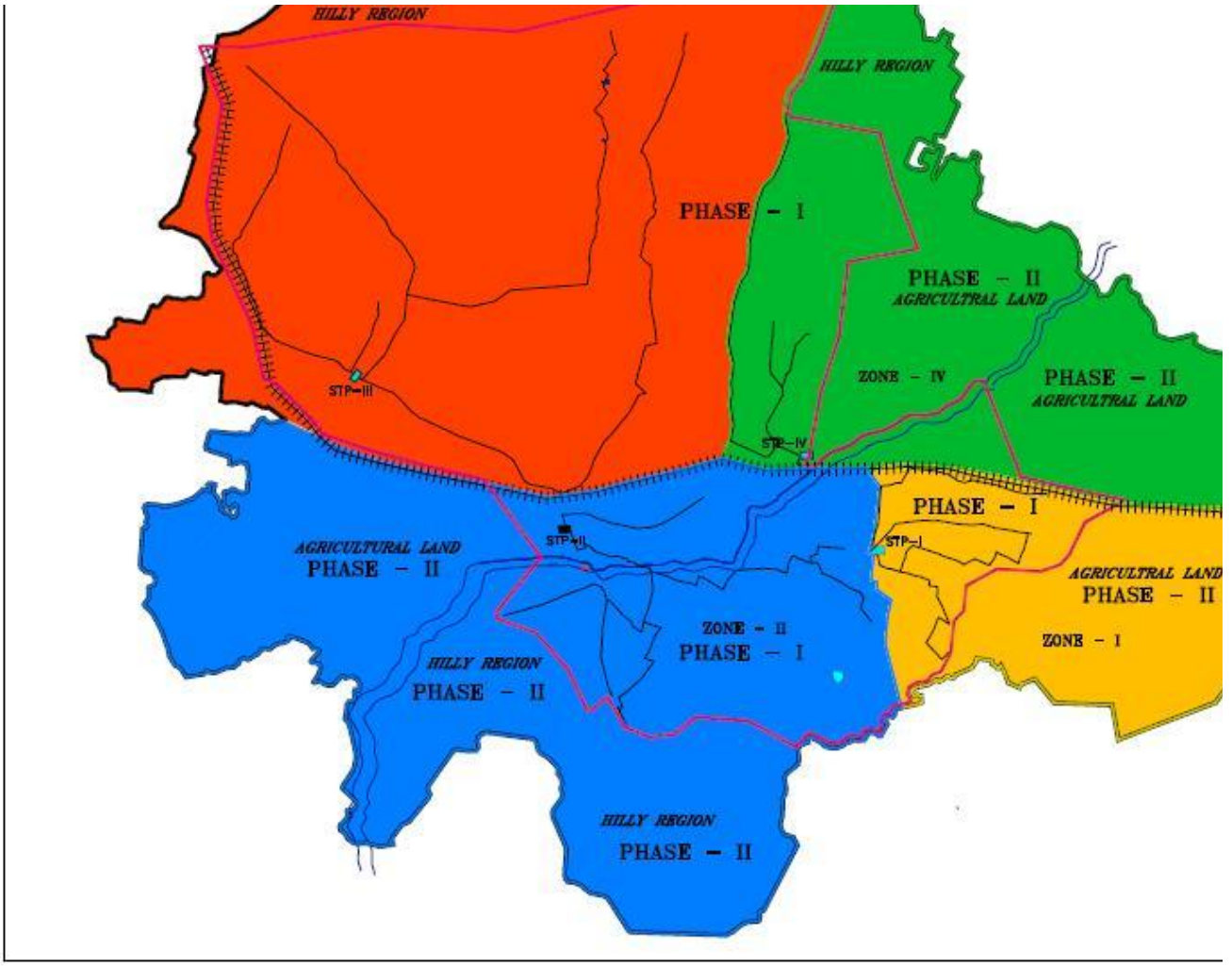


Figure 1.02 – UGSS Scheme of SALEM City

1.3 NEED OF EIA AND EMP STUDY

The project attracts Environment Assessment and Environment Management Plan Study as per TNUDF. The rigor of environmental assessment required to identify and mitigate the impacts largely depends upon the complexities of project activities. TNUDF has categorized the projects in to different categories – E1, E2 and E3 linked to severity of impacts and regulatory requirements. As the project is categorized under the E 1 category, the project is expected to have only moderate environmental issues, which requires Environmental Assessment Study.

E-1 projects are those wherein TNUIFSL foresees major environmental impacts thus necessitating Environmental Assessment Reports (EAR). This project however under the E1 category (which would not require environmental clearance) as classified by the Ministry of Environmental and Forest. Thereby, the project does not attract EIA Notification 2006 and no EIA / EMP needs to be done as per MoEF guidelines.

This project however comes under a World Bank Funded project, which has been categorized under E-1 category by TNUDF and requires an Environmental Impact Assessment Study and Environmental Management Plan. As per the requirement of Tamil Nadu Urban Infrastructure Facilities Services Limited (TNUIFSL), the EIA / EMP study has been conducted.

1.4 REVIEW OF LAWS, LEGISLATIONS AND POLICIES

The environmental law applicable for this project as per TNUIFSL comes under both pollution and natural resources. The key mandatory environmental laws are as listed below in the table

Table – 1.01 List Environmental laws applicable as per TNUFSIL

No.	ENVIRONMENTAL LAWS	Remarks
1.	Water (Prevention and Control of Pollution) Act, 1974 and Tamil Nadu Water (Prevention And Control of Pollution) Rules, 1974	As per TNPCB
2.	The Water (Prevention and Control of Pollution) Cess Act, 1977	As per TNPCB
3.	Environment (Protection) Act, 1986	As per TNPCB
4.	Forest (Conservation) Act, 1980	NA
5.	Wildlife Protection Act, 1972	NA
6.	Coastal Regulation Zone (CRZ) Notification, 1990	NA

As per the Air & Water protection act (Environmental Protection Act 1986) the proponent has to obtain Consent from TNPCB. The Consent to Establish has been issued with Special notes as in Annexure - 4.1. As per the requirement of Tamil Nadu Urban Infrastructure Facilities Services Limited (TNUIFSL) the EIA / EMP study has been conducted. Necessary permission has been obtained from Govt. of Tamil Nadu for construction of Sewage Treatment Plant at the above mentioned site. The land use of the proposed project site is classified as Government Poramboke (Mankuttai Eri) under the control of Commissioner Salem Corporation for the purpose of Salem Corporation Sewerage Scheme Project and change in land use is approved as per the GO No.273 Dt: 7/06/2010 – Annexure – 02.

Table – 1.02 List Approvals & Acts

Clearances	Authority	Remarks
Approval of Land	State Government	As per GO – by Salem Collector
Consent to Establishment	TNPCB	Obtained
Consent to Operate	TNPCB	To apply
Air Act 1981 & TN Air Rules 1983	TNPCB	Obtained
Permission / Land use	PWD/DTCP/SCMC	Obtained GO
Disposal of Treated water into Canal	SCMC	Obtained
Any other permissions required	Government	Nil

1.5 PROJECT PROPOSAL

The project proposes to construct Sewage Treatment Plant for Zone III in Bodinaickenpatti Village to treat the wastewater which has been let into the river through the drain. This project is proposed to divert all the sewage influent from the nearby area of Zone III which will be collected through underground sewerage system to minimize the overflow of sewage during rainy season and to reduce the pollution load in the river. The aerial view of site location is show in Figure – 1.04. The site is surrounded by open land and settlements, the wastewater arising from these settlements are collected through pipelines into the proposed sewage treatment plant for safe disposal.

Figure: 1.04 – Aerial view of STP Site Location

1.6 OBJECTIVES OF EIA – EMP

Environmental Impact Assessment (EIA) has come to serve as an important tool for integrating the objectives of environmental management with the requirement of economic growth and social development. Thus, the purpose of EIA-EMP exercise is to evaluate the beneficial and/or the adverse effects of a proposed development activity on the surrounding environment.

1.7 SCOPE OF EIA

The Scope of EIA and the report covers the following:

- Assessment of existing Environmental status with respect to physical, chemical, biological including terrestrial flora and fauna, loss & other forest products, if any, and identification of impacts on them.

- Assessment of drinking water, ground water, and

- Surface water quality at project and impact of proposed activities on the same
- Assessment of Ambient Air Quality, to stipulate with National Ambient Air Quality standards and impact of the project on Ambient Air Quality of the surrounding.

- Preparation of an Environmental Management Plan (EMP) outlining control strategies for mitigation of adverse impacts, if any.

- Outlining a Post Project Monitoring Plan (PPMP) to ensure that the EMP is achieved.

CHAPTER – II

PROJECT PROFILE

2.1 PREAMBLE

Salem is a Selection grade municipality and the 'District headquarters for Salem district. The town is spread over an area of 94 km^2. It is the largest urban centre in the district and is about 340 km south west of Chennai. Salem is located in the north central part of the state, about 340 kilometres (211 mi) southwest of state capital, Chennai. It is the fifth Municipal Corporation and Urban agglomeration in Tamil Nadu after Chennai, Coimbatore, Madurai and Tiruchirappalli. An Underground sewerage scheme has been formulated for the town and the Collection system works are in progress. It is proposed to provide Sewage Treatment Plants to treat the sewage of the town. It is proposed to convey the sewage to the STP site by means of UGSS. The treated effluents from the Sewage Treatment Plant is proposed to be let into the near by canal which carries the treated water to the Thirumanimutharu river. Salem City Municipal Corporation has under taken the task of Designing, providing, construction, erection and commissioning, start up and performance trial run for 6 months followed by 5 years of O & M of 35.0 MLD capacity Sewage Treatment Plant (STP) with modern technology at Mankuttai, Bodinaickenpatti village in Salem Municipality of Salem district in Tamil Nadu .

Salem City Municipal Corporation has entrusted the work to M/s. Subaya Construction Company limited, Chennai. **M/S. SUBAYA CONSTRUCTION COMPANY LIMITED** entrusted the task of Conducting Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) to M/s. SBS Enviro Concepts, No.604, Navi Mumbai - 01 as a part of statutory clearances before commencement of work.

2.1.1 LOCATION

The site is located in 11°40'4"N 78°7'35"E of Bodinaickenpatti village and its boundary is shown in the Figure – 3.01. The total area is about 2.44 Acres. The STP mainly meets the need of disposing the sewage from the Zone III to avoid drainage problems and keep the area hygienic and to reduce the pollution load in the river. The proposed site is surrounded by settlements and some open areas.

2.1.2 OWNERSHIP

The land is allotted by the Tahsildar, Salem Taluk as per the directions issued by the District Collector Salem in Roc 19813/2009/ES dt. 14.6.2010 in accordance with **G.O.Ms.No/273** Revenue Department dt. 7.06.2010 to Salem Corporation taken over the possession of the land. The signed copy of Possession Certificate is given in the Annexure – 3.

2.2. SCOPE OF WORK

The scope work includes receiving the raw sewage from 1300 mm size RCC pipe line and pumping to various units for treatment. Finally the treated effluent shall be disposed to Odai. The average ground level of the off take point of the STP site is 275.0 M and the sewage invert level of the STP site is 269.44 m are shown in the Figure – 2.01. The treated effluent is disposed through closed conduit pipes for disposal. The layout of the units is shown in the Figure – 2.02.

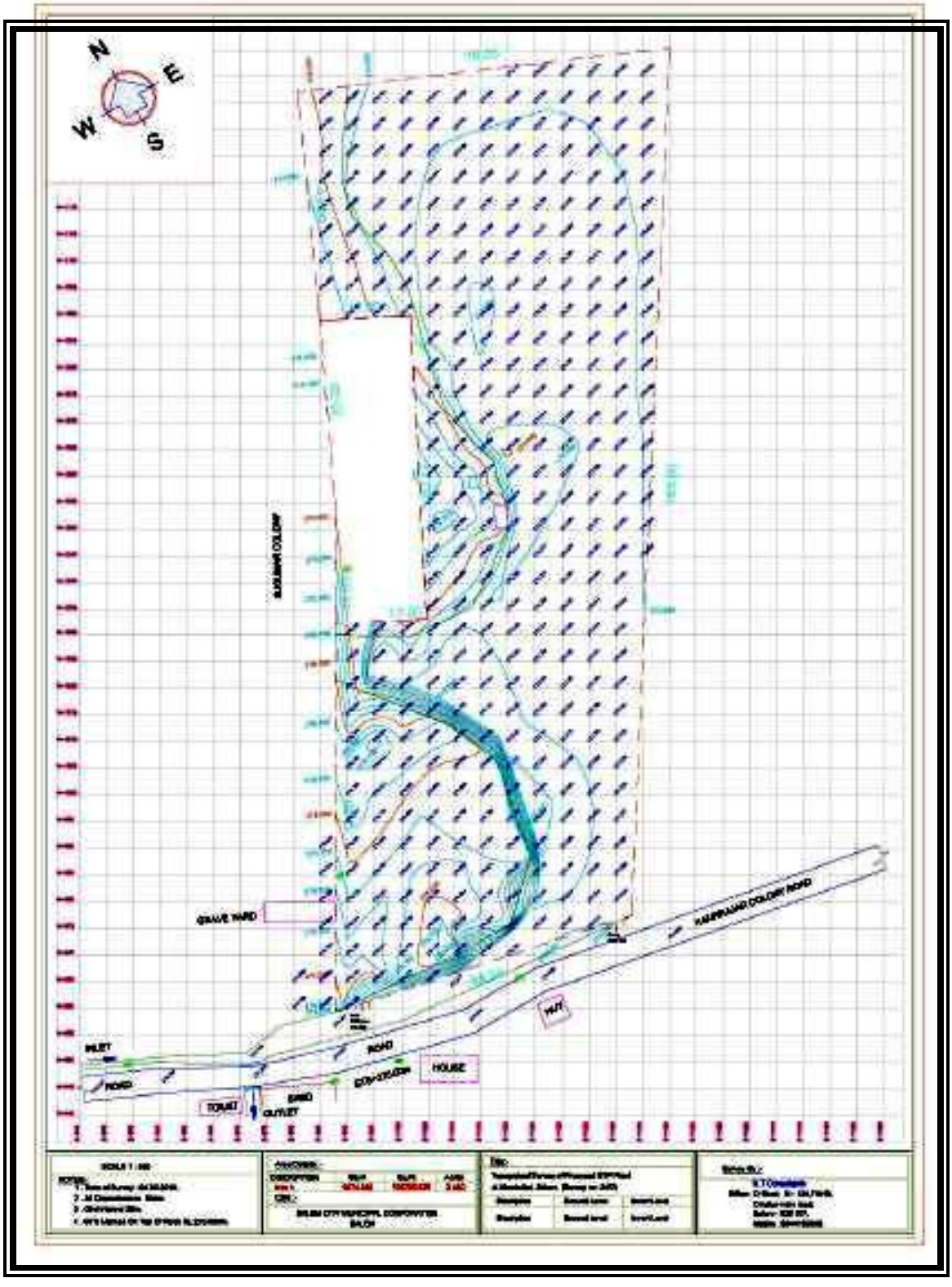


Figure – 2.01 STP Site Contour Plan

2.3 SEWAGE COLLECTION AND DISPOSAL

The sewage will be collected from Zone III through UGSS pipeline towards the Sewage Treatment Plant. The treated sewage from the STP will be disposed to a near by canal which in turn leads to Thirumanimuthra river. The existing canal has adequate cross section and slope to carry the treated sewage. The treated sewage of flow of 35 MLD will be diverted into the canal.

2.4 PROCESS DESCRIPTION AND DESIGN DATA

The treatment technology adopted is Fluidized Aerobic Bio Reactor in line with CPHEEO guidelines and the various process units are furnished here. The basic design parameters of the STP are given in Table 2.1. The hydraulic flow diagram of the Sewage Treatment Plant unit is shown in the Figure – 2.02. The pipelines between tanks are of gravity line and pumping lines as shown in Figure – 2.03.

2.4.1 DESIGN DATA

The Treatment Plant is based on the following Parameters

Sl No	DESCRIPTION	
01	Nature of Wastewater	**SEWAGE**
02	Source	Under ground Sewage generated from Zone-III of Salem City Municipal Corporation.
03	Expected maximum quantity/Day	35.0 MLD
04	Selected Treatment System	Fluidized Aerobic Bio Reactor (FAB)
05	Location	Mankuttai, Salem
06	Owner	Salem City Municipal Corporation
07	Main Contractor	M/s. Subaya Constructions Company Ltd
08	Consultant	M/s. SBS Enviro Concepts

The proposed Sewage Treatment Plant is designed to meet an initial load of **35 MLD** with means for expansion provided for an ultimate capacity of **45 MLD**. Design is also done to meet peak flow conditions in the Sewage Treatment Plant.

Table: 2.01 Raw Sewage Characteristics

Sl. No.	Parameter	Value	Unit
01	pH	6.70	-
02	Bio-Chemical Oxygen Demand	224	mg / lit
03	Chemical Oxygen Demand	436	mg / lit
04	Total Suspended Solids	186	mg / lit
05	Total Kjeldahl Nitrogen (as N)	61	mg / lit
06	Ammonia Nitrogen (as N)	50	mg / lit
07	Total Phosphorous (as PO_4)	5	mg / lit
08	Sulphate	82	mg / lit
09	Fecal Coliform	10^6	MPN / 100 ml
10	Total Coliform	10^7	MPN / 100 ml
11	Chlorides	450	mg / lit
12	Oil & Grease	2	mg / lit

Selected Treatment System: Fluidized Aerobic Bed Process

2.4.2. FLOW CHART OF TREATMENT SYSTEM

CAPACITY: = 35.0 MLD

RECEIVING CHAMBER

↓

COARSE SCREEN

↓

FINE SCREEN

↓

GRIT DETRITER

↓

FLOW CHANNEL

↓

AERATION TANK (FAB I & II)

↓

Sec CLARIFIER TANK

↓

CHLORINE CONTACT TANK

↓

OUT FALL CHAMBER

2.4.3. DESCRIPTION OF THE PROCESS - SEWAGE

2.4.3.1. PRIMARY TREATMENT

- The Raw Sewage through under ground Collection conveyance gets collected in the Collection Well having retention of 10 mints. Considering the Peak flow.
- From the Collection Well the Raw sewage is pumped into the Screening Chamber with the help of Submersible Non Clog Pumps for the removal of Floating particles.
- The outlet of the Screening chamber flows into Detriter tanks for the removal of Sand, Grit etc.
- The outlet of the detriter flows into the aeration tank for further treatment.

2.4.3.2. SECONDARY TREATMENT

- In the aeration tank the air will be supplied through Positive Displacement Air Blower for degradation of organic impurities/pollutants by micro-organisms. The wastewater along with Bio mass will flow by gravity into the Secondary Clarifier tank for Solid-Liquid Separation and re-circulation of solids to the aeration tank.

- The Bio-mass from the bottom of the Secondary Clarifier tank will be transferred by means of an pump to maintain the desired Mixed Liquor Suspended Solids (MLSS) concentration of 6,000 – 8000 mg/l.

- The excess bio mass shall be pumped into Sludge Thickener for thickening the Sludge.

- The thickened Sludge shall be pumped into the Centrifuge for Dewatering.

- Supernatant of the Sludge Thickener is pumped back into the Aeration Tank.

- The supernatant from the Secondary Clarifier tank shall flow by gravity into the Chlorine Contact Tank for Disinfection and disposed though the Out Fall Chamber meeting the standards for disposal.

Table: 2.02 Treated Sewage Characteristics

Sl. No	Parameter	Value	Unit
01	Bio-Chemical Oxygen Demand	Less than 20	mg / lit
02	Chemical Oxygen Demand	Less than 250	mg / lit
03	Total Suspended Solids	Less than 30	mg / lit
04	pH	5.5 – 9	-
05	Oil & Grease	Less than or equal to 5.0	mg / lit
06	Nitrate Nitrogen (as NO3)	Less than 10	mg / lit
07	Ammonia Nitrogen (as N)	Less than 50	mg / lit
			mg / lit
08	Total Phosphorous (as PO4)	Less than 5.0	
09	Total Coliform	Less than 1000 no/ 100 ml	MPN / 100 ml

Table: 2.03 Civil Works Specification

Sl, No	DESCRIPTION	SIZE-meters	MOC	Qty
01	RECEIVING CHAMBER	8.0 x 5.0 x 1.5 SWD	RCC	01
02	COARSE SCREEN	2.0 x 5.0 x 0.60	RCC	02
03	FINE SCREEN	3.0 x 5.0 x 0.60	RCC	02
04	GRIT DETRITER	6.0 x 6.0 x 2.0	RCC	02
05	FLOW CHANNEL	2.0 x 7.0 x 0.45	RCC	01
06	DISTRIBUTION CHAMBER	3.0 x 5.0 x 4.0	RCC	01
07	AERATION TANK-1	30.0 x 7.5 x 5.0	RCC	02
08	AERATION TANK-2	30.0 x 9.5 x 5.0	RCC	02
09	Sec CLARIFIER TANK	Dia 22.5 x 3.00	RCC	02
10	Sec CLARIFIER OUTLET CHAMBER	3.0 x 3.0 x 3.0	RCC	01
11	RETURN SLUDGE SUMP	4.0 X 4.0 X 4.0	RCC	01
12	SLUDGE THICKNER TANK	Dia 14.0 x 3.00	RCC	01
13	BLOWER ROOM	10.0 x 5.0	RCC	01
14	CENTRIFUGE FEED SUMP	4.0 x 4.0 x 4.0	RCC	02
15	CENTRIFUGE HOUSE	12.0 X 5.0	RCC	01
16	CHLORINE CONTACT TANK	30.0 x 6.0 x 4.0	RCC	01
17	CHLORINATER HOUSE	8.0 x 6.0	RCC	01
18	TONNE CONTAINER ROOM	8.0 x 10.0	RCC	01
19	DG SET ROOM	8.0 x 8.0	RCC	01
20	ELECTRICAL PANEL ROOM	6.0 x 10.0	RCC	01
21	TRANSFORMER YARD	8.0 x 8.0	RCC	01
22	OUT FALL CHAMBER	6.0 x 2.0	RCC	01

2.5 DESCRIPTION OF UNITS

2.5.1 INLET CHAMBER (Receiving Chamber)

The raw sewage will be delivered through 1300 mm dia RCC pipe into the Inlet chamber. The function of the Inlet chamber is to reduce the incoming velocity which shall be constructed in RCC M30 concrete. The chamber is provided with coarse screen for screening the coarse particles coming through the inlet pipe which reduces the choking of pump and to ensure smooth running. All internal surfaces shall be finished with 15mm thick smooth cement plaster with water proofing compound. All outside surface above ground level shall be finished with 15mm thick sand faced plaster. The receiving chamber is provided with two numbers working submersible pumps and one no. stand by pumps to pump the raw inlet wastewater to the screen chamber.

2.5.2 COARSE SCREEN

After the Inlet chamber two numbers of coarse screens are provided for removal of floating and oversized material coming with the sewage which shall be constructed in RCC M30 concrete. The sewage from the receiving well is passed through coarse screen to remove large floating material such as plastic bags, sticks, leaves, paper, cloth, rags, gunny bags etc. The removal of floating material is essential because they may clog the sludge pipe line/choke pumps during subsequent pumping in the treatment plant. The screens are provided in an inclined (45 deg for manual screen) to facilitate raking of entangled screenings. In the screening chamber the removal efficiency of major sewage constituents like BOD, COD, SS, P, Organic Nitrogen and NH_3-N will be nil and a small percentage >5% of the Suspended solids will be removed.

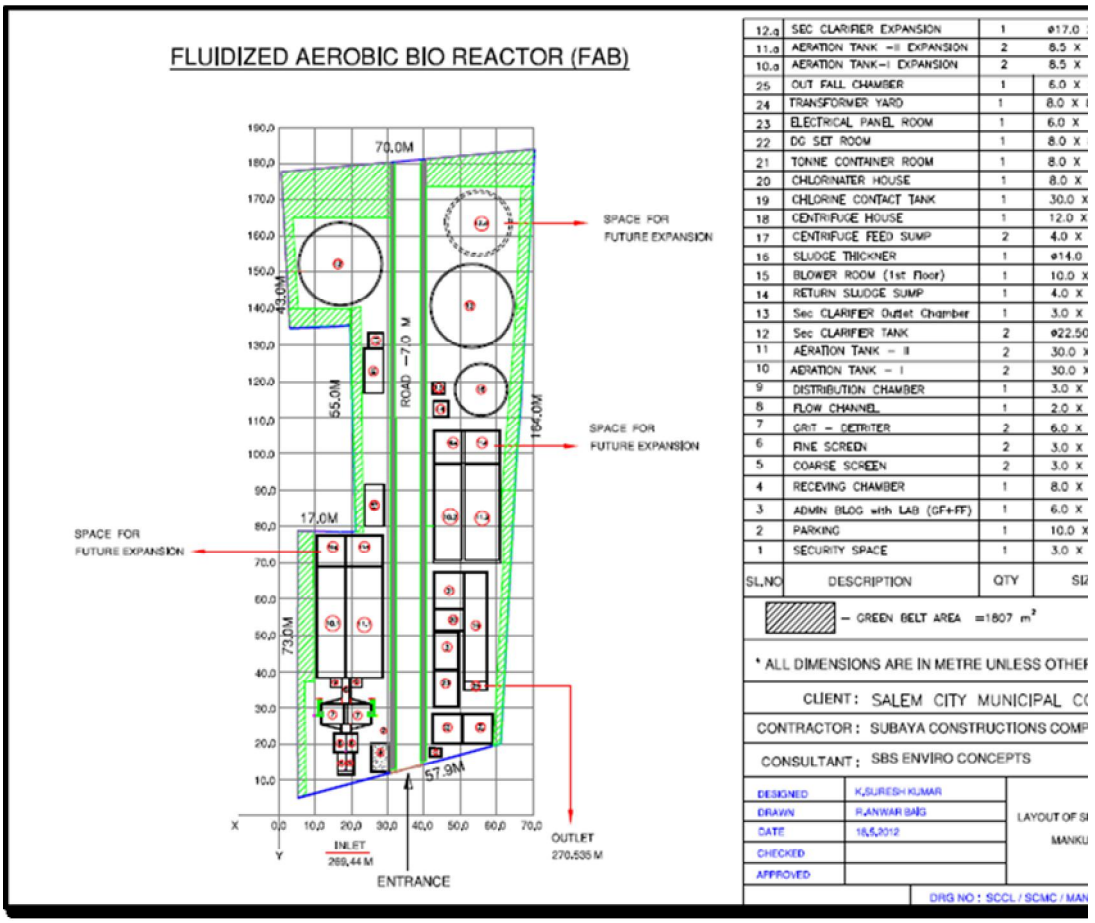


Figure – 2.02 – Sewage Treatment Plant Layout of proposed Site

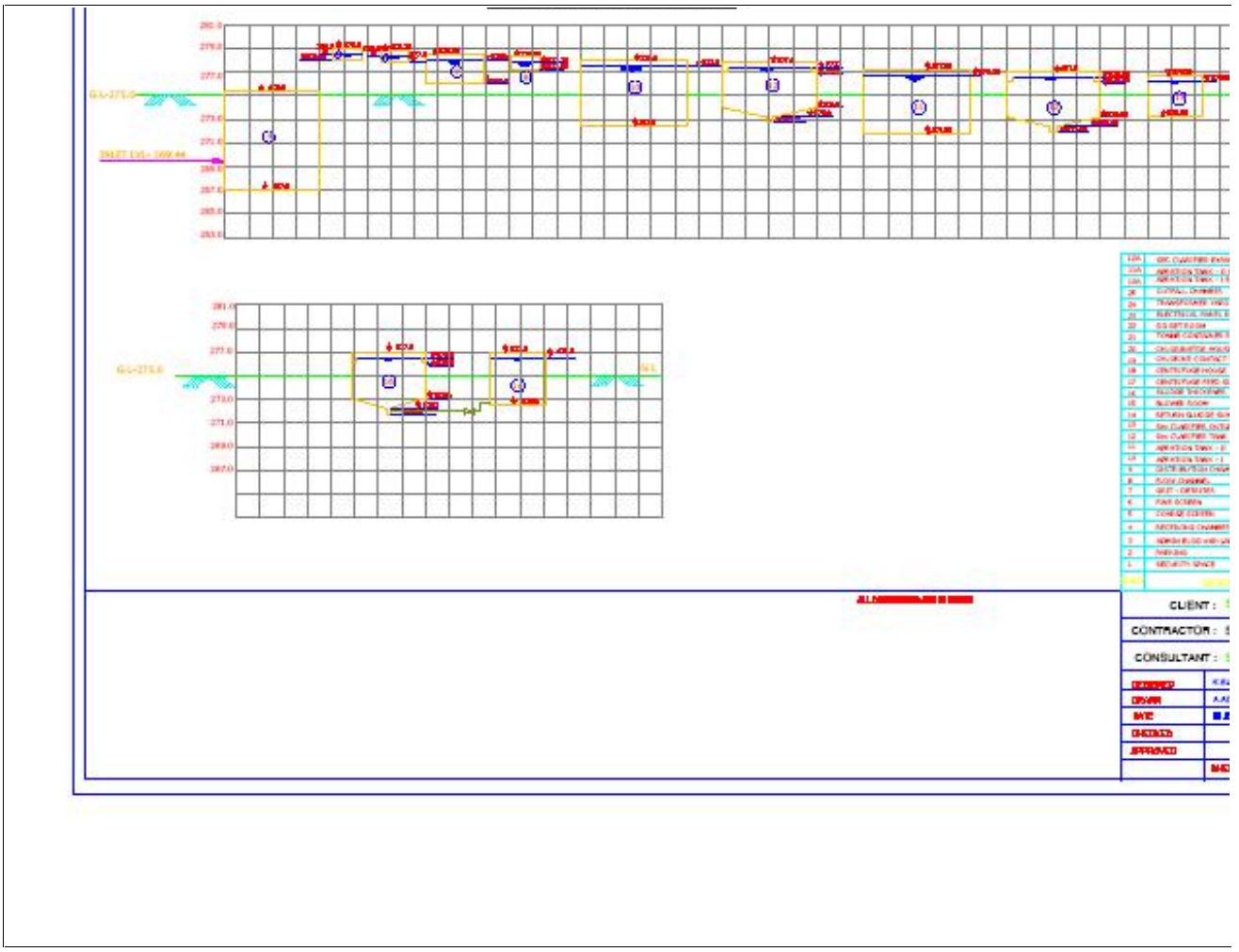


Figure – 2.03 – Hydraulic Flow Diagram of proposed Site

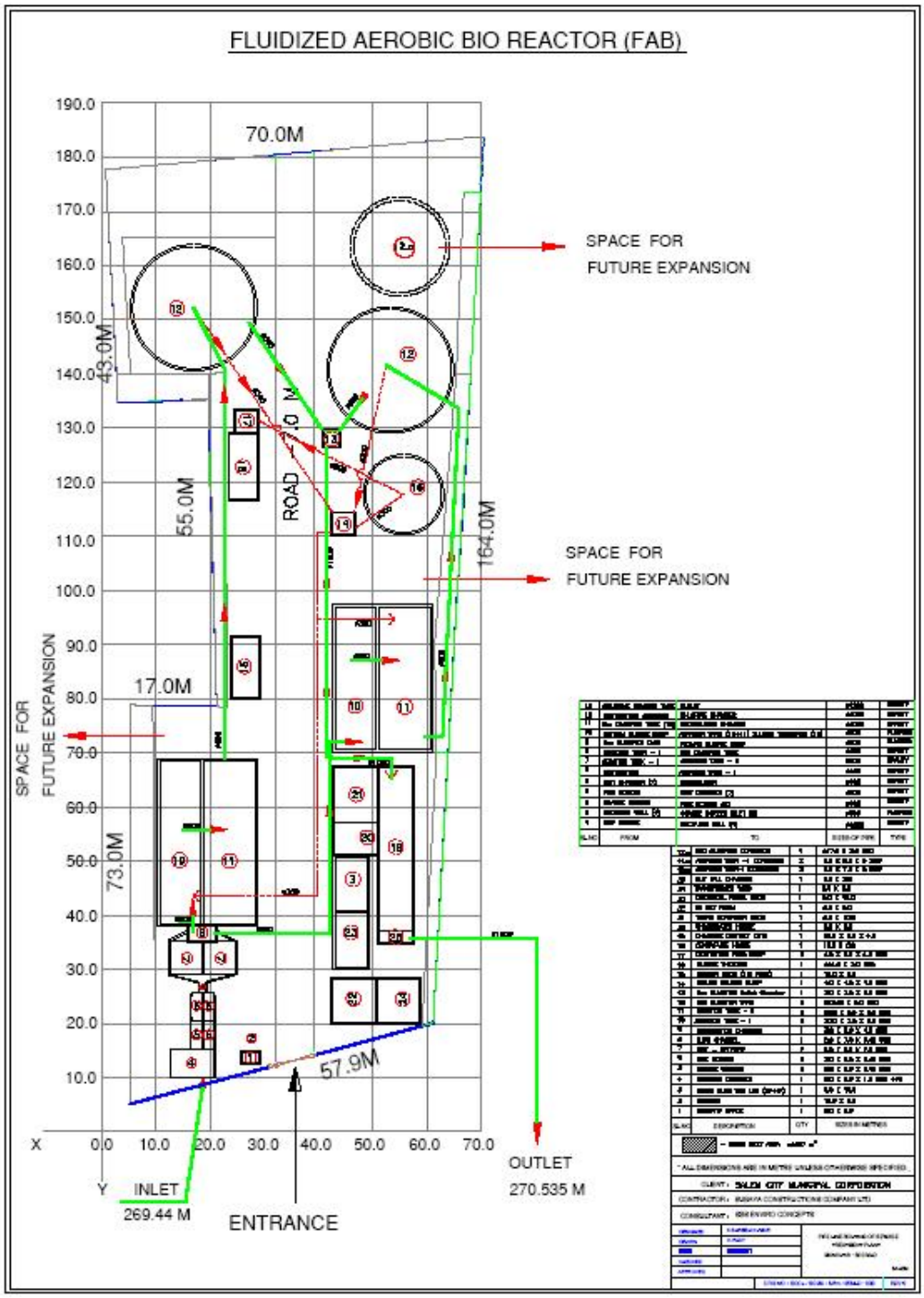


Figure – 2.04 – Pipeline routing of proposed STP

Table 2.04 The basic design parameters as per tender

Name of the Unit	Design Parameter
Receiving Well	Average flow-35 MLD. Peak factor-2.25. Detention Time-60 secs
Coarse screen	Average flow-35 MLD, No. of units-2 Nos. (Mechanical-1 No. Manual-1 No.) Approach velocity at Average flow – 0.3m/sec. Velocity through screen at average flow-0.6m/sec. Velocity through screen at Peak flow-1.2m/sec.
Fine screen	Average flow-35 MLD. No. of units-2 Nos. (Mechanical-1 No. Manual-1 No.). Approach velocity at Average flow – 0.3m/sec. Velocity through screen at average flow – 0.6m/sec. Velocity through screen at Peak flow – 1.2m/sec.
De gritting	Average flow – 35 MLD. No. of units-2 Nos. (Working-1 No., Standby-1 No) Surface Overflow rate – 960m^3/m^2/day Velocity – 0.15m to 0.30m/sec. Detention time – 60secs.
Primary Clarifier – Centrally driven if required.	Average flow – 35 MLD. Peak factor – 2.25. Overflow rate – 35-50m^3/m^2/day (Average flow) 80-120 m^3/m^2/day (Peak flow).
Aeration (with modern technologies)	Average flow – 35 MLD. Peak factor – 2.25. MLSS 3000-4000 mg/lit MLVSS/MLSS – 0.80, F/M=0.3-0.5 kg BOD 5day / Kg MLSS/day HRT – 4-5 Hours. Kg of O_2 required/Kg of BOD removed – 0.8 to 1.0. Returned Sludge – 25-50%.

Secondary Clarifier (if required) (for ASP)	Average flow – 35 MLD Peak factor – 2.25 Overflow rate – 15-25m^3/m^2/day (Avg flow) 40-50 m^3/m^2/day (Peak Flow)
Sludge Handling Units	As per CPHEEO Manual for the relevant units proposed.
Chlorine contact Tank	Dosage – 10ppm. Contact time – 30 minutes. Average flow – 35 MLD
Other Secondary Treatment system	Bidder to specify as per design.

2.5.3 FINE SCREEN

Fine screen channels are provided to remove still finer suspended / floating particles like leaves, paper, weeds etc that is escaping coarse screen. They may escape from primary clarifier and attach themselves to the weir of clarifier thereby preventing uniform overflow. Sometimes the screenings might choke sludge pipe line and also sludge pumps. The screens installed are mechanical whereby the cleaning is done by means of a mechanical lift and removed by using belt conveyor. This prevents any manual handling of the screen and is an added advantage.

2.5.4 GRIT CHAMBER

Sewage after passing through bar screens is taken to a grit chamber where inorganic particulate matter of specific gravity above 2.65 and particle size of above 150 microns are separated and settled. If the grit is allowed to enter in to the aeration tank and it may choke diffusers. The separated grit will be collected and disposed of suitably. The collected grit is removed by means of a mechanical conveyor system which transfers the grit from the grit chamber for disposal. All operations are handled by means of mechanical equipments.

In the grit chamber the removal efficiency of major sewage constituents like BOD, COD, SS, P, Organic Nitrogen and NH_3-N are ranging from 5 – 15 % as mentioned below.

	BOD	COD	SS	p_b	Org-N^c	NH_3-N
Grit chambers	0 – 5	0 – 5	0 – 15	nil	nil	nil

By pass arrangements will be provided from the outlet of grit chamber to divert any flooded water to avoid any disturbance to the operation of the plant during any emergency

2.5.5. AERATION TANK (FAB Reactor)

The sewage after reaching Grit Chamber is taken to aeration tank. Two stages of aeration tanks are proposed for the treatment of the sewage by adopting Fluidized Aerobic Bed Reactor. The system is a carrier in a fluidized bed was fluidized within the state, so that solid (bio film), liquid (waste water), gas (air) between the three-phase full contact with collisions between particles. The bio film surface has continuous growth of micro-organisms in as vigorous stage. The technology allows the bed to maintain a high concentration of biomass; mass transfer efficiency is extremely high so that the matrix degradation of waste water is fast. The hydraulic retention time is short and running load is greater than the general activated sludge by 10 ~ 20-fold and it is resistance to shock load capability.

Fluidized Aerobic Bio-Reactor (FAB), the space and power saving technology is a better alternative to conventional wastewater treatment plants that are large-sized, power intensive and require a lot of monitoring.

FAB offers an effective option to the conventional systems made unviable due to scarcity of space, geographical network of piping and high power. Fluidised Aerobic Bio-Reactor (FAB) as the name indicates consists of floating media of

cylindrical shapes and different sizes. As compared to conventional technologies FAB reactors are compact, energy efficient and user friendly.

BASIC PRINCIPLE

Floc forming organisms form clusters or attach to available surfaces. The FAB media provides a very large surface area (450 m^2 per m^3 volume) which

-- Increases the specific volumetric capacity of activated sludge tanks

-- Controls biomass activity

-- Reduces operating cost

The clarified sewage enters into the FAB reactor, which contains the FAB media. The FAB media significantly increases the surface area for bacterial growth as shown in Fig – 2.06,07. Air is supplied through fine bubble diffusers as shown in Fig 2.05. Bacteria oxidise the organic matter present in the sewage. Oxidised sewage overflows out of the FAB reactor, into the secondary settling tank.

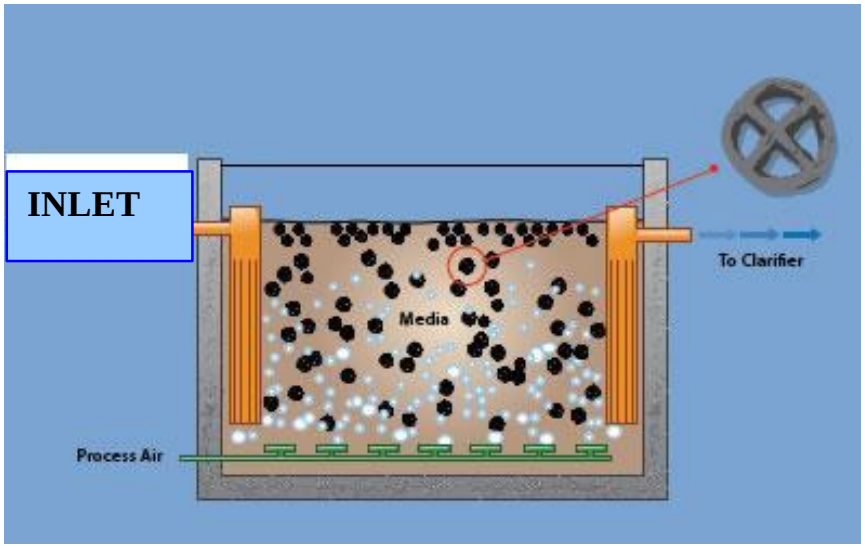


Figure : 2.05 Model of FAB Reactor

Figure: 2.06 FAB media used in the reactor

Figure: 2.07 FAB media with Biomass

Advantages using FAB Reactor:

- Significant reduction in space requirement due to high surface area & loading rate of FAB media.
- Reduced power and operating costs

- FAB Reactor is best suitable when designing a new waste water treatment plant, where operating cost & space are constraints.
- Reduce bulking problems in existing treatment plants. Odourless operations, with a self-regulating system
- High bio-film surface area, with high loading rates
- Reduced power consumption
- Simple to operate, low maintenance requirements
- Non-clogging design, better oxygen transfer efficiency
- Attached growth process, low sludge production, no sludge recycling or monitoring of M.L.S.S.

2.5.6 SECONDARY CLARIFIER

The MLSS / Bacteria / Sludge / Bio mass accompanying sewage after aeration tank will be allowed to settle in the secondary clarifier. The sloped bottom provided inside the clarifier allows the sludge to slide in to the central pit provided at the center. There is a scrapping mechanism which rotates at specified RPM helps in moving the sludge in to the central pit. The sludge settled will be pumped back in to the aeration tank to maintain the required / designed level of MLSS. The excess sludge will be pumped in to the thickener. The parameters of the overflow from the secondary clarifier will meet all the requirements of treated sewage standards with respect to BOD, COD, SS except bacterial count.

In the secondary clarifier the removal efficiency of major sewage constituents like BOD, COD, SS, P, Organic Nitrogen and NH_3-N are ranging from 80 – 95 % as mentioned below.

Removal in %	BOD	COD	SS	p[b]	Org-N[c]	NH_3-N
Sec. Clarifier	65 - 80	60 -80	60 - 85	8 - 12	15 - 50	8 - 15

2.5.7 SLUDGE THICKENER

The sludge from the secondary clarifiers is pumped into sludge thickener. The provision of the thickener is, therefore, a very desirable items as it will considerably reduces the volume of the sludge i.e., increases the solids concentration. The overflow from the thickener goes back to the grit chamber. There are no sludge digesters in the proposed design. As a result there is no requirement for collection of the gas or flare to prevent obnoxious odors. This would not pose an odour nuisance to the surrounding area and the disposal of sludge will be easier.

2.5.8 CHLORINE CONTACT CHAMBER

The treated sewage is disinfected using gas chlorinator all the micro organism that is present in water / waste water is not harmful to human beings. Disinfection is the process meant for removal of those microorganisms, which are harmful (disease causing) to human beings. In disinfection process, the cell wall of micro organism is punctured and deactivation of the enzyme occurs. A minimum contact time of 15 mins is required for the chlorine to destroy the micro organisms in the treated sewage. Free residual chlorine of 0.5 ppm should be maintained after 15 mins to ascertain complete destruction of the micro organisms.

2.6 THE DISPOSAL OF TREATED SLUDGE

The treated sludge is taken to the site which has been identified by Salem Municipal Corporation. The disposal of grits, screened particles will be collected and removed regularly.

The entire system has been designed to treat an immediate flow of 35 MLD while keeping head space for an increase in the population and wastewater of up to a total of 45 MLD. Future expansion spaces for ultimate capacity are provided for aeration tanks and secondary clarifiers as shown in Fig.2.03. The future expansion area for Aeration tank I and Aeration tank II will be 81 m^2 and 64 m^2. An area of 226 m^2 has been provided for Secondary clarifier expansion. All the units will be having access from the internal roads. The tanks in the proposed design will be provided with a walkway platform for both inspection and maintenance purposes.

To ensure smooth operation of the treatment system during emergencies and maintenance, the system is designed with appropriate bypass arrangement for continuous treatment. By pass arrangements will be provided from the outlet of grit chamber to divert any flooded water to avoid any disturbance to the operation of the plant during any emergency. The plant is designed to withstand any low flow of sewage by controlling the raw sewage pumping and the major units are designed with a stand by tank to treat the wastewater to meet the PCB standards

CHAPTER – 3

3.1 DESCRIPTION OF ENVIRONMENT

The present environmental status of the proposed project has been studied covering 1 Km radius and presented in this chapter. It is necessary to know the present quality of the environment with respect to the various aspects considered under impact identification. These factors include air, water, noise, soil, meteorology, land use, socio-economic and demographic pattern. For this purpose, a monitoring schedule was chalked out covering for a month of the year during May '11 to generate baseline data on ambient air quality, quality of ground water / surface water, soil, ambient noise and meteorological parameters like temperature, humidity, wind speed and direction, cloud cover, rainfall etc. The baseline data collection on socio-economic and demographic factors, land use pattern, forests, geology, soil and agriculture resources etc. were carried out thoroughly by field survey and secondary data has been collected from the State Government authorities.

3.1.1 LOCATION

The site is located in 11°40'4"N 78°7'35"E of Bodinaickenpatti village and its boundary is shown in the Figure – 3.01. The total area is about 2.44 Acres. The STP mainly meets the need of disposing the sewage from the Zone III to avoid drainage problems and keep the area hygienic and to reduce the pollution load in the river. The proposed site is surrounded by settlements and some open areas.

3.1.2 LAND CLASSIFICATION

The land allotted to the STP is an abandoned eri. There are up to 8 similar eris in and around Salem. These areas of land have been turned into Eris by diversion of drainage, sewage and storm water through channels into the site. The site

turned into an abandon Eri over time. In addition to this Eri was later encroached by local people for temporary habitation. This has been cleared as per approval given by the government with resettlement for the people settled in the area. The area used for the STP covers a land of 2.44 acres including present and future expansion. The remaining area of the Eri will remain left undisturbed.

3.1.3 OWNERSHIP

The land is allotted by the Tahsildar, Salem Taluk as per the directions issued by the District Collector Salem in Roc 19813/2009/ES dt. 14.6.2010 in accordance with **G.O.Ms.No/273** Revenue Department dt. 7.06.2010 to Salem Corporation taken over the possession of the land. The signed copy of Possession Certificate is given in the Annexure – 3.

3.1.4 NEARBY FEATURES/ENCROACHMENTS

The land surrounding the Eri / site for Sewage Treatment Plant is seen with some settlements and open area. On the south side of the site is having the State Highway and the East & West side of the site is with some settlements. The Northern side of the site is with open area. The abandoned Eri which having a total of approximately 8 acres out of which 2.44 has been allotted for the Sewage Treatment Plant.

3.1.5 DRAINAGE ARRANGEMENTS

The site was earlier an Eri in which drainage, sewage and storm water get stagnant and over flows into the existing canal. There is a drain running nearby the site which collects the water and diverts it into the Thirumanimutharu River. During construction a temporary bund will be created to divert the wastewater reaching the Eri which diverts the water into the canal, that leads to the Thirumanimuthar river.

3.1.6 ENVIRONMENTAL SENSITIVITY (1 KM RADIUS)

Table: 3.01 Environmental Sensitive Areas as per TNUDF

Sl. No	Areas	Name
1	National Park	Nil
2	Sanctuary / Tiger Reserve / Elephant / any other Reserve	Nil
3	Core Zone of Biosphere Reserve	Nil
4	Habitant for Mitigatory Birds	Nil
5	Archaeological Sites i) Notified ii) Others	Nil
6	Major Water Bodies	Nil
7	Defense Installation	Nil
8	Airports	Nil
9	Railway Lines	Salem to Chennai
10	National Highways	NH7 (147 mts. from site) Hosur to Kanyakumari
11	State Highways	SH159 (42 mts. from site) Palpatti to Suramangalam Rd
12	Schools / Colleges	Nil
13	Hospitals/ primary health centers	Nil

Table – 3.02 Distance of areas near by the Site

No.	Structures	Distance from Site boundary
1.	House – 1	25 mts
2.	House – 2	9 mts.
3.	State Highway - 159	42 mts.
4.	National Highway - 7	147 mts.

Figure – 3.01 – Site Map showing nearby area

- House
- State Highway
- National Highway
- Site Boundary
- Distance from site

3.2 AIR ENVIRONMENT

Identification of different pollutants, which are expected to be released into the atmosphere and having significant impact on the neighborhood, is an essential component in impact assessment of the air environment. The ambient air quality status of the study area of 1 km radial distance from the existing project will form the baseline information. The predicted impacts due to the project will be superimposed to find out the net (final) impacts on environment. If the final impacts due to the proposed project are known at the planning stage of the project, a viable Environmental Management Plan (EMP) can be proposed to mitigate and minimize adverse effects on the environment. The design of the ambient air quality-monitoring network in the air quality surveillance programme is based on the following considerations.

- Micro-meteorological conditions of the study area
- Topography of the study area
- Representation of regional background levels
- Influences of the existing sources, if any.

3.2.1 MICROMETEOROLOGY AT SITE

Prevailing micro-meteorological conditions at site regulate the dispersion (and hence dilution) of air pollutants in the atmosphere. Therefore, study of meteorological conditions is an integral part of environmental impact assessment studies. Accordingly, a meteorological data were collected during the month of May ‘11.

• Air temperature (°C)
• Relative humidity (%)
• Wind speed (m/s)
• Wind direction

3.2.2 DATA ANALYSIS

Meteorological data collected during the study reveals the following status.

Wind Direction: Mainly CALM and SW/NW quadrants.

Temperature: Temperature values were ranging from 26.5 °C to 38.6°C.

Relative Humidity: The mean relative humidity value was found to be 78.30%.

Atm. pressure: The mean atmospheric pressure was found to be 747 mm of Hg.

Rainfall: Moderate rainfall recorded during the study period.

3.2.3 EXISTING AMBIENT AIR QUALITY

Methodology for Ambient Air Quality

The ambient air quality monitoring stations were selected to assess the baseline status in and around the proposed site of STP as shown in Figure: 3.02. The locations were selected in the two cordial directions including one direction in down wind direction.

Based on the project activities the parameters chosen for assessment of ambient air quality were Particulate Matter ($PM_{2.5}$), Respirable Particulate Matter (RPM), Sulphur – Di-oxide (SO_2), Nitrogen – Di-oxide NO_2) and Carbon Monoxide (CO). All parameters are sampled and analyzed as per the requirements of Central Pollution Control Board (CPCB).

Table - 3.03 Meteorological Data

DATE	Temperature (°C)		RAINFALL @0830 HRS IST (in mm)	RELATIVE HUMIDITY		WIND				TOTAL AMOUNT OF CLOUD (in okta)
						SPEED		DIRECTION		
	MAX	MIN		0830	1730	0830	1730	0830	1730	
1	39.7	21.6	24.2	75	51	6	0	E	CALM	6
2	34.9	24.9	0.1	73	42	0	0	CALM	CALM	4
3	37.2	26.6	0.0	75	42	0	0	CALM	CALM	4
4	37.0	26.1	0.0	76	49	0	0	CALM	CALM	4
5	38.4	26.9	0.0	70	34	0	0	CALM	CALM	3
6	38.8	22.7	10.6	75	35	0	0	CALM	CALM	2
7	39.3	24.9	0.0	72	42	0	0	CALM	CALM	5
8	38.7	26.7	0.0	74	38	0	0	CALM	CALM	4
9	38.8	27.7	0.0	70	44	0	0	CALM	CALM	6
10	38.0	27.8	0.0	74	44	0	0	CALM	CALM	4
11	39.4	28.6	0.0	72	38	0	0	CALM	CALM	4
12	39.4	28.5	0.0	67	29	0	0	CALM	CALM	6
13	40.3	28.0	0.0	65	38	0	0	CALM	CALM	4
14	40.8	28.3	0.0	63	42	0	0	CALM	CALM	3
15	40.2	27.6	0.0	65	35	0	0	CALM	CALM	6
16	40.5	24.7	0.0	57	38	0	0	CALM	CALM	5
17	37.6	27.8	0.0	62	40	0	0	CALM	CALM	3
18	39.8	25.1	9.2	69	46	0	0	CALM	CALM	6
19	36.0	22.2	10.0	78	83	0	0	CALM	CALM	8
20	29.2	24.1	1.3	78	67	0	0	CALM	CALM	7
21	31.2	23.3	0.4	86	69	0	0	CALM	CALM	8
22	31.0	25.1	0.2	80	48	0	0	CALM	CALM	6
23	37.0	26.0	0.0	66	48	0	0	CALM	CALM	2
24	37.8	25.2	8.0	76	47	0	0	CALM	CALM	5
25	37.7	26.7	0.0	66	43	0	0	CALM	CALM	2
26	38.4	26.9	0.0	71	37	0	0	CALM	CALM	4
27	38.5	26.8	0.0	66	29	0	0	CALM	CALM	2
28	40.1	27.4	0.0	68	40	0	0	CALM	CALM	3
29	39.9	22.0	97.6	82	48	0	0	CALM	CALM	4
30	36.6	26.0	0.0	71	47	0	0	CALM	CALM	3
31	37.7	22.8	6.3	79	56	0	0	CALM	CALM	6

Figure – 3.02 – Site Map showing sampling point

- **Air sampling points**
- **Noise sampling**
- **Water sampling**
- **Soil sampling**

Table - 3.04 Ambient Air Quality Monitoring Stations Distance from Site

S. No.	Location Name	Location Code	Distance in Km
1.	Project Site	M 1	-
2.	Kamarajar Street	M 2	0.060
3.	Kamarajar Street Opp.	M 3	0.171
4.	Near Ammasi Nagar	M 4	0.143
5.	Near NH 7	M 5	0.140
6.	Salem City	M 6	

DATA ANALYSIS

The ambient air quality status is given in Table 3.05 and the locations are mentioned in Table 3.04. The Respirable Particulate Matter (RPM) and Particulate Matter 2.5 ($PM_{2.5}$) values were ranging between 56.8 and 68.9 µg/m^3 and 33.1 and 48.2 µg/m^3 respectively. The SO_2 and NO_2 values are ranging between 17.5 and 23.2 µg/m^3 and 34.3 and 39.9 µg/m^3 respectively. The CO values were found to be 0.2 % v/v in all locations. It seems to be well within the NAAQ limits (Industrial, residential and rural areas).

Table - 3.05 Ambient Air Quality Monitoring Data

Sl. No.	Location Name	Code	UNIT	Values	NAAQs Limits (Industrial, Residential & Rural AREAS)	REFERENCE METHOD
1	**RESPIRABLE PARTICULATE MATTER (RPM)**					
	STP Site-Mankuttai	M 1	µg/m^3	60.5	100	**IS:5182:P4:2005**
	Kamarajar Street	M 2	µg/m^3	61.4	100	
	Kamarajar St. Opp	M 3	µg/m^3	56.8	100	
	Near Ammasi Nagar	M 4	µg/m^3	65.5	100	
	Near NH7	M 5	µg/m^3	68.9	100	
	Salem city	M 6	µg/m^3	58.3	100	
2	**PARTICULATE MATTER 2.5 ($PM_{2.5}$)**					
	STP Site-Mankuttai	M 1	µg/m^3	35.0	60	**EPA 40 CFR:P50:Appex:I**
	Kamarajar Street	M 2	µg/m^3	36.8	60	
	Kamarajar. Opp	M 3	µg/m^3	33.1	60	
	Near Ammasi Nagar	M 4	µg/m^3	37.6	60	
	Near NH7	M 5	µg/m^3	48.2	60	
	Salem city	M 6	µg/m^3	45.6	60	
3	**SULPHUR DI-OXIDE (SO_2)**					
	STP Site-Mankuttai	M 1	µg/m^3	20.5	80	**IS:5182:P2:2001**
	Kamarajar Street	M 2	µg/m^3	20.9	80	
	Kamarajar. Opp	M 3	µg/m^3	18.7	80	
	Near Ammasi Nagar	M 4	µg/m^3	17.5	80	
	Near NH7	M 5	µg/m^3	23.2	80	
	Salem city	M 6	µg/m^3	22.1	80	
4	**NITROGEN - DI-OXIDE (NO_2)**					
	STP Site-Mankuttai	M 1	µg/m^3	38.2	80	**IS:582:P6:2006**
	Kamarajar Street	M 2	µg/m^3	39.9	80	
	Kamarajar. Opp	M 3	µg/m^3	35.0	80	
	Near Ammasi Nagar	M 4	µg/m^3	34.3	80	
	Near NH7	M 5	µg/m^3	38.5	80	
	Salem city	M 6	µg/m^3	38.0	80	
5	**CARBON MONOXIDE (CO)**					
	STP Site-Mankuttai	M 1	% v/v	< 0.2	2	IS:13270 :2003
	Kamarajar Street	M 2	% v/v	< 0.2	2	
	Kamarajar. Opp	M 3	% v/v	< 0.2	2	
	Near Ammasi Nagar	M 4	% v/v	< 0.2	2	
	Near NH7	M 5	% v/v	< 0.2	2	
	Salem city	M 6	% v/v	< 0.2	2	

3.3 NOISE ENVIRONMENT

3.3.1 Methodology

Noise levels were monitored at five locations within and outside the project premises. Noise readings were taken for day time.

3.3.2 Data Analysis

The day time Leq Noise levels were ranging from 58.8 dB (A) to 69.7 dB (A). It is observed that noise levels varied at different sampling stations. The noise levels are found to be higher than the prescribed limits TNPCB (residential) but within the limits for an industrial area as in the Table – 3.06. The proposed treatment system will not contribute to any increase in the noise level being a sewage treatment plant thereby not bringing any significant increase in the noise level.

Table - 3.06 Noise level Status

Sl. No.	LOCATIONS	Code	UNIT	DAY TIME		TNPCB Standards		Ref. method
				Min	Max	Indu.	Resi.	
1	STP Site-Mankuttai	M 1	dB(A)	65.7	68.3	75	55	Instruments Manual
2	Kamarajar Street	M 2	dB(A)	59.8	63.7	75	55	Instruments Manual
3	Kamarajar. Opp	M 3	dB(A)	58.8	61.7	75	55	Instruments Manual
4	Outside Of site	M 5	dB(A)	68.1	69.7	75	55	Instruments Manual
5	Salem city	M 6	dB(A)	65.1	65.9	75	55	Instruments Manual

3.4 WATER ENVIRONMENT

The site itself an Eri which collects the entire storm and drain water from the nearby area and diverts it into the canal, which leads to the Thirumanimutharu River. The major water bodies are not seen nearby the survey area is Pallapatti Lake, which is seen in the upstream. The various water bodies and canals around the survey area are listed in the Table: 3.07 with the distance from the site.

Table: 3.07 Distance of Lakes/Water bodies from the proposed Site

Sl No.	LAKES / WATER BODY	Distance From Site
01	Kannankurichi Lake	5.7 Km
02	Pallapatti Lake	0.66 Km
03	Selatthampatti Lake	2.7 Km
04	Thirumanimutharu River	1.0 Km

The Mankuttai Eri is an abandoned site and the site partially holds the wastewater generated in the nearby area and overflows into the Odai. The area was partially covered with waste landfills and debris. At present the Odai travels for a distance of 2 - 3 kms from the site to reach the Thirumanimuthar River.

The upstream of the river is located in between open fields and some residential areas. The upstream of the river is located near hills of Yercaud and travels around 21 kms to reach the site. During the flow it collects the nearby overflow flow from the water bodies located in its path. The treated water is disposed within the limits as per the TNPCB standards and thus the effect of the wastewater on the water bodies is minimized. The treated water flows into the canal and reaches the Thirumanimutharu River, where the water quality of the river shows as per surface water standards and below the limit. The disposal of treated water into the river doesn't contribute any pollution load to the present

quality of the river water. The disposal of treated water will be strictly monitored to maintain the standards for disposal into the canal.

The downstream of the river passes through the city around 5 kms, with mainly open spaces, buildings and residential buildings. The neighbouring lakes merge with the Thirumanimutharu on its pathway. The Thirumanimutharu river flow a distance of around 65 kms to reach the major river Cauvery. The areas surrounded are mainly open area and also some cultivation fields. The developments are seen mainly in the downstream.

The current usage of land in the Upstream and Downstream falls in the urbanization area, where the agricultural fields are developed into either commercial or domestic usage. There are no agricultural lands dependent on this, the upstream and downstream are not used for any agricultural purpose nor has it been used for any drinking purpose, as the agricultural land has been converted into developed area. There are no dependent on this river upstream and down stream in the area. The current use of the upstream and down stream is to carry wastewater and storm drain water into the river.

The survey was carried out in ground water as there is no nearby surface water other than the sewage which overflows from the drain. The location of ground water sampling represents the baseline condition of water in the area. A total of 3 Nos. ground water samples were collected as there is no major water bodies in the study area, which will be affected by the proposed project. The ground water samples mainly collected from the bore wells located in and around the site have been analyzed as per standard methods.

3.4.1 METHODOLOGY

Four Nos. of water samples were collected during the study period for Physico-chemical and Bacteriological parameters after taking suitable precautions and analysed as per Standard methods. Samples were collected for Chemical analysis as per procedure outlined in IS: 3025:P1:2002. Sterilized bottles were used for collection of water samples for bacteriological analysis, stored in icebox and transported to the laboratory for the analysis. Parameters like pH, Temperature, DO etc. were measured in the field while collecting the samples. MPN index of coliforms were determined in the laboratory as per Standard methods.

3.4.2 GROUND WATER

At all locations, pH values were in the range of 7.50 – 8.1 with agreeable colour, taste and odour. Chloride and Sulphate values were in the range of 10 – 296 mg/l and 4.5 – 173 mg/l respectively. Hardness values were found to be in the range of 26 – 681 mg/l. Iron value was found to be within permissible limit ranging from 0.03 – 0.1 mg/l. The maximum coliforms were found to be 8 MPN/100 ml. The Escherichia Coli found to be mostly absent and present in only one location ranging to 2.0 MPN/100 ml. It was seen that the sample taken at the site (M1) showed all water parameters having levels well above the limit specified (IS- 10500). In addition it was seen that E. coli limits were above the required standards for the sites M1 and M2. (IS – 10500)

Table - 3.08 Water Quality Data

Sl. No.	PARAMETERS	UNIT	M 1	M2	M3	M4	TEST
1	Turbidity	NTU	1.1	0.6	1.1	0.5	IS:302
2	pH	-	8.1	7.7	7.9	7.5	IS:302
3	Total Dissolved Solids	mg/l	1560	42	192	350	IS:302
4	Electrical Conductivity	µS/cm	2410	64	214	310	IS:302
5	Chlorides (as Cl)	mg/l	296	10	160	190	IS:302
6	Total Suspended Solids	mg/l	<1	<1	<1	<1	IS:302
7	Sulphates (as SO_4^{-2})	mg/l	173	4.5	154.5	168	IS:302
8	Calcium (as Ca)	mg/l	79	6.0	28.0	55.0	IS:302
9	Magnesium (as Mg)	mg/l	118	2.7	25.0	12.0	IS:302
10	Total Hardness (as $CaCO_3$)	mg/l	681	26	150	110	IS:302
11	Phenolphthalein Alkalinity (as $CaCO_3$)	mg/l	77	Nil	Nil	Nil	IS:302
12	Total Alkalinity (as $CaCO_3$)	mg/l	803	8.6	78	110	IS:302
13	Iron (as Fe)	mg/l	0.09	0.03	0.05	0.11	IS:302
	Biological Parameters						
14	Coliform Bacteria (MPN / 100 ml)	MPN	2.0	8.0	5.0	3.0	IS:1622:19
15	Escherichia coli (MPN / 100 ml)	MPN	< 2	2.0	Absent	Absent	IS:1622:19

3.5 SOIL ENVIRONMENT

In order to assess the baseline status of soil quality of the project site and neighborhood, four sampling locations were selected. At each location, samples were collected using augers and analyzed for physical, micro and macro nutrient parameters.

At all locations, pH ranges from 7.80 to 9.40. Nitrogen, Phosphorus and Potassium are found to be in the range of 85 – 110 Kg/Ac, 28 – 35 Kg/Ac and 41 – 74 Kg/Ac respectively. Iron and Manganese was found to be in the range of 1.4 – 1.9 mg/l and 0.6 – 1.02 mg/l. Texture Class was found to be Sandy Loam.

Table - 3.09 Soil Quality Data

S. No.	PARAMETERS	UNIT	M 1	M 2	M 3	M 4
1	Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam
2	Lime status		Nil	Nil	Nil	Nil
3	Electrical conductivity	mmhos/cm	0.059	0.042	0.072	0.051
4	pH Soil Reaction	No.	9.4	7.8	8.5	9.0
MACRO NUTRIENTS: (Kg/Ac)						
5	Nitrogen	Kg/Ac	88	85	110	91
6	Phosphorus	Kg/Ac	33	35	28	30
7	Potassium	Kg/Ac	74	55	41	60
MACRO NUTRIENTS: (mg/l)						
8	Iron	mg/l	1.5	1.8	1.4	1.9
9	Manganese	mg/l	1.0	0.9	0.6	1.02
10	Zinc	mg/l	1.6	1.3	1.2	1.8
11	Copper	mg/l	1.5	1.2	0.9	1.7

M 1 - Project Site
M 2 - Kamarajar Street
M 3 - Kamarajar Street Opposite
M 4 - State Bank Colony

3.6 LAND ENVIRONMENT

The land use of the proposed project site is classified as Eri and change into land use application was obtained and the documentary proof for the same is enclosed in **Annexure 3**. As per the basic information the land use pattern of the area in around project site are mostly settlements and open areas.

3.6 SOCIO ECONOMIC STUDY

RECONNAISSANCE SURVEY

Environment is a whole complex of physical, social, economic, cultural and aesthetic dimensions which affects individual communities and ultimately determines their forms, characters, relationships and survivals. As such it is imperative to integrate the components of socio-economic environment in Impact Assessment Study related to environmental conservation, protection and management.

The social environment refers to demographic structure of the area incorporating population dynamics, infrastructure resource base and health status of the community, while economic environment refers to land utilization pattern, land values, employment generation, industrial development and sustainability of the project in financial term. The aesthetic environment refers to scenic value of the area, tourist attraction, forest, and wildlife, historic and cultural monuments.

Baseline Socio-Economic Environment Data

The area within 1 km radius of the site falls mostly in Salem taluk. The abstract of village-wise description of demographic features is given in Table – 3.10. The population of the area according to the 2001 census was 6, 96,760, out of which 3, 53,933 (50.79%) were males and 3, 42,827 (49.20%) were females.

Table - 3.10 Abstract of Village wise description of Demographic profile

Particulars	Total
Total Population	6, 96,760
Male Population (% with total population)	3, 53,933 (50.79%)
Female Population (% with total population)	3, 42,827 (49.20%)
No. of Households	162676

Source: Census of India 2001

Social Structure

Majority of the people in the study area belong to Hindu and Muslim religion. The study area also contains Scheduled Castes (SC) and Scheduled Tribes (ST). The distribution of population of socially weaker sections in the study area is shown in Table – 3.11.

Table - 3.11 Distribution of Population by Social Structure

Category	Total
Total Population	6, 96,760
Scheduled Castes	76653
% to total population	11%
Scheduled Tribes	1345
% to total population	0.19%
Total SC and ST	77998
% to total population	11.19 %

Among the total population, 11% belonged to the scheduled castes (SC) and scheduled tribes 0.19% (ST)

Literacy Levels

The distribution of literates and literacy rates in the study area are given in the Table – 3.12 below

Table - 3.12 Literacy Level

Particulars	Total
Total Population	6, 96,760
Male population	1,25,634
Male literates	82,910
Female population	1,21,968
Female literates	67,943
Total literates	1,50853
% of study area literates to total population	60.92%
Male literacy rate	65.99 %
Female literacy rate	55.70%

Source: Census of India 2001

The study area experiences a moderate literacy rate of 60.92 %. The male literacy (i.e.) the percentage of literate males to the total males of the study area is observed as 65.99% while female literacy rate, which is an important indicator for social change, is observed as 55.70 % in the study area.

OCCUPATIONAL STRUCTURE

The occupational structure of the study area is studied with reference to main workers, marginal workers and non-workers. The main workers include 10 categories of workers defined by the Census Department consisting of cultivators, agricultural laborers, those engaged in live-stock, forestry, fishing etc. mining and quarrying; manufacturing, processing and repairs in household industry; and other than household industry, construction, trade & commerce, transport & communication and other services. The marginal workers are those engaged in some work for a period of less than six months during the reference year prior to the census survey. The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beggars, vagrants etc.; institutional inmates or all other non-workers who do not fall under the above categories. The occupational structure of the study area is shown in Table – 3.13

Table - 3.13 Occupational Structure of Study Area

Occupation	Total	
	No.	% to population
Total Workers	1,19,220	48.5
Cultivators	28,015	23.50
Agricultural laborers	42,323	35.50
Household industries laborers	3,098	2.60
Others	45780	38.40
Total main workers	77,499	31.30
Marginal workers	40,111	16.20
Non-workers	1,28,382	52.50
Total population	2,47,602	-

Source: Census of India 2001

The occupational pattern in the study area shows that majority (52.50%) of the population in the villages belongs to the non-workers category, 16.20% is marginal workers, and the remaining 31.30% are main workers. About 35.5% of the workers are engaged in agricultural labour (Category II), and about 23.50% are cultivators (Category I). Thus more than three fourths of the population in the region is engaged in agriculture, which is the main occupation in the area.

CHAPTER – 4

PREDICTION AND EVALUATION OF IMPACTS

4.1 IDENTIFICATION OF IMPACTS

Identification of impacts is an important step in the Environmental Impact Assessment process. The major element involved in the process of environmental impact assessment is identification of impacts as it leads to other elements such as quantification and evaluation of impacts. Although, a number of impacts have been identified while describing the existing environmental status, it is necessary at this stage to identify the critical impacts that are likely to occur due to the proposed activity for various components of environment. The adaptation of “Network Method” which involves understanding of cause condition effect relationship between an activity and environmental parameters for identification of impacts has been found most suitable. The detailed list of activities and actions described earlier in this report has been taken into consideration for generation of cause condition effect networks.

This type of method has been basically advantageous in recognizing the seriousness of impacts that would trigger by the proposed activities. The idea was to account for the project activity and identify the types of impacts, which would initially occur. The next was to select each impact and identify the secondary and tertiary impact, which induced as a result. This process was repeated until all possible impacts were identified.

4.2 PREDICTION OF IMPACTS

Many scientific techniques and methodologies are available to predict impacts on physico-ecological and socio-economic environment. The expected worst probable impact derived by predictive models using the design parameters of the proposed project have to be super imposed over the existing (pre-project) status of various components of environment to find out the final (post-project) status of the environment surrounding the project site. The knowledge about the final impacts of any proposed project at the planning stage helps the decision makers in identification and implementation of proper control measures, if necessary, during the execution of the project or preserves the environmental quality.

The proposed site is falling in Zone III of Bodinaickmpettai Village to treat the wastewater which has been let into the river through the drain. This project is proposed to divert all the sewage influent from the nearby area of Zone which will be collected through underground sewerage system to minimize the overflow of sewage during rainy season and to reduce the pollution load in the river. The site falls under Eri which has been abandoned by the authorities. The site is devoid of any water bodies, expect our site which was previously an Eri, which collects the entire storm and sewage. The water consisting of sewage and storm water from the nearby area which flows into the Odai located adjacent to the Eri and reaches the Thirumanimuthar river.

The sampling locations are identified on the basis of prediction of impact due to the flow of treated water and to analysis the present status of the environment nearby the site.

4.3 AIR ENVIRONMENT

As the existing air quality measured during the season reveals the air quality is well within the limit and no new source will be added due to the proposed activity, the application of mathematical models for prediction was not felt necessary. The gaseous emission from the construction equipments will be minimal and occur only during the construction period. The impact is insignificant.

The base line status of the air quality suggests existence of a pristine environment. The proposed facility will only provide STP to treat the waste water generated in Zone III of Salem town. The incremental rise of these pollutants over baseline level will be less than 5µg/m3 that too for a very short period during construction activities, which is unlikely to have any negative impact on surrounding environment. The transportation activities will not be increased as the sewerage collection and disposal system is planned as per underground distribution system through pipelines.

The sludge generated will not be stored in the plant site and same will be disposed to the municipal solid waste composting yard. Any sewage treatment plant will have odour nuisance only when the sewage become septic. Adequate care will be taken for proper pumping of raw sewage with out allowing stagnation to avoid odour nuisance. Also once sewage enters in the aeration system there will be no odour nuisance. In the aeration tank, the air will be supplied through blower to maintain required MLSS and continuous operation of blower is maintained to avoid odour nuisance.

The area within the radius of 100 mts. from the proposed site will have no further developmental activities as prescribed by TNPCB and the same has been obtained. Apart from above a green belt around the entire site will be developed to keep the odor nuisance minimum.

Apart from this, the grit collected in the grit chamber will be regularly removed and all pumps will be set with stand by pumps to avoid the halting of the STP which can cause odor. In case of power failure, generator will be operated, thereby preventing any stagnation of water and continuous operation of the STP.

4.4 NOISE ENVIRONMENT

The impact of noise depends mainly on the characteristics of the noise generating sources, topography and atmospheric conditions. There is no anthropogenic noise source. The noise generated due to construction equipments may lead to marginal rise by 10 dB. The total manpower used for the construction activities will be less than 50 and earmuffs will be provided for all the workers and no noise impact is anticipated to the human health. There will not be any increase in noise level thus the noise impact will be very minimal and restricted to the site of work only. The operational phase of the STP will have minimum noise generating equipment and so the impact will be insignificant. The only source of noise will be from the stand by DG set and pumps. The DG set will be kept in the room with acoustic enclosures. The procurement of DG set will be done in such a way that the noise level generated within the prescribed limit and assurance will be obtained from the manufacturer. The DG set will be operated only during the power failure and personal protective equipments will be provided to the employees working close to the DG sets. Periodic maintenance of the DG sets will be carried out. The pump sets will be mostly submersible. Any other pumps will be placed in enclosures with tight foundations and vibrations and noise will be controlled at the source. Periodical maintenance of mechanical equipments will be done for smooth running of equipments to avoid noise generation and energy loss.

4.5 WATER ENVIRONMENT

The proposed facility is to treat the sewage generated. The treated sewage from the STP will be disposed through a closed conduit pipe in to the nearby canal which in turn leads to Thirumanimuthara River. The existing drain already at the site will be diverted via the edge of the site to the Mankuttai eri. The drain has adequate cross section and slope to carry the treated sewage. There are no water bodies or canals that would be affected by the construction of this site. The most critical period is during rainy season and the canal has been built, considering the flow during rainy season. No ground water will be used for the construction or operation of the project. There will be only 12 to 15 nos. staff during the operational period and the requirement is minimal. For the operation and maintenance of the STP, it will be run in 2 shifts with the following employees.

Table: 4.01 List of Employee during Operation Phase

Sl. No.	DESCRIPTION	Nos.
01	PLANT MANAGER	1
02	PLANT OPERATOR	3
03	LAB CHEMIST	1
04	LAB ASSISTANT	1
05	HELPER/WATCHMAN	3
06	GARDENER	1
07	ELECTRICIAN	1

The wastewater generated from the administration buildings and other buildings in the site will be collected in a tank during the operational phase and will be routed into the receiving chamber of the Sewage Treatment Plant for further treatment and disposal.

The tanks for the Sewage treatment plant are constructed with M 30 concrete and will be leak proof with water tightness according to the CPHEEO standards. No seepage of wastewater will be allowed as the structure will be designed to withstand the external soil, water and seismic pressure and load on it.

The survey was carried out in ground water as there is no surface water other than the sewage which overflows from the drain. The location of ground water sampling represents the baseline condition of water in the area. A total of 3 Nos. ground water samples were collected as there is no major water bodies in the study area, which will be affected by the proposed project. The ground water samples mainly collected from the bore wells located in and around the site have been analyzed as per standard methods.

4.6 BIOLOGICAL ENVIRONMENT

As such there will be no significant impact on terrestrial ecology due to the project activity. The proposed site is an abandoned Eri and no cutting of trees is involved for clearing of site. The green belt development as a part of the proposed activity will have beneficial impact. The aquatic flora and fauna of the receiving body will not have any impact as the treated sewage quality will meet the prescribed standards.

4.7 SOIL ENVIRONMENT

The soil environment seems to be less effecting due to the disposal of treated sewage into the canal. For the construction of the civil structures the geo technical survey has been done at four points. The soil conditions at this site found thro rotary drilling is non uniform deposit of Soft Disintegrated Rock up to 2.00 m from existing ground level. The bore hole was terminated in the soft rock layer at 6.0m in location number 1 and 7.50m in location 4. In the bore hole locations 2 and 3 soil conditions are highly Organic Peat soil of 2.50m,

2.20m depth followed by Soft Disintegrated Rock up to 3.50m, 4.00m respectively from existing ground level. The bore hole was terminated in the soft rock layer at 10.50m. The detailed Soil Test Report is given in Annexure - 07

4.8 SOCIO-ECONOMICS

On the socio-economic front the proposed activities would bring significant positive impacts in the terms of:

1. Better housing and sanitation facilities for the local residents of the municipality.
2. The availability of water for down stream users like cultivation and other allied activities will be positive impact.
3. Better employment opportunities. Ultimately better living standards

Thus no negative impact to the socio-economic segment could be viewed.

4.9 EVALUATION OF IMPACTS

4.9.1 ENVIRONMENTAL POLLUTION

As the existing air quality measured during the season reveals the air quality is well within the limit and no new source will be added due to the proposed activity, the application of mathematical models for prediction was not felt necessary. The gaseous emission from the construction equipments will be minimal and occur only during the construction period. The impact is insignificant. There will not be any increase in noise level thus the noise impact will be very minimal and restricted to the site of work only. The operational phase of the STP will not involve any noise generating equipment and so the impact is insignificant. The proposed facility is to treat the sewage generated. The treated sewage characteristics will meet all the statutory norms prescribed according to the receiving body.

4.9.2 ECOLOGY

As such there will be no significant impact on terrestrial ecology due to the project activity. The proposed site is barren land and no cutting of trees is involved for clearing of site.

4.9.3 AESTHETIC ENVIRONMENT

The topographic character and diversity of vegetation will improve because of a well-planned project. The plantation of trees in and around the area would enhance diversity of vegetation. The visual quality of air and water may not change due to proper in-plant control measures changes in aesthetics category. The odour released by the proposed activity will be minimal due to pumping of raw sewage directly via the underground sewage system currently under construction thereby avoiding septic conditions.

4.9.4 HUMAN INTEREST

Taking into account the existing social infrastructure and their development after implementation of the project, there will be substantial positive impact on almost all parameters considered; It may be due to better job opportunities and better hygienic condition by treatment system provided.

FIG 4.1 IMPACT NETWORK FOR AIR ENVIRONMENT

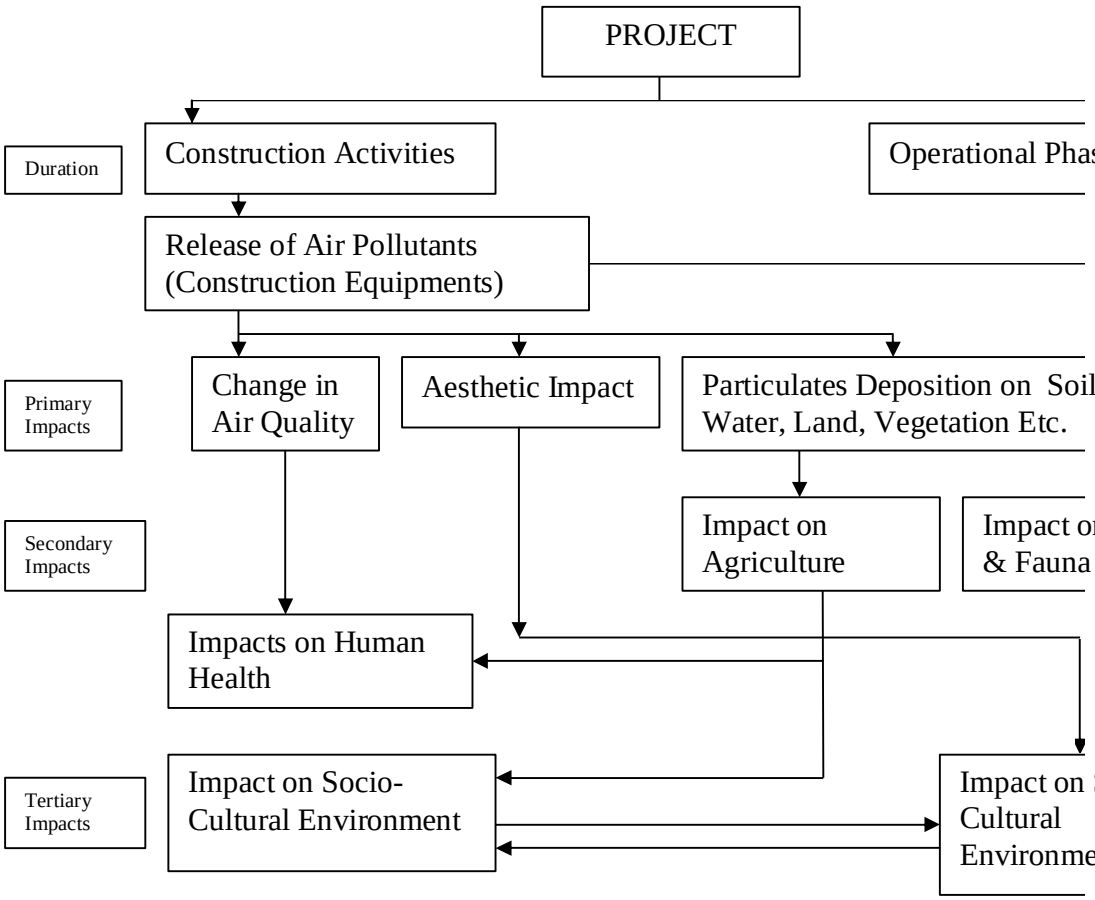


FIG. 4.2 IMPACT NETWORK FOR NOISE ENVIRONMENT

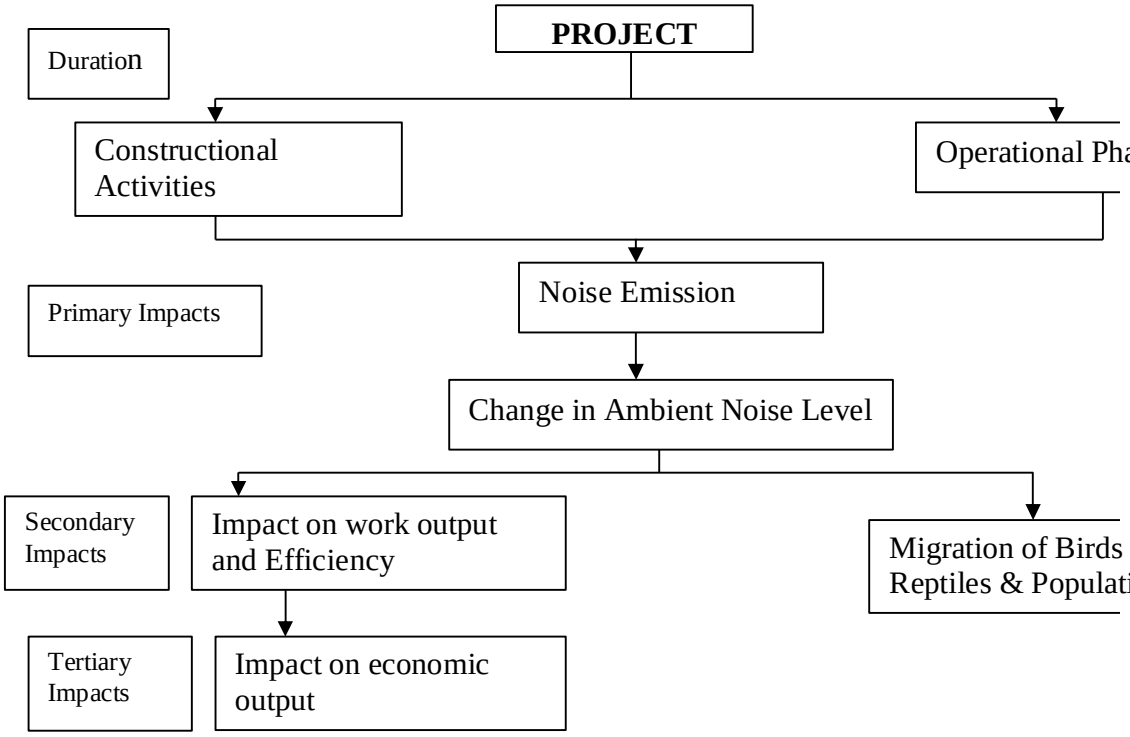


FIG.4.3 IMPACT NETWORK FOR MICRO FLORA & FAUNA

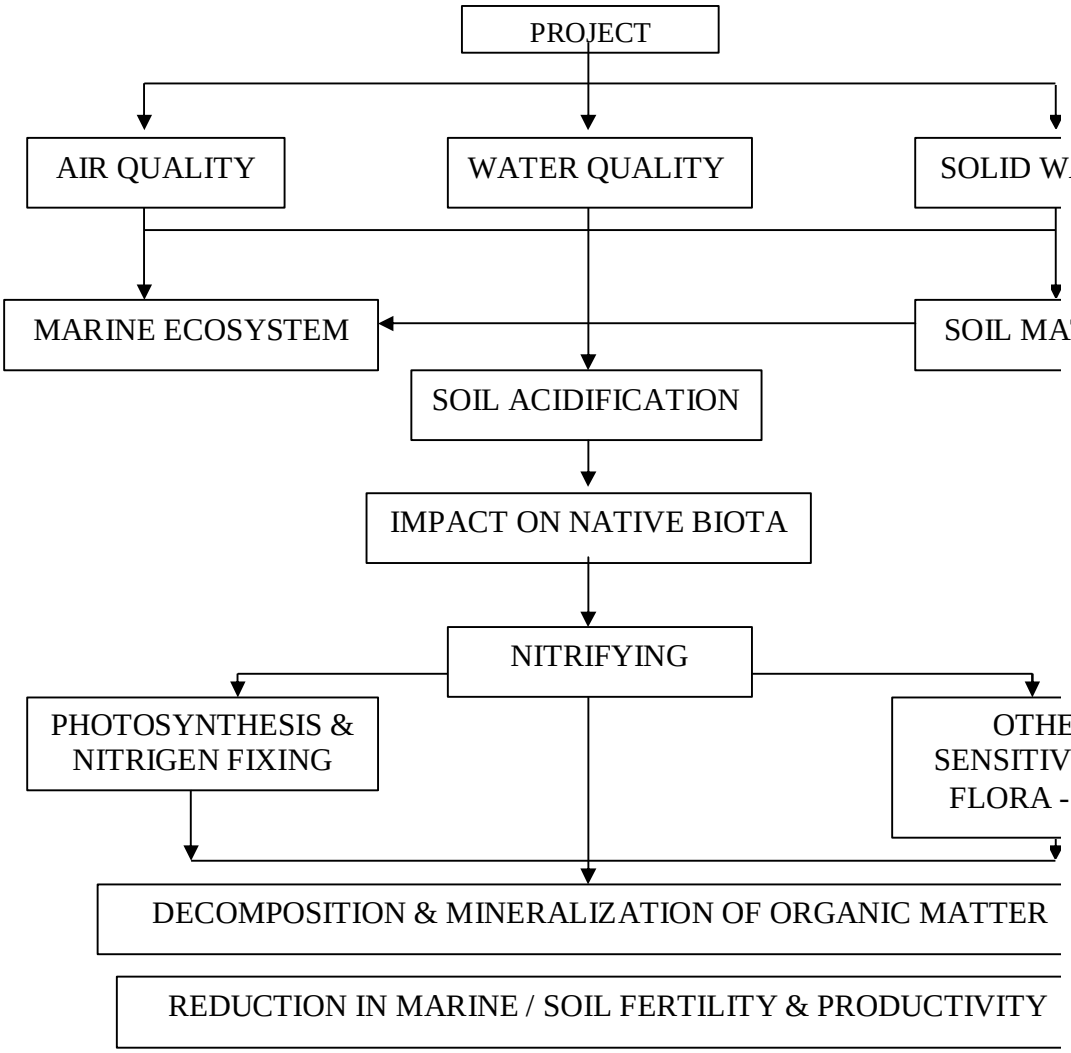
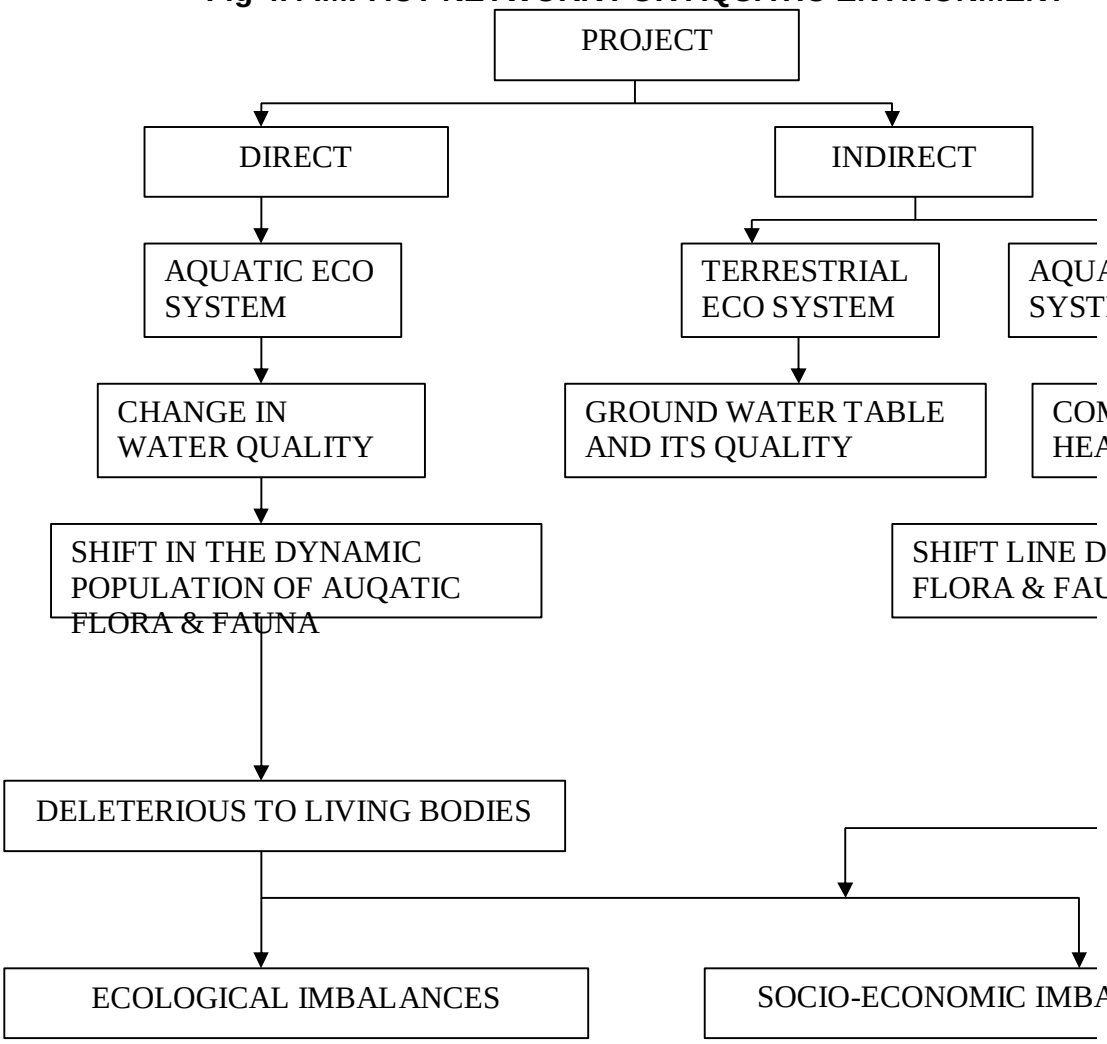


Fig 4.4 IMPACT NETWORK FOR AQUATIC ENVIRONMENT



CHAPTER – 5

PUBLIC HEARING & PUBLIC CONSULTATION

5.1 PUBLIC CONSULTATION /PUBLIC HEARING

The public hearing / public consultation were conducted on 9.10.2010 at Salem City Municipal Corporation by the Corporation. The Municipal Commissioner, Municipal Engineers were present during the meeting. The advantage and its demerits where discussed in the meeting, details of public hearing are given in the Annexure -08.

The Public Hearing/Stakeholder consultation was held on the 9th of October 2010 at Mankuttai area. This meeting was made public with the help of advertisements published in both national and vernacular new papers. The meeting was attended by the general public, councilor and others. Executive engineer S. Venkatesh conducted the meeting and answered all the questions raised by the public. A total of 26 stakeholders and participants were present. Reports of the meeting were published in newspapers “The Hindu” on 12.10.2010; “Thina Boomi” Tamil newspaper on 13.10.2010 and “Thina Malar” Tamil newspaper on 14.10.2010.

Table: 5.01 Public hearing details

S. No.	Issues raised	Response of the borrower/ULB to the issues	Comments
1)	Earlier a meeting was held regarding a similar matter and there was no response after the meeting. Why is it being repeated again?	Commissioner, Salem Corporation	This is a new project in the same site and any problems or disturbances that the people might face as a result of this project must be determined.

2)	Sewage from different areas of Salem is collected here. Will there be any aesthetic or hygiene problems resulting in disease?	Commissioner, Salem Corporation	The site already has water stagnating in it. Setting up of the STP here would remove the problem of water collection and stagnation and also the sewage will be immediately and continuously treated thereby not causing any problems.
3)	Will there be any odor problems from the plant while it is running?	Commissioner, Salem Corporation	New technology is being used in this STP thereby there will be no odor problems or other disturbances.
4)	Will there be any problems for people moving around in this area and from nearby areas?	Commissioner, Salem Corporation	There will be no problems for any of the people living around the site and in nearby areas.
5)	What are the benefits of the new technology being used in this STP?	Commissioner, Salem Corporation	There will be overall control of air, water, noise and solid waste pollution.
6)	Sewage that gets collected at the site prior to treatment, will this affect the surrounding soil?	Commissioner, Salem Corporation	There won't be storage of wastewater at the site. The plant will run continuously and treat the water as and when it reaches the plant.
7)	When will the STP start functioning?	Commissioner, Salem Corporation	In approximately 2 years, the site will be ready and running.
8)	Will all the wastewater from Salem city be brought here? Why was this place chosen for setting up of the site?	Commissioner, Salem Corporation	All the wastewater won't come here. In this project there are 4 STPs to be set up in Salem dividing it into different parts. One of that is this site which will get the wastewater from one particular part of Salem. Area chosen for setting up of the site is a low lying area. Hence the wastewater from other places can be brought to the site by gravity making it a good option.

9)	Will the site cause any problems to the public borewells?	Commissioner, Salem Corporation	There will be no problems to the borewells.
10)	How to remove the waste generated from the plant?	Commissioner, Salem Corporation	By the new technology, the purified water and the waste is separated.
11)	What is drainage?	Commissioner, Salem Corporation	Wastewater is collected via. pipelines and collected at one point for purification. This is drainage.
12)	Will the area be clean with the coming up of the STP?	Commissioner, Salem Corporation	All the existing wastewater collection problems will be solved and the place will be overall cleaner.
13)	Where will the treated water be disposed to?	Commissioner, Salem Corporation	The treated water is diverted via pipelines to the Thirumanimutharu odai.
14)	If the plant will clean the area and keep the area clean, then we have no protest against it.	Commissioner, Salem Corporation	With the help of the general public, the plant can be set up faster and start functioning.

CHAPTER – 6

ENVIRONMENTAL MANAGEMENT PLAN

After identification, prediction and evaluation of impacts for the proposed project a detailed Environmental Management Plan (EMP) is outlined to minimize the adverse impacts.

Table – 6.01 - Action Plan to the PCB Comments

No.		
1.	The Corporation shall furnish full fledged sewage treatment plant proposal with design and drawing while applying for consent for establishment under the Water (P& CP) Act 1974 as amended.	Submitted
2.	The Corporation shall obtain consent for establishment for the discharge of sewage treatment under section 25 of the Water (P&CP) Act, 1974 and for the installation of underground sewerage system along with the STP before establishment.	Will be complied.
3.	The Corporation shall submit appropriate land use certificate from DCTP.	Obtained by the Corporation
4.	The Corporation shall declare the land for a radius of 100 meters as no development activities in consultation with DCTP.	Obtained by the Corporation
5.	The Corporation shall develop green belt all around the proposed STP.	Canopy trees will be planted all around the site as a control for odor nuisance. The greenbelt around the proposed

		STP will be developed as it is in the scope of this project.
6.	No flooding of treated / untreated effluent is permitted.	As the natural stream / canal have adequate capacity to carry the treated sewage to the discharge point, the flooding is not expected.
7.	No activities on land shall be taken without consent of the Board under the Water (P & CP) Act.1974 as amended.	Will be complied
8.	The Corporation shall ensure that there will not be any public complaint during the operation of STP.	Will be complied
9.	The Corporation shall construct compound wall around the periphery of the site at a height of 6 feet.	Construction of compound wall will be done

Table: 6.02 Conditions as per the TNPCB Consent to Establish

S. No.	Additional Conditions as per Consent to Establish	
1	The corporation shall provide septic tank for the sewage and shall connect the overflow to the receiving well of STP	Will be provided by SMC
2	The corporation shall install full fledged STP as proposed so as to satisfy the discharge standards prescribed by the board before commissioning	Proposed to install STP as prescribed.
3	The corporation shall have standby arrangement for all critical components like pumps, blowers, aerators etc. to ensure continuous and smooth functioning of STP	Standby arrangement are given
4	The corporation shall provide necessary safety measures like safety kit, chlorine gas leak detection system with alarm, eye wash,	Necessary safety measures will be provided.

	etc. for handling chlorine gas cylinders.	
5	25% of the land area acquired by the unit shall be utilized for green belt with trees planted at the rate of 400 trees/ hect.	Will be considered and the available area of 0.36 Acre will be used for green belt development and landscaping.
6	The corporation shall provide rain water harvesting facilities whenever possible to increase the recharge of ground water.	Will be provided
7	The STP operation shall not lead to any public complaint.	STP will be operated properly to avoid any complaint.
8	The unit shall install Electro Magnetic flow meter with computerized recording system at inlet / outlet of STP.	Will be installed during operation
9	The operation of Sewage Treatment Plant shall not give rise to any objectionable odour.	Odour problems are controlled and prevented at the source itself
10	Manual cleaning of effluent tanks must be avoided and mechanical means must be adopted. Accumulation of sludge in effluent tanks must be avoided.	Cleaning will be done by mechanical means.
11	The corporation shall declare the land for a radius of 100 meters as a no development activities in consultation with DTCP.	Received order
12	The corporation shall develop green belt of 25 meters width all around the proposed Sewage Treatment Plant.	The green belt area will be developed in the available throughout the boundary of the site.
13	No flooding of treated / untreated effluent is permitted in the Sewage Treatment Plant area.	Will be operated properly
14	The quality of treated sewage shall be got analyzed regularly once in a month and report shall be furnished to Tamil Nadu Pollution Control Board.	Will be analysed in the Lab provided and report will be furnished
15	The corporation shall provide necessary storm water drain in and around the Sewage Treatment Plant site and ensure that there will not be any water logging.	Will be provided

16	The corporation shall provide uninterrupted power supply to the Sewage Treatment Plant to operate continuously. The corporation shall have standby power supply for operation of Sewage Treatment Plant.	Will be provided
17	The sludge from centrifuge is in un-digested form. It should be properly handled and disposed off after stabilization. The STP sludge shall be used for green belt development.	The sludge treatment will be done and disposed as per the norms.
18	The screening waste collected from the fine screen and grit removal unit shall be properly collected and disposed.	Will be properly removed and disposed
19	The corporation shall have base line data on ground quality at least in 6 locations around the Sewage Treatment Plant site in consultation with District Environmental Engineer, Tamil Nadu Pollution Control Board and periodically monitor the ground water quality in the same locations once in six months. The complied data shall be furnished to the District Environmental Engineer once in a year.	Periodic monitoring has been planned in the EMP
20	The corporation shall provide compound wall on all side of Sewage Treatment Plant area.	Boundary compound wll be provided
21	The corporation shall comply with all the conditions specified in the NOC.	All conditions are maintained as per the NOC

6.2 CONSTRUCTION PHASE

There will be marginal impacts during construction phase. The control of pollution during construction is of considerable importance. The following aspects require control during the construction phase.

- The baseline status of gaseous pollutants (SO_2 and NO_x) is well within the standards prescribed by MoEF for residential area. However, care should be taken for regular maintenance of machinery and vehicles.
- It is recommended that while procuring machines/equipments for construction purpose, it should be checked that the manufacturers have taken adequate

measures to minimize noise generation. The equipments and machines should be maintained properly. Earmuffs or other protective devices should be provided to the staff working in noise prone areas to avoid adverse impact of noise.

- All wastes produced during the construction should be properly handled, stored and disposed of in accordance with the recommended good waste management practices proposed by the MoEF. The unused construction materials and construction equipment should be removed from the site after the construction.
- The project is unlikely to have any adverse impact on the representative plants and animal species of the area. Construction activities should be regulated taking into account the aesthetic considerations. Wherever loose soils are to be dumped, the same should be used for plantation.
- The construction activities should be so designated that the existing pristine environment is not subjected to degradation. Proper care should be taken to prevent soil erosion, loss of land, and sanitary conditions
- Workers should receive medical examination and necessary treatment before starting work. Facilities for first aid should be provided at the construction site. Proper sanitation should be provided during construction.
- While designing the STP adequate care has been taken to keep the formed ground level above the overflow sluice level of the adjoining eri to avoid the flooding of the STP even during the critical monsoon period.

The EMP during construction and pre construction phase is given in Table 6.03 & 6.04.

Table: 6.03 List of clearances and permissions

Clearances	Authority	Remarks
Approval of Land	State Government	As per GO – by Salem Collector
Consent to Establishment	TNPCB	Obtained
Consent to Operate	TNPCB	Will be obtained after construction
Air Act 1981 & TN Air Rules 1983	TNPCB	Obtained
Permission / Land use	PWD/DTCP	Obtained GO

Table – 6.04- Identification of Impacts and Environmental Management Plan
Pre Construction Phase Impacts

Impacts	Environmental Management Plan
Tree Cutting	No cutting of trees is involved for the clearing of site as the proposed site is barren land with out vegetation. The proposed green belt for improvement of aesthetic view is the positive impact of the project
Utility Relocation	No common utilities like telephone cables, electric cables, electric poles, water pipelines, public water taps, etc will be relocated for the implementation of the project
Baseline parameters	The baseline parameters Viz air, water, noise level, soil, flora and fauna and socioeconomic conditions were monitored as a part of EIA studies. The baseline parameters are well within the limit.
Planning of temporary Traffic arrangements	The proposed site is well connected with roads and no traffic arrangements anticipated.
Disposal of treated wastewater.	The treated waste water will be disposed in to the near by river through with sufficient holding capacity to receive the complete treated sewage. The treated sewage will meet the prescribed standards. The management plan will be formulated after discussion with irrigation department.
Storage of materials	The designated sufficient land will be allocated for storage construction materials.
Construction of labour camps	The temporary accommodation will be constructed and maintained. The labour camp will be established with sufficient drinking water supply and water for cooking and washing. The sanitary facilities will be provided and soak pits will be provided for the temporary toilet facilities All relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp will be strictly amended and monitored

CONSTRUCTION PHASE

Table: 6.05 - EMP during construction phase

Plantation of trees	The green belt development plan will be started during construction stage it self.
Protection of top soil	Top soil from the STP area will be stored in stock piles and will be used for gardening purposes
Disposal of construction debris and excavated materials.	All wastes produced during the construction should be properly handled, stored and disposed of in accordance with the recommended good waste management practices proposed by the MoEF. The unused construction materials and construction equipment should be removed from the site after the construction.
Pollution from Fuel and Lubricants	The un used fuel and waste oil will be disposed to the authorized vendors of TNPCB.
Water Pollution from Construction Wastes	storm water drains and rainwater harvesting will be provided
Risk from Electrical Equipment	All machines to be used in the construction will conform to the relevant Indian and will be inspected and properly maintained as per IS provision.
Safety Aspects	All machines used shall confirm to the relevant Indian standards Code and shall be regularly inspected. Protective footwear and protective goggles to all workers employed on mixing of materials like cement, concrete etc will be provided. Earplugs will be provided to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation.

6.3 POST CONSTRUCTION PHASE

- Project proponents are advised, to keep track on ambient air pollution concentration levels by periodic monitoring.
- All the toxic/hazardous substance should be disposed off or stored as per guidelines of MOEF under HWM rules and MSIHE rule so as to avoid and prevent the pollution of land, air.
- Priority for the local people in giving jobs during and after the construction of the plant.
- Overall development of the area promoting cultural activities, marketing and family welfare programmes.
- The proper management for the treated sewage during rainy season may be envisaged with consultation with statutory bodies

6.4 GREENBELT DEVELOPMENT

Eco-environment conservation and pollution abatement through greenbelt are two major components which are vital for any activity, whether proposed, existing or under expansion stage. Greenbelt development plan for a particular sector mainly depends upon:

i. Nature and extent of pollution load
ii. Sinking capacity of the ecosystem
iii. Climatic factors
iv. Soil and water quality

As per the GO, total area given for STP is 2.44 Acre, which includes utilized area for Sewage Treatment Plant units and other buildings and the future expansion is 0.0917 Acre. Rest of the area available around 0.26 Acre will be utilized for Green belt development and landscaping shrubs and plants. The green belt proposed will have primary and secondary zone with two rows in the boundary and the free space available will be planted with large canopy trees.

Whereas for optimization of width of greenbelt the prime considerations are:

i. Height and canopy area of trees (maximum)
ii. Mean wind velocity

iii. Distance from source
iv. Pollutant concentrations
v. Dry deposition velocity of plants (specific to pollutant and plants)

Further, depending upon the topo-climatological conditions and regional ecological status, selections of appropriate plant species for this purpose is based up-on the following criteria.

i. The plants should be fast growing
ii. Having thick canopy cover
iii. Preferably perennial; and evergreen
iv. Having large leaf area index
v. Indigenous
vi. Resistance to specific air pollutants
vii. Finally, should maintain the ecological and hydrological balance of the region.

6.4.1 GREENBELT DEVELOPMENT PLAN

The general principles involved while raising the greenbelt are:

- Trees growing up to 10m or more in height with thick perennial foliage should be planted.
- Species diversity of the greenbelt should be maintained
- Trees should be planted around the roadside and near market places for arresting emissions from vehicular traffic.
- Fast growing trees should be planted, as they will attain their full height in short period of time.
- Since the tree trunks are normally devoid of foliage which may be up to a height of 3m, it may be useful to have shrubbery in front of the trees so as to give coverage to that portion.
- The green belt will be developed for an extent of 2m all-round the plant in the available area. Plants will be planted within a period of 3 years from the commission of plant. The average canopy height of the green belt, no.

and types of plant species will be counted once in 3 years using suitable techniques of vegetation sampling.

The green belt consists of Primary and Secondary zone. The average canopy height of the green belt plant number and types of plants species will be counted in 3 years using suitable techniques of vegetation sampling.

The Primary zone will be nearest one to the emission sources, where the ambient pollutant concentration is higher. The trees planted here must have dense spreading canopy. The trees will be planted closer with a spacing of 2 - 3 m between trees and width of this zone will be 1 – 2 m. The proposed STP site will have a greenbelt with a width of 2 meters on all sides as shown in Fig 6.01.
The south side of the site will have a thicker greenbelt area due to the space availability. All areas of the site will be surrounded with grassy lawn and trees and shrubs wherever possible. The proposed trees for plantation to reduce any pollutants from the site are as listed in the Table – 6.04.

The free space around the buildings and the units in the site will be planted mainly with

- *Occinum sanctum*
- *Hibiscus rosa-sinensis*
- *Vinca Rosa*

The ***Occinum sanctum*** – Thulasi is chosen for its medicinal, anti-pollutant, anti-oxidation and air-purifying properties, making it an ideal shrub to plant in the open areas seen near the buildings and units and along the road side as shown in the Figure 6.01. The Thulasi in turn has medicinal value and oxygen generation quantity from the shrub will be more. The plants are planted with a distance of 0.5 m alternately planting the *Hibiscus sp*. with the *Occinum sp*.

The rest of the free space in front of the buildings will be planted with ornamental plants mainly with

- *Aglaonema modestum*
- *Bougainvillea spectabilis*
- *Croton tiglium*

In addition to the above to species, an evergreen herbaceous perennial plant *Aglaonema modestum* is an excellent air-purifier plant will be also planted near to the units. It is a very common plant with shiny, green leaves that have interesting markings on them. The plant grows even better with less water; it can filter out airborne impurities and toxins.

Table: 6.06 - Proposed Trees for Plantation for Green Belt

Name of Plant species	Height	Canopy – Architecture efficiency	Dust Collecting Index	Air pollution tolerance
Azadirachta indica	Tall	Semi-erect	Fair	Medium
Pithecolobium dulce	Tall	Round	Moderate	High
Polyalthia longitolia	Tall	Erect	Moderate	Medium
Tectona grandis	Tall	Erect	Moderate	Medium
Terminalia arjuna	Tall	Erect	Moderate	Medium
Bauhinia purpurea	Medium	Semi-erect	Good	Medium
Butea monosperma	Medium	Semi-erect	Good	Low
Cassia fistula	Medium	Round	Fair	High
Saraca indica	Medium	Semi-erect	Fair	Low
Thespesia populnea	Medium	Round	Moderate	Medium
Acacia arabica	Dwarf	Round	Good	Medium
Diospyros embryopteris	Dwarf	Round	Moderate	High
Thevetia nerifolia	Dwarf	Round	Fair	Low
Parkinsonia aculeta	Dwarf	Semi-erect	Good	

In addition to the above plants, the below mentioned trees are largely planted due to the space availability and to reduce any air and noise pollutants from the source. These plants are planted near the side of internal roads and around the major units with a distance of 1 – 2 m spacing.

- *Polyalthia longifolia*
- *Azadirachta indica*
- *Pongamia pinnata*
- *Calamus rotang*
- *Phyllostachys aurea*

Polyalthia longifolia is a lofty evergreen tree, native to India, commonly planted due to its effectiveness in alleviating noise pollution. It exhibits symmetrical pyramidal growth with willowy weeping pendulous branches and long narrow lanceolate leaves with undulate margins. The tree is known to grow over 30 ft in height. These trees are planted with a distance of 2 m intervals in the boundary of roads and in the side of West side of the site.

Azadirachta indica commonly called as Neem tree, which is a fast-growing tree that can reach a height of 15–20 meters (49–66 ft), rarely up to 35–40 meters (115–130 ft). Neem tree has tremendous capacity to absorb carbon dioxide and purify the air, making it a perfect tree to decrease the air pollutants and decrease noise by creating a barrier in the area. Neem tree can adjust to climatic changes easily, grows quickly and lasts long. The Neem trees will be planted mainly in the west and south side of the site and alternately planted along with the *Polyalthia longifolia* in the road side in the North portion of the site.

Pongamia pinnata is a species of tree native in tropical and temperate region. The species has been moved to the genus *Millettia* recently. A legume tree that grows to about 15–25 meters (15–80 ft) in height with a large canopy which spreads equally wide. It may be deciduous for short periods. The leaves are a soft, shiny burgundy in early summer and mature to a glossy, deep green as the season progresses. *Pongamia pinnata* is one of the few nitrogen fixing trees (NFTS) to produce seeds containing 30-40% oil. It is often planted as an ornamental and shade tree with large canopy.

6.5 MEASURES TO MINIMIZE EFFECTS ON NEIGHBORHOOD

All the units in the Sewage Treatment Plant are located and will be constructed to minimize the effect on the neighborhood and surroundings.

- The receiving chamber is placed below ground level. This prevents the spread of any undue odor from the wastewater inlet.

- The debris collected from the screening chamber and grit chamber will be continuously collected and disposed regularly to prevent the stagnation of the waste thereby preventing odor and reduction in aesthetic conditions.

- The aeration tank will be continuously run and maintained properly with regular service of blowers and pumps. Standby blowers and generator are also provided for uninterrupted operation of the system. This ensures that the aeration system functions well and causes no smell or disturbance to the neighborhood.

- The blower room is an enclosed area with shutters opening towards the aeration tank. Ventilation is provided in the same direction. This direction is devoid of buildings and residential areas thereby preventing disturbances and noise.

- The clarifiers do not produce any sound or odour and so are strategically placed on the side of the Housing board flats. The proper maintenance of the unit prevents smell and unnecessary problems, which will be maintained regularly.

- The site is also provided with space for further developments amounting to 371 m^2, which will endure treatment for any further development in the area.

THE CLEARANCE REQUIRED IN ENVIRONMENTAL ANGLE

Clearances	Authority	Remarks
Consent to Establishment	TNPCB	Obtained
Consent to Operate	TNPCB	To be applied after construction
Permission/ Land use/Treated water disposal	PWD/DTCP	Obtained

6.6 MEASURES DURING OPERATION & MAINTENANCE

Table: 6.07 – Unit wise measures during Operation & Maintenance

Sl. No.	SYSTEM	PROBLEMS	MITIGATION
1	Receiving well	Stagnation of the wastewater	Continuous operation of the treatment plant allowing constant flow of wastewater and preventing stagnation. Stand by pump provided.
2	Course/fine screen	Clogging of Screens with debris Foul smell and degrading solid matter accumulating on the screen	Proper cleaning and replacement of the screen at regular intervals
3	Grit chamber	Any escaping grit or solids into the system can affect the pumping equipment. Bad odor from settled matter	Proper settling of any solid matter that may have escaped the screens by ample detention time. Periodic cleaning of chamber.

4	Aeration tank (FAB)	• Proper mixing for a even higher load of wastewater continuously thereby preventing the onset of anaerobic conditions. • Microbiology of the tank can have the following - Poor floc formation and dispersed growth, toxicity, nitrification and denitrification problems and filamentous bulking. • Debris accumulation on the air inlets of diffusers • Slim and microbial growth on the diffusers and the walls of the tank • Even aeration in the tank with proper mixing to prevent stagnation and development of anaerobic conditions.	• Proper equipment to run continuously • Healthy microbial population in the tank with periodic analysis to check toxicity. • Cleaning and maintenance of the diffuser periodically. • Constant aeration and mixing to prevent settling of the microbes and suspended matter in wastewater. • Maintenance of aerobic conditions in the reactor.
5	Secondary Clarifier	• Hydraulic short circuiting can occur causing uneven settling and dead zones in the tank. • Low detention time • Too much mixing and churning inside the tanks preventing settling. • High forward velocity causing bottom scour. • Degradation of settled matter causing foul odor, septicity and growth of filaments. • Floating solids in the tank. • Algae and scum building over the weirs.	• Proper design of the tank preventing short circuiting and adequate detention time in the tank. • Tank inlet set in a way that prevents turbulence thus enabling proper settling. • An adequate velocity which would prevent the settled matter from scouring off. • Removal of settled matter for sludge dewatering. • Pumps and other

			equipment properly serviced and running with stand by always present.
6	Chlorine contact tank	Adequate amount of disinfection to prevent any harmful microbes from passing out with the treated water	Proper dosing with chlorine and an adequate detention time.
7	Sludge thickener	Odor from the production of gases due to degrading sludge	Proper maintenance of conditions required to produce the beneficial products (manure) for reuse.

The maintenance of equipments like, pumps, Mechanical screens, Detritors, Clarifiers, Blowers, Centrifuge etc., will have the maintenance manual of respective equipment manufacturer or supplier followed.

For operation of the plant, trained operators will be posted. Further a consultant, if required, will be engaged to improve the operators' exposure in day to day running the plant.

For chlorinator and Tonne container, safety equipment such as gloves, face mask, oxygen cylinder will be procured along with chlorinator. The use of these will be demonstrated by the supplier's representative along with operation of Chlorine tonne containers.

ISSUE BASED MEASURES

Table: 6.08 – Operational problem and its remedial measures

No.	Operational problem	Factor	Remedial measures
1.	Excess flow than the designed quantity	Storm or rain water through the drain	The flow will be bypassed after grit chamber by closing the main valve.
2.	Sludge Floating to surface in Secondary Clarifiers	Bulking of sludge	Aeration tank Dissolved Oxygen level and sludge recirculation pump operation to be increased
3.	Improper Effluent Distribution: Fouled Weirs	Accumulated solids and biological growth	Frequent and thorough cleaning of weirs will be done
4.	Aeration Tank Content Turns Black	Inadequate aeration	Aeration piping system will be checked for leaks and plugged air diffusers will be checked for any cleaning.
5.	In Diffused Aeration Systems, Air Is Rising in very large bubbles or clumps in some areas	Diffusers are plugged	Diffusers will be checked and cleaned to reduce plugging.
6.	Increase in suspended solids in the secondary clarifier overflow for given design figures		Check MLSS level, D.O level in the aeration tank. Pump out accumulated sludge in secondary clarifier. Check rake mechanism functioning and direction of rotation Pump out excess sludge if MLSS is high.
7.	Sludge withdrawal ports plugged	Low velocity in sludge withdrawal lines	The clogged lines will be back flushed and the sludge will be

			pumped more frequently
8.	Higher sludge flow to sludge thickener	Sludge withdrawal rate is low or more suspended solids in the raw sewage	The underflow pump will be operated for more duration
9.	Pin floc in Secondary Clarifier Overflow (very fine solids particles suspended throughout lightly turbid liquid)	Excessive turbulence in aeration tanks or Over oxidized sludge	Sludge wasting will be increased.

SAFETY PRECAUTIONS TO WORK IN SEWAGE TREATMENT PLANT (DOS AND DON'TS)

Table: 6.09 – Safety precautions during the operation STP (Dos & Don'ts)

No.	DOs	Don'ts
1.	Practice good personal hygiene and safety to guard against occupationally related diseases.	Do not eat, drink, or smoke while handling grit, screenings or sludge.
2.	Wear clothing that protects the arms and legs. Keep shirts tucked into pants	Avoid loose-fitting clothing that could get caught in moving equipment
3.	Wear the appropriate protective gloves whenever working in contact with wastewater, bio solids. Wash hands with a disinfectant soap after handling wastewater, bio solids, or chemicals.	Never allow wastewater, bio solids, or chemicals to come into contact with cuts or broken skin. Do not place fingers into mouth, nose, ears, or eyes while handling wastewater, bio solids, or chemicals.
4.	When working with classifiers or grit equipment, beware of rotating equipment.	Do not sacrifice safety for speed
5.	Wear safety harness or life jacket when leaning on or hanging over aeration tank guard rails or safety chains.	Do not sit on aeration tank guard rails or safety chains
6.	Use care and caution when using hand tools, power tools, and	Do not use tools and equipment unless trained and experienced in the proper use

	portable power equipment.	and operation.
7.	Use care and caution when lifting heavy tools and equipment.	Do not use defective tools or equipments for handling tough jobs
8.	Use care and caution when working in the laboratory. Store chemicals in a safe place where they are not hazardous to personnel or property. Wash hands with a disinfectant soap after handling chemicals. Wash off chemical spills on skin immediately with running water.	Do not place fingers into mouth, nose, ears, or eyes while handling chemicals. Do not have personal contact with chemicals
9.	Keep all work places including service rooms, storage rooms, passageways and exits clean and orderly. Keep all walk areas free of sludge, lime, caustic, polymer, rags, grit, grease, oil, or other materials that could cause slipping.	Do not walk on sludge. Do not walk on bare foot or in slippery footwear.
10.	Have at least two persons present before entering a launder or weir trough, one person to enter the sedimentation effluent troughs or weir trough, the other in the clear to observe in the event of an emergency	Never enter a sedimentation tank effluent trough or weir through alone and unattended
11.	Plant personnel must be trained and instructed on the use and handling of chlorine, chlorine equipment, chlorine emergency repair kits, and other chlorine emergency procedures. ü Use extreme care and caution when handling Chlorine ü Lift chlorine cylinders only with an approved and load-tested device. ü Secure chlorine cylinders into position immediately ü Store chlorine l-ton cylinders on their sides only (horizontally)	o Never leave a cylinder suspended. o Avoid dropping chlorine cylinders. o Avoid banging chlorine cylinders into other objects. o Never apply direct flame to a chlorine cylinder. o Except to repair a leak, do not tamper with the fusible plugs on chlorine cylinders. o Do not hammer, bang, or force chlorine

	ü Always keep valve protection hoods in place until the chlorine cylinders are ready for connection ü Use only the specified wrench to operate chlorine cylinder valves. ü Open chlorine cylinder valves slowly; no more than one full turn ü Have at least two personnel present before entering a chlorine atmosphere ü One person to enter the chlorine atmosphere, the other to observe in the event of an emergency	cylinder valves under any circumstances o Never enter a chlorine atmosphere unattended o Never store other materials in chlorine cylinder storage areas; substances like acetylene and propane are not compatible with chlorine.
12.	Use care and caution when working around all electrical equipment Observe "DANGER" and "HIGH VOLTAGE" signs. Consider all electrical conductors and equipment to be "live" until positively proven to be de energized. Use only wooden or fiberglass ladders when working around electrical lines and equipment. Have frayed or broken electrical cords repaired immediately	Do not bypass electrical safety devices. Do not use open-face drop lights. Never tape frayed or damaged electrical cords. Never use an empty electrical control panel as a storage locker Never use electrical tools in or near water without ground fault interrupter circuit. Never stand in water when using an electrical tool or equipment

6.7 POST-PROJECT ENVIRONMENTAL MONITORING PROGRAMME (PPMP)

PREAMBLE

Several measures have been suggested in the Environment Management Plan (EMP) for mitigation of identified adverse environmental impacts. These have to be implemented to ensure compliance with the environmental regulation and also to maintain a healthy environmental conditions in and around the proposed activity. A monitoring strategy is required to ensure that all environmental resources which may be subject to contamination are kept under review and hence monitoring of the individual

elements of the environment is necessary. The proponent will be entrusted with this responsibility.

EMISSIONS AND AIR QUALITY

The project proponent will monitor the ambient air quality regularly in 4 locations in and around the plant. The locations will be identified in consultation with TNPCB. The equipment will have facilities to monitor SPM, RPM, SO_2 and NO_x and other gases which makes odour in the ambience.

WATER QUALITY

Surface and ground water will be sampled regularly once in a season from various locations in and around proposed plant to ascertain the trend of variation in the water quality, if any. The surface water quality of treated sewage receiving body will be analysed fortnightly (once in fifteen days) through recognized laboratory.

Tests to be carried out on regular basis during O & M period of STP

The regular sampling is to be carried out twice a day at the points given below and tested in the Laboratory situated in the Admin Block of STP on regular basis and reported.

- Excess sludge for Volatile Suspended Solids and Total Solids
- Inlet chamber at sewage treatment plant for flow, pH, SS, temp., COD and TDS.
- Outlet of the sedimentation units for BOD, suspended solids, PH, COD and TDS.
- Outlet of the reactor unit for Dissolved Oxygen, Sludge volume Index & pH.
- Outlet of the secondary treatment units for BOD, Suspended solids, pH, COD , Micro biological analysis and oil & grease
- Outlet of the chlorination units for BOD, Suspended solids, pH Micro biological analysis and Residual Chlorine

NOISE LEVELS

Noise levels will be measured at the source of generation. It is desirable that the noise attenuation measures are taken while procurement of DG sets used for stand by purpose. The employees working near to the DG room will be provided with personal protective equipment like ear plugs/ear muffs.

OCCUPATIONAL HEALTH

Maintenance of occupational safety and health is very closely related to productivity and good employer-employee relationship. In addition to these, safety of employees during construction, operation and maintenance of plant and equipment shall be achieved by following proper safety measures.
For occupational safety, the following will be provided.

- Annual Inspection and maintenance of pollution control systems after getting official clearance for shutdown or with permission of authorized officer.
- Regular cleaning of floors, roads and other dusty places.
- The workers exposed to noisy equipment will be provided with ear plugs. If necessary, the duty hours will be rotated, so that noise exposure time is kept within specified limits.
- Regular medical check up for the employees will be done.

BIOLOGICAL MONITORING

Space has been made available around the entire site for a massive tree plantation, which will be taken up along the boundary of the plant leading to a favorable impact on the surrounding environment. The proponent will continue to improve the green cover in the area by planting trees in the open area. Trees survival rate will be monitored in the plantation areas and will be maintained at about 80% by replacement of dead trees.

INTERACTION WITH STATE POLLUTION CONTROL BOARD (SPCB)

The proponent shall be in regular touch with TNPCB and send them quarterly progress report on EMP. Any new regulations considered by State/Central Pollution Control Board for the plant will be taken care of.

LABORATORY FACILITIES

Environment management department should be developed with qualified and experienced Chemists. It is recommended to monitor the inlet and out let of sewage treatment plant on daily basis. The environment cell will monitor the effectiveness of EMP and reported to concerned authorities. An environmental laboratory should be developed with the following equipments.

LIST OF MONITORING / ANALYTICAL EQUIPMENTS.

Sl. No.	Description	Quantity
1	pH Meter	1
2	Conductivity Meter 1	1
3	D.O. Meter	1
4	Distillation Apparatus	2
5	B.O.D. Incubator	1
6	C.O.D. Apparatus	1
7	Hot Air Oven	2
8	Incubator	2
9	Refrigerator	1
10	Water Bath	1
11	Dessicator	3
12	Hot Plate	2
13	Autoclave	1
14	Thermometers	4

15	Electronic Balance (Single Pan)	1
16	Automatic Burettes	4
17	Fixed Vol. Pipettes	6
18	Laminar flow	1
19	Centrifuge	1
20	Magnetic stirrer	1
21	Filtration assembly	1
22	Vaccum Pump	1
23	Aeration Pump	1
24	Microscope	1
25	Physical Balance	1
26	Muffle Furnace	1
27	Bacteriological Water bath	1
28	Bacteriological Incubator	1

FREQUENCY OF MONITORING OF POLLUTION SOURCES

Regular monitoring in a systematic and standardized manner helps in assessment of current environment and provides information on operational performance of installed pollution control facility. During construction Constant supervision over the site to control the movement of materials and noise disturbances are monitored.

Further during operational period the Air, Noise and Soil samplings are carried out periodically, whereas water samples will be done regular basis as mentioned in the Table 6.10.

Table 6.10 - Monitoring during Construction phase

S.No	Place of monitoring	Parameters of pollution	Frequency of monitors	Unit cost /sample	Total Cost	Amount /Year
1.	Air quality monitoring	$PM_{2.5}$, PM_{10}, SO_2, NO_X & CO	3 seasons per year at 4 locations	5000	60000	60000
2.	Water quality	As per IS: 10500 - 1991 norms	4 seasons at 5 locations	3000	60000	60000
3.	Noise quality	Leq dB(A)	4 seasons at 4 locations	500	8000	8000
4.	Soil quality	pH, texture, electrical conductivity, organic matter, nitrogen, phosphate, sodium, calcium, potassium and Magnesium.	Once in a year at 4 locations	3000	12000	12000

Monitoring during operation phase

Sl. No.	**Place of Monitoring**	**Parameters of Pollution**	**Frequency of Monitors**	**Funds allocation per year**
1	Ambient air quality at plant boundary and nearby habitation	$PM_{2.5}$ & PM_{10}, SO2, NOx, CO	3 seasons per year at 4 locations	4 location X 5000 rupees X 3 seasons = Rs.60,000/-
2	Monitoring of Surface and ground water quality surrounding areas	As per IS:10500 - 1991 norms	To be carried once in 3 months (Seasonal) at 5 locations	5 locations X 3000 rupees X 4 SEASONS = 60,000

3	Surface water quality of receiving body	Bio-chemical Oxygen Demand, Total suspended solids, Chemical oxygen demand, pH ,Oil and grease, Ammonium Nitrogen, Nitrate Nitrogen, Total Phosphorous, Total Coliforms	Fortnightly	1 location X 2 times in month X 12 months X 2000 rupees = 48,000/-
4	Noise monitoring near DG sets	Leq dB(A)	Daily basis by proponent and once in three months by approved laboratories	4 locations X 4 seasons X 500 rupees = 8000
5	Inlet and outlet of STP	Physical, Chemical & Biological Parameters specified under IS:2490:1982	Daily basis by the proponent once in fortnightly	2 location X 2 times in month X 12 months X 1000 rupees = 48,000/-
6	Soil quality	pH, texture, electrical conductivity, organic matter, nitrogen,	Once in three months at the disposal point and 2 points around the site location	3 locations X 3 seasons X 3000 rupees = 27,000/-

		phosphate, sodium, calcium, potassium and Magnesium.		
TOTAL				2,51,000/-

Note: The monitoring program is tentative and this will be fixed with Consent condition of TNPCB and in consultation with District Environmental Engineer, TNPCB during applying for the Consent to Operate.

6.8 Cost of environmental control measures

The cost of environmental control measures are as shown below in the table, we have provided an amount of approximately 4.00 % of the total project cost as the capital investment and for implementation of EMP.

Sl. No	Operation & Maintenance Expenditures	Capital Cost (in Lakhs)	Recurring Cost (in lakhs)	Recurring cost for 5 yrs(in lakhs)
1	Monitoring plan	2.51	2.51	12.55
2	Green belt development & maintenance	1.50	0.75	3.75
3	EHS training & Monitoring	1.50	1.25	6.25
4	PPE& Safety equipments	1.00	0.25	1.25
5	Environmental lab	6.25	2.75	13.75
	Total	12.76	7.51	37.55

CHAPTER – 7

CONCLUSION

Identification, estimation/quantification of possible impacts over baseline status of water quality, biodiversity, terrestrial ecology, air quality, noise levels, flora and fauna at the proposed locations during the month of May 2011, reveals that:

1. The proposed site is free of pollution sources.
2. There are no critical habitats in the vicinity of the project locations.
3. The project does not require clearing of any trees.
4. There is no endemic and rare floral species are identified in the study area
5. The aquatic environment will not have direct negative impact
6. Better housing and sanitation facilities for the local residents of the municipality.
7. Better employment opportunities and in turn better living standards.
8. The project does not involve any displacement of habitations. Thus no negative impact to the socio-economic segment could be viewed.
9. The solid waste generated will be treated and used as manure.

The potential environmental, social and economic impacts of the project have been assessed and comprehensive mitigation and community developmental plans have also been developed. Environmental Management Plan will be exercised at design stage, construction stage and operational stage to meet all the consent norms of TNPCB With their expertise, experience, commitment and dedication, Salem City Municipal Corporation along with M/s. Subaya Construction Company limited, Chennai, the contractors for this project, will Design, Construct, Commission and Operate the 35 MLD capacity Sewage Treatment Plant (STP) with modern technology at Mankuttai village in Salem Municipality of Salem district in Tamil Nadu.