Draft Environmental Impact Assessment Report

for

"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW"

at

S.F. No. 491, Plot No. B-25, SIPCOT Industrial growth center

Villages: Oragadam

Taluk: Sriperumbudur

District: Kancheepuram

State: Tamil Nadu

By

Apollo Tyres Limited

[Project Sector – 4, Schedule 1(d), Category-B, Thermal power plants (< 500 MW coal based); located inside notified industrial area viz. Oragadam SIPCOT Industrial growth center] as per EIA Notification 2006 and its subsequent amendment

ToR Issued vide SEIAA-TN/F.No.7412/SEAC/1(d)/ToR – 1298/2022 dated 26.10.2022

Baseline Period: January 2023 to March 2023

EIA Consultant & Laboratory

M/s. Hubert Enviro Care Systems (P) Ltd, Chennai

(NABET Certificate Number & Validity: NABET/EIA/24-27/RA 0335 & Valid up to 31.03.2027

NABL Certificate Number: TC-12310 dated 25.09.2023 valid till 24.09.2025)

January 2025

Revision Status

Name of the Client	:	M/s. Apollo Tyres limited
Name of the Project	:	"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW"
Name of the report	:	Draft EIA Report

Project No: H/01/2020/CON/001	**Document No:** RP003

Notes:
1.

Revision details:

Rev No.	Date	Details	Prepared by: Name	Prepared by: Sign	Checked by: Name	Checked by: Sign	Approved by: Name	Approved by: Sign
R2	01.11.2024	3rd submission - PH	Mr. Vamsee Krishna		Dr. J.R Moses		Dr. J.R Moses	
R1	24.10.2024	2nd submission	Mr. Vamsee Krishna		Dr. J.R Moses		Dr. J.R Moses	
R0	30.09.2024	1st submission	Mr. Vamsee Krishna		Dr. J.R Moses		Dr. J.R Moses	

Acknowledgement

The following personnel are gratefully acknowledged for their fullest support in collection, compilation of needful data regarding the project and kind co-operation in fulfilling the report on Environmental Impact Assessment (EIA) report for the **"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW"** at S.F. No. 491, Plot no. B-25, SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudhur Taluk, Kancheepuram District by M/s. Apollo Tyres Limited.

M/s. Apollo Tyres Limited,

Mr. Thomas Mathew (Plant Head)

M/s. Hubert Enviro Care Systems Private Limited

Dr. J R Moses (CEO)

Dr. Raj Kumar Samuel (Director – Technical)

Mr. Vamsee Krishna Navooru (Consultancy Head)

Declaration by Project proponent

I, Mr Thomas Mathew C (Plant Head) of Apollo tyres Limited, Chennai give the declaration/undertaking that the contents(information and data) of EIA report prepared in compliance with the terms of Reference (ToR) for the **"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW"** at S.F. No. 491, Plot no. B-25, SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudhur Taluk, Kancheepuram District by M/s. Apollo Tyres Limited is true to the best of my knowledge.

For Apollo Tyres Limited

Declaration by the Head of the Accredited Consultant Organization

I, **Dr. J. R. Moses**, hereby confirm that the below mentioned experts prepared the EIA/EMP report for the **"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW"** at S.F. No. 491, Plot no. B-25, SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudhur Taluk, Kancheepuram District by M/s. Apollo Tyres Limited and also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature: 

Name: Dr. J. R. Moses

Designation: Chief Executive Officer

Name of the EIA Consultant Organization: Hubert Enviro Care System Private Limited, Chennai.

NABET Certificate No & Validity: NABET/EIA/24-27/RA 0335 & 31.03.2027

Declaration of Experts contributing to the EIA

I hereby certify that I was involved in the EIA report for the project titled **"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW"** at S.F. No. 491, Plot no. B-25, SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudhur Taluk, Kancheepuram District by M/s. Apollo Tyres Limited. I was a part of the EIA team in the following capacity that developed the above EIA.

EIA Co-ordinator	
Name:	Dr. J R Moses
Signature:	
Date:	06.11.2024
Period of Involvement:	January 2020 – Till date

Contact Information:

M/s.Hubert Enviro Care Systems Pvt. Ltd.,
A-21, Phase III, Behind Lions Club School,
Thiru-vi-ka Industrial Area, Guindy,
Chennai – 600032
Tamil Nadu, India
Email: consultancyhead@hecs.in
Website: *www.hecs.in*

Functional Area Experts:

S. No.	Functional Areas		Name of the Expert	Period of Involvement	Signature
1	AP	FAE	Dr. J R Moses	**Period:** January 2020 – till date **Task:** Selection of air quality monitoring location, sampling and interpretation of ambient air quality results. Estimation of fugitive emissions, identification and assessing of impacts due to air pollution and suggested suitable mitigation measures.	
2	AQ	FAE	Tamil Selvan B	**Period:** January 2020 – till date **Task:** Collection and developing of	

S. No.	Functional Areas		Name of the Expert	Period of Involvement	Signature
				micro-meteorological data from secondary sources, preparing site specific wind rose pattern, prediction of dispersion of pollutants and incremental pollution levels with air quality modelling. Identification of impacts and proposed the suitable control measures, development of EMP.	
3	LU	FAE	Mr. Venkateswarlu Rachala	**Period:** January 2023 - March 2023 **Task:** Development of land use maps and land use pattern of study area using GIS/related tools, and finalization of land use maps. Performed site visit for ground reality survey, and marking of eco- sensitive areas within the study area as per Topo map and Gazette notifications.	
4	WP	FAE	Dr. Rajkumar Samuel	**Period:** January 2020 – till date **Task:** Based on the type of industries validated the effluent characteristics and finalized the water balance for the project, Identification of surface and ground water quality monitoring locations, interpretation of water quality analysis results. Identification and quantification of impacts and proposed suitable control measures and Environmental Management Plan.	
5	EB	FAE	Tamil Selvan B	**Period:** January 2020 – till date **Task:** Site visit, collection of baseline data from primary and secondary sources on flora and fauna species, and comparing of field data. Compilation of Ecology and bio diversity data and their impact assessment on the study area, greenbelt development plan and environmental management plan for biological environment	

S. No.	Functional Areas		Name of the Expert	Period of Involvement	Signature
6	SE	FAE	Mr. V. Dhivakar	**Period:** January 2020 – till date **Task:** Site visit, and baseline socio-economic surveys. Collection of secondary data, discussion with stake holders and preparation of socio-economic status of the study area. Review of demographic characteristics, and supervision of baseline data collection. Collection and analysis of perception study carried out for the proposed project. CER activities/plan need based assessment for the proposed project.	
7	N	FAE	Mr. Vamsee Krishna Navooru	**Period:** January 2020 to November 2021 and April 2022 – till date **Task:** Identification of noise monitoring locations and measured the ambient noise levels generated due to various activities. Verification of Noise and traffic baseline data, and their impact assessment, identifying the probable impacts and suggested noise pollution control measures along with environmental management plan.	
8	SHW	FAE	Mr. Vamsee Krishna Navooru	**Period:** January 2020 to November 2021 and April 2022 – till date **Task:** Quantification of Municipal solid waste generation and management measures, quantification of hazardous waste generation with management measures.	
9	RH	FAE	Dr. J R Moses	**Period:** January 2020 – till date **Task:** Identification of hazards materials, fire accidents within the facility and validation of risk assessment & Disaster management plan along with the preparation of risk for the proposed unit with consequence analysis and mitigation measures	

EIA Team Members:

S. No	Name	Role
1.	Abraham Abishek Moses	TM for AP & WP
2.	Pravina Rachel Moses	TM for EB & WP
3.	Tamil Selvan	TM for EC (Sector - 4) TM for WP
4.	Ramrajan S	TM for EB
5.	Chelladurai	TM for SE
6.	Raj MP	TM for WP & LU
7.	Praveenkumaar R	FAA for AP & LU
8.	Uma Maheshwari	TM for LU
9.	Subathra T	FAA for AP & LU

AP - Air pollution monitoring, prevention and control

AQ - Meteorology, air quality modelling and prediction

LU - Land use

WP - Water pollution monitoring, prevention and control

EB - Ecology and biodiversity

SE - Socio-economics

N - Noise

SHW - Solid and hazardous waste management

RH - Risk assessment and hazards management

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LIST OF ACRONYMS

AAQM	– Ambient Air Quality Monitoring
ACC	– Air Cooled Condenser
AFBC	– Atmospheric Fluidized Bed Combustion
APC	– Air pollution Control Measures
CPCB	– Central Pollution Control Board
CTO	– Consent to Operate
CSR	– Corporate Social Responsibility
EIA	– Environmental Impact Assessment
EMC	– Environmental Monitoring Cell
EMP	– Environmental Management Plan
EHS	– Environment, Health and Safety
FBC	– Fluidized Bed Combustion
ETP	– Effluent Treatment Plant
GLC	– Ground Level Concentration
IMS	– Integrated Management System
IS	– Indian Standard
ISO	– Indian Standard Organisation
KLD	– Kilo Liters per Day
KVA	– Kilovolt ampere
LOS	– Level of Service
MEE	– Multiple Effect Evaporator
MT	– Metric Tonnage
MoEF& CC	– Ministry of Environment, Forests and Climate Change
MUV	– Multi Utility Vehicle
MW	– Mega Watt
NAAQs	– National Ambient Air Quality Standards
NABET	– National Accreditation Board for Education & Training
NABL	– National Accreditation Board for Testing and Calibration Laboratories
OHC	– Occupational Health Center
OSR	– Open Space Reservation
PPE	– Personal Protective Equipment
PPM	– Post Project Monitoring
PUC	– Pollution under Control
R&D	– Research and Development
RO	– Reverse Osmosis
SIPCOT	– State Industries Promotion Corporation of Tamil Nadu
SHE	– Safety, Health and Environment
SOI	– Survey of India
SPCB	– State Pollution Control Board
STP	– Sewage Treatment Plant
SUV	– Sports Utility Vehicle
TNPCB	– Tamil Nadu Pollution Control Board
TPH	– Tons per Hour
TTRO	– Tertiary Treatment Reverse Osmosis
TSDF	–Treatment, Storage and Disposal Facility
ZLD	– Zero Liquid Discharge

EXECUTIVE SUMMARY

1. Project Description

The tyre manufacturing facility at Oragadam, Sriperumbudur, Kancheepuram has R & D plant along with 4.6MW of coal based Co-generation (Captive) power plant which is operating with the valid CTO. Due to the increased need in the power requirement, ATL is proposed to set up an "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW". The Components of existing Co-generation plant has 4.6MW turbine, compressors, AFBC boilers of capacity 35TPH is available in main plant vide Consent order No. 2205243788473 dated 20.08.2022 and 60 TPH boiler is available for 4.6MW power plant vide Consent order No. 2108236606685 dated 11.11.2021. The combination of 35 TPH and 60 TPH boiler capacities will be utilized for the proposed expansion of 14.6MW power plant for which the CTE Amendment will be obtained.

In addition to the above, turbine of 10MW capacity with suitable Air Cooled Condenser will be installed within the existing facility for the proposed project. The installed capacity of existing thermal power plant is 7.5 MW; however, TNPCB restricted the thermal power plant to generate only 4.6 MW and issued CTO for the same.

The Terms of Reference application was submitted in the PARIVESH portal vide proposal no. SIA/TN/THE/50607/2020 dated 03.02.2020. This report is in accordance to the Terms of Reference (TORs) given for Environmental Clearance by the State Expert Appraisal Committee of the Ministry of Environment and Forestry, Climate Change as vide SEIAA-TN/F.No. 7412/SEAC/1(d)/ToR – 1298/2022 dated 26 October, 2022 and thus explores the scope of environmental impacts of the above plant (enclosed as **Annexure – 1**).

As per the issued ToR, baseline monitoring is performed from March to May 2024 and Draft EIA report has been prepared and submitted to TNPCB for public hearing meeting. After completion of public hearing, action plan along with PH Compliance will be addressed in Final EIA Report and to be submitted in parivesh portal for seeking Environmental Clearance.

Salient Features of the Proposed Project

S. No.	Particulars	Details
1.	Name of the project	"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW"
2.	Project Proponent	M/s. Apollo Tyres Limited
3.	Location	S.F No.491, Plot No.B-25, SIPCOT Industrial Growth Center, Oragadam, Sriperumbudur, Kancheepuram - 602105
4.	Site Coordinates	12°51'27.25"N and 79°56'40.59"E (Centroid).
5.	Project Category	The proposed project falls under Schedule 1(d) – Thermal Power

<table>
<tr><th>S. No.</th><th>Particulars</th><th>Details</th></tr>
<tr><td></td><td></td><td>Plant, Category – ‘B’.</td></tr>
<tr><td>6.</td><td>Product details</td><td>The existing and proposed product details are as follows;
<table>
<tr><th>S. No</th><th>Product</th><th>Existing (MW)</th><th>Proposed (MW)</th><th>After expansion (MW)</th></tr>
<tr><td>1</td><td>Co Gen power generation through Captive power plants</td><td>1 x 4.6</td><td>1 x 10</td><td>1 x 4.6
1 x 10</td></tr>
</table>
Note:
1. The valid Consent to Operate (Air & Water) is obtained for the existing 4.6 MW power plant and the same is enclosed as Annexure – 2a.
2. The valid Consent to Operate (Air & Water) is obtained for the whole plant is enclosed as Annexure – 2b.</td></tr>
<tr><td>7.</td><td>Land Area</td><td>The total area and built area of the whole plant are 50.72 Ha (125.35 acres) and 27.304 Ha (67.469 acres) respectively for the full tyre plant. The proposed project details are as below;
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Details</th><th colspan="2">Existing</th><th colspan="2">Proposed</th><th colspan="2">After expansion</th></tr>
<tr><th>Ha.</th><th>Acres</th><th>Ha.</th><th>Acres</th><th>Ha.</th><th>Acres</th></tr>
<tr><td>1</td><td>Built up area*</td><td>0.882</td><td>2.179</td><td>0.0357</td><td>0.0882</td><td>0.9177</td><td>2.2672</td></tr>
</table>
The layout of the project is enclosed as Annexure – 3.
Greenbelt development:
1. The greenbelt was developed in the existing premises over an extent of 12.51 Ha (30.913 acres), i.e., 24.66%.
2. Furthermore, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 of 6.70 Ha (16.55 acres) which is adjacent to the site. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.
3. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. The allocation letter from the SIPCOT is enclosed as the Annexure – 4.
The land document of the whole plant is enclosed as Annexure – 5.</td></tr>
<tr><td>8.</td><td>Water Requirement</td><td>The detailed total water requirement of the project is as follows;
<table>
<tr><th>S. No</th><th>Details</th><th>Existing (KLD)</th><th>Proposed (KLD)</th><th>After expansion (KLD)</th></tr>
<tr><td>1</td><td>Process</td><td>338.00</td><td>302.00</td><td>640.00</td></tr>
<tr><td>2</td><td>Domestic</td><td>7.00</td><td>0.75</td><td>7.75</td></tr>
<tr><td colspan="2">Total</td><td>345.00</td><td>302.75</td><td>647.75</td></tr>
</table>
Source:
• The freshwater of 7 KLD is utilized for domestic purposes and</td></tr>
</table>

S. No.	Particulars	Details
		TTRO water of 338 KLD is utilized for processes. • The freshwater and TTRO water is being sourced from SIPCOT – Oragadam and the same will be followed after the expansion also. • The water agreement between SIPCOT – Oragadam and ATL is enclosed as **Annexure –6.** Water Balance Diagram for the existing and after expansion project is enclosed as **Annexure – 7.**

S. No.	Particulars	Details
9.	Wastewater Generation and Disposal method	**Effluent Management:** **Disposal method:** The generated effluent is being treated in RO followed by MEE of existing combined ETP capacity of 1100 KLD (300KLD X3; 200 KLD X 1) and the same will be followed after the expansion. In addition, ZLD is being followed, and the same will be followed after expansion as well. **Sewage Management:**
10.	Power requirement	**Construction phase:** 50KVA from DG sets and fuel consumption is 100 liters per day. **Operation Phase:**

Effluent Management:

S. No	Details	Existing (KLD)	Proposed (KLD)	After expansion (KLD)
1	RO Reject	67.5	12.5	80.0
2	DM Plant regeneration	20.5	-12.5	8.0
3	Auxiliary Cooling Blow Down	24.0	2.0	26.0
4	Boiler Blow Down	34.5	10.5	45.0
Total		**146.5**	**12.5**	**159.0**

Sewage Management:

S. No	Details	Sewage (KLD)	Treatment Unit capacity (KLD)	Disposal Method
1	Existing	7	350 (1X150 and 2X100)	The generated sewage is being treated in existing combined STP of capacity 350 KLD and the same will be followed after expansion. The treated water is being used greenbelt development.
2	Proposed	0.75		
3	After expansion	7.75		

Operation Phase:

S.	Details	Existing	Proposed	After

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>No</th><th></th><th>(MW)</th><th>(MW)</th><th>expansion (MW)</th></tr>
<tr><td>1</td><td>Power requirement</td><td>4.6</td><td>10</td><td>14.6</td></tr>
</table>
Source: The power requirement is being met through the existing power plant and the same will be followed after expansion.
</td></tr>
<tr><td>11.</td><td>Manpower requirement</td><td>
Construction phase: 100 nos
Operation phase:
<table>
<tr><th>S. No</th><th>Details</th><th>Existing (Nos)</th><th>Proposed (Nos)</th><th>After expansion (Nos)</th></tr>
<tr><td>1</td><td>Manpower</td><td>45</td><td>5</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>12.</td><td>Project Cost</td><td>INR. 40 crores</td></tr>
</table>

2. Description of the Environment

i. Air Environemnet

The ambient air quality has been monitored at 8 locations as per NAAQS, 2009 within the study area. The results obtained are summarised as below:

- The average baseline levels of PM_{10} vary from 55.00 to 69.91 µg/m³.
- The average baseline levels of $PM_{2.5}$ vary from 31.90 µg/m³ to 41.95 µg/m³.
- The average baseline levels of SO_2 vary from 9.70 µg/m³ to 13.44 µg/m³.

1. The average baseline levels of NO_2 vary from 19.18 µg/m³ to 26.88 µg/m³.

ii. Noise Environment

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

- In Industrial area (Project site, vaipur, Panayur, Panrutti, Vallam Kandigai), day time noise level was about 63.8 dB (A) to 68.8 dB (A) and 57.6 dB (A) 60.1 dB (A) during night time, which is within prescribed limit by CPCB for Industrial area (75 dB (A) Day time & 70 dB (A) Night time).
- In Residential area (Mattur, Umaiyaparanacheri, Sirumangadu) day time noise levels varied from 53.1 dB (A) to 54.9 dB (A) and night time noise levels varied from 43.2 dB (A) to 44.8 dB (A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area are within the limit prescribed by CPCB for Residential area (55 dB (A) Day time & 45 dB (A) Night time).

iii. Surface water Quality

Surface water sample results are discussed below:

- Water sampling results are compared with Surface water standards IS 2296:1992.
- pH in the collected surface water samples varies between 6.75 to 8.23 which is within the limit of IS 2296:1992.

- The Total Dissolved Solids (TDS) value of collected surface water sample ranges from 300 mg/l to 787 mg/l
- The Total hardness value of the collected surface water sample ranges between 130 mg/l to 395 mg/l
- BOD value of surface water varies from 2 mg/l to 4 mg/l
- COD value of surface water varies from 12 mg/l to 32 mg/l

iv. Ground water Quality

A summary of analytical results are presented below:

- The ground water results of the study area indicate that the pH range varies between 6.81 and 7.41. It is observed that the pH range is within the permissible limit of IS 10500:2012.
- The Total Dissolved Solids range of the collected ground water sample is varied between 328 mg/l – 732 mg/l.
- The acceptable limit of the chloride content is 250mg/l and permissible limit is 1000 mg/l. The chloride content in the collected ground water samples in the study area ranges between 73.52 mg/l – 219.30 mg/l.
- The acceptable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. the sulphate content in the collected ground water samples in the study area is varied between 29.4 mg/l – 88.9 mg/l. It is observed that all the samples are meeting the acceptable limit of the IS 10500: 2012.
- The Total hardness ranges is between 170 mg/l – 395 mg/l for ground water samples. It is observed that all the samples are within the permissible limit of the IS 10500: 2012.

v. Soil Environment

Summary of analytical results

- The pH of the soil samples ranged from 6.22 to 7.24, indicating that the soils are slightly acidic to moderately alkaline in nature.
- Conductivity of the soil samples ranged from 95 µmhos/cm to 365 µmhos/cm.
- Nitrogen content in the collected soil samples ranged from 84.30 mg/kg to 142.60 mg/kg.
- Phosphorous content ranged from 9.00 mg/kg to 15.30 mg/kg.
- Potassium content ranges from 45.20 mg/kg to 76.40 mg/kg.

vi. Biological Environment

The project site is found in non-forest area. Therefore, management plan is not required. The proposed project will not have any impact of terrestrial ecology of the area. However, the project area has greenbelt by planting native species to maintain the good environment.

vii. Socio-economic Environment

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

3. Anticipated Environmental Impacts and Mitigation Measures

- **Air environment:** Electrostatic Precipitator is provided with adequate stack height of 75m from ground level.
- The fly ash generated from the process is being collected in the storage silo and disposed to the authorised brick manufacturer by truck covered in tarpaulin and the same is proposed to follow after expansion.
- Fugitive emissions from the coal crusher and coal transporation is being prevented using bag filter and enclosed system / belt transfer system respectively. These control measures will be carried out after expansion as well.
- **Water Environment:** The sewage of 7.75 KLD is being routed to the existing combined STP (capacity: 150KLD X 1, 100KLD X 2) which is common to R&D plant, power plant and main tyre plant.
- The generated effluent of 146.5KLD is being treated in the existing combined ETP (capacity: 300KLD X 3 & 200KLD & 1) which is common to R&D plant, power plant and main tyre plant. After expansion, 159 KLD of effluent will be treated in the same existing combined ETP facility and will maintain the ZLD process.
- If contaminated, proper expertise will be brought to schematize the various recharge mechanism to reduce or nullify the impact effects.
- **Solid and Hazardous waste:** The wastes generated will be stored in temporary storage facility and transferred to nearby Treatment, Storage and Disposal Facility (TSDF) and also to the approved vendors of State Pollution Control Board (SPCB) landfill and Co-processing.
- These waste will be segregated & stored and will be disposed off by giving it to the TNPCB authorized dealers/recyclers/TSDF within a stipulated period of time (90 days).
- Hazardous waste will be disposed to TNPCB authorized TSDF/recyclers as applicable.
- **Greenbelt Development:** The project site is surrounded by the existing greenbelt of 24.66%. Additionally 8,312 no of trees were developed as proposed greenbelt in 16.55

acres, adjacent to the site. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.

4. Environmental Monitoring Programme

Monitoring of environmental samples will be done as per the guidelines provide by MoEF&CC/CPCB/TN-PCB. The methods conducted or applied are approved or sanctioned by the any recognized body or authority i.e. MoEF&CC/CPCB/TNPCB.

5. Additional Studies

Public Hearing: Since the site is located in Notified SIPCOT Industrial Growth Center at Oragdam, Public Hearing may kindly be exempted for the proposed project as per 7-III Stage (3) (b) of the EIA Notification, 2006 and its amendments.

Hazard Identification and Risk Assessment (HIRA): It is carried for identification of undesirable events that can lead to a hazard, the analysis of hazard of this undesirable event, that could occur and usually the estimation of its extent, magnitude and likelihood of harmful effects. It is widely accepted within industry in general that the various techniques of risk assessment contribute greatly toward improvements in the safety of complex operations and equipment.

Rehabilitation and Resettlement (R&R): As the proposed project will be carried out in the existing premises, the project does not involve in the Resettlement and Rehabilitation issue.

6. Project Benefits

i) By providing captive power plant, there would be decreased load on the state electricity grid.
ii) Socio-economic benefit to the locals as it would provide employment during construction and in operation phase
iii) The project site shall require no displacement of habitation and away from the habitation area, as it is located inside the SIPCOT industrial area.
iv) The infrastructure of Mathur Govt High School and Chennakuppam Govt Adi Dravidar Welfare Hr Sec School will be developed under CER activity.

7. Environmental Management Plan

i) **Greenbelt Development:** The total area of the site is 50.71 Ha (125.307 acres), out of which 12.51 Ha (30.913 acres) of land is earmarked to develop greenbelt of 24.66% in the site premises. Currently, total of 3,314 no of trees were developed in the allocated area for greenbelt.

Additionally, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 to an extent of 16.55 acres (6.70 Ha) which is adjacent to the site. Hence, the additional land allocated by SIPCOT for the development of greenbelt is considered as the proposed greenbelt development for this project. In this greenery parcel, total of 8,312 no of plants has been planted

and being maintained by the ATL. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.

ii) **Corporate Environmental Responsibility:** The Company is aware of the obligations towards the Environment and to fulfil the social obligations. As per OM F. No: 22-65/2017-IA.III dated 1st May 2018 M/s. Apollo Tyres Limited will allocate 1.0% of the project cost (40 Crore) towards CER, i.e., 1.0% of 40 Crores = 40 lakh.

iii) **Environmental Management Plan:** The cost estimate for the Environmental Management Plan is provided in the following table;

Budget estimation for EMP

S. No.	Description	Capital Cost (Rs. In Lakhs)	Operating cost (Rs. In Lakhs)
1.	Landscaping & Gardening	5.0	1.0
2.	Solid waste Management (Organic waste converter)	10.0	2.5
3.	Rainwater harvesting	8.0	0.5
4.	Air pollution Control measures	3.5	1.0
5.	Energy Conservation (Solar Panel)	15.0	1.5
6.	Miscellaneous	8.5	4.0
Total Cost		**50.0**	**10.5**

CHAPTER – 1

INTRODUCTION

1. INTRODUCTION

1.1 Purpose of the Report and About the Project

M/s. Apollo Tyres Limited (ATL) is an international tyre manufacturer and the leading tyre brand in India. The company has a total of six manufacturing units - 4 in India and 1 each in the Netherlands and Hungary. The tyre manufacturing facility at Oragadam, Sriperumbudur, Kancheepuram has R & D plant along with 4.6MW of coal based Co-generation plant in it which is operating with the valid CTO. Due to the increasing need in the power requirement, ATL is proposed to set up an "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 X 10 MW".

The Components of existing Co-generation plant has 4.6MW turbine, compressors, AFBC boilers of capacity 35TPH is available in main plant vide Consent order No. 2205243788473 dated 20.08.2022 and 60 TPH boiler is available for 4.6MW power plant vide Consent order No. 2108236606685 dated 11.11.2021. The combination of 35 TPH and 60 TPH boiler capacities will be utilized for the proposed expansion of 14.6MW power plant for which the CTE Amendment will be obtained.

In addition to the above, for the proposed project, turbine of capacity 10MW with suitable Air Cooled Condenser will be installed within the existing facility. The installed capacity of existing thermal power plant is 7.5 MW; however, TNPCB restricted the thermal power plant to generate only 4.6 MW and issued CTO for the same.

The proposed project is for the Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW" at the existing tyre manufacturing unit in Oragadam SIPCOT (State Industries Promotion Corporation of Tamil Nadu), Kancheepuram District of Tamil Nadu by M/s. Apollo Tyres Limited. The Terms of Reference application was submitted in the PARIVESH portal vide proposal no. SIA/TN/THE/50607/2020 dated 03.02.2020. This report is in accordance to the Terms of Reference (TORs) given for Environmental Clearance by the State Expert Appraisal Committee of the Ministry of Environment and Forestry, Climate Change as vide SEIAA-TN/F.No. 7412/SEAC/1(d)/ToR – 1298/2022 dated 26 October, 2022 and thus explores the scope of environmental impacts of the above plant (enclosed as **Annexure – 1**).

The proposed project is located inside existing tyre manufacturing unit at the Oragadam SIPCOT. The Environmental Clearance was not obtained for SIPCOT (State Industries Promotion Corporation of Tamil Nadu) - Oragadam since it was established before the EIA notification, 2006.

The proposed project involves "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW" which falls under Schedule

1(d) i.e. Thermal Power Plants, of Category "B" (i.e. less than 500 MW, coal based) as per the EIA notification 2006 and its subsequent Amendment. Baseline monitoring for the project was undertaken from January 2023 – March 2023. As per the issued ToR, Draft EIA report has been prepared and submitted to TNPCB for public hearing meeting and after completion of public hearing the final EIA report will be submitted in Parivesh Portal for obtaining Environmental Clearance.

1.2 Identification of the Project Proponent

Apollo Tyres Ltd is an international tyre manufacturer and the leading tyre brand in India. It is built around the core principles of creating stakeholder value through reliability in its products and dependability in its relationships. The company has a total of six manufacturing units --4 in India and 1 each in the Netherlands and Hungary. India's fifth and 7th globally, is coming up in Andhra Pradesh.

The company markets its products under its two global brands – Apollo and Vredestein, and its products are available in over 100 countries through a vast network of branded, exclusive and multi-product outlets. The product portfolio of the company includes the entire range of passenger car, SUV, MUV, light truck, truck-bus, two-wheeler, agriculture, industrial, specialty, bicycle and off-the-road tyres, and retreading material and tyres.

Headquartered in Gurgaon, India, the company has a turnover of US$ 2.3 billion and ranks among the global top 20 tyre makers. Apollo Tyres has been recognised as the 'Best Company To Work For' both in Asia and Europe in the recent past, and has won several accolades for its HIV-AIDS awareness and prevention initiative for the trucking and allied communities, and for its Waste Management initiatives in the community.

In November 2015, Apollo Tyres acquired Reifencom GmbH, one of the largest tyre distributors in Germany, with both online and offline presence. In May 2009, the company acquired Apollo Vredestein BV (originally Vredestein Banden BV) in the Netherlands, producer of niche high end passenger car and specialty tyres, and with an extensive distribution network across Europe.

1.3 Brief Description of Nature, Size, Location of the project & its importance of the Country

1.3.1 Nature, Size & Location of the Project

The proposed project is located at S.F. No. 491, Plot no. B-25, SIPCOT Industrial Growth Center, Oragadam, Sriperumbudur, Kancheepuram District – 602 105. The built-up area of the existing 4.6MW plant is 0.882 Ha (2.179 acres) whereas the proposed project is adjacent to the existing facility over an extent of 0.036 Ha (0.088 acres). The overall area of the plant is 50.72 Ha (125.307 acres). The project falls in SOI topo sheet no. D44T13 and lies between 12°51'27.25"N and 79°56'40.59"E (Centroid). The project site co-ordinates are given in the **Table 1-1** and Location map

of the project site is given in **Figure 2-1**. The salient features of the proposed project site are represented in **Table 1-2**.

Table 1-1 Coordinates of the Project site

S.No	Latitude	Longitude
1	2°51'44.61"N	79°56'46.21"E
2	12°51'15.44"N	79°56'52.61"E
3	12°51'9.49"N	79°56'39.78"E
4	2°51'11.91"N	79°56'39.56"E
5	12°51'11.00"N	79°56'34.31"E
6	2°51'25.64"N	79°56'31.91"E
7	2°51'25.67"N	79°56'33.25"E
8	2°51'24.18"N	9°56'33.47"E
9	12°51'24.37"N	79°56'34.05"E
10	12°51'26.49"N	79°56'33.82"E
11	12°51'26.53"N	79°56'31.63"E
12	12°51'40.85"N	79°56'28.36"E
13	2°51'42.57"N	79°56'36.50"E
14	2°51'40.01"N	79°56'37.05"E
15	12°51'41.13"N	79°56'42.84"E
16	2°51'43.78"N	79°56'42.30"E

Table 1-2 Salient features of the Proposed Project

<table>
<tr><th>S. No.</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1.</td><td>Name of the project</td><td>Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW”.</td></tr>
<tr><td>2.</td><td>Project Proponent</td><td>M/s. Apollo Tyres Limited</td></tr>
<tr><td>3.</td><td>Location</td><td>S.F No.491, Plot No.B-25, SIPCOT Industrial Growth Center, Oragadam, Sriperumbudur, Kancheepuram - 602105</td></tr>
<tr><td>4.</td><td>Site Coordinates</td><td>12°51'27.25"N and 79°56'40.59"E (Centroid).</td></tr>
<tr><td>5.</td><td>Project Category</td><td>The proposed project falls under Schedule 1(d) – Thermal Power Plant, Category – ‘B’.</td></tr>
<tr><td>6.</td><td>Product details</td><td>The existing and proposed product details are as follows;
<table>
<tr><th>S. No</th><th>Product</th><th>Existing (MW)</th><th>Proposed (MW)</th><th>After expansion (MW)</th></tr>
<tr><td>1</td><td>Co Gen power generation through Captive power plants</td><td>1X4.6</td><td>1X10</td><td>1X4.6
1X10</td></tr>
</table>
Note:
1. The valid Consent to Operate (Air & Water) is obtained for the existing 4.6 MW power plant and the same is enclosed as Annexure – 2a.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>2. The valid Consent to Operate (Air & Water) is obtained for the whole plant is enclosed as Annexure – 2b.</td></tr>
<tr><td>7.</td><td>Land Area</td><td>The total area and built area of the whole plant are 50.72 Ha (125.35 acres) and 27.304 Ha (67.469 acres) respectively for the full tyre plant. The proposed project details are as below;
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Details</th><th colspan="2">Existing</th><th colspan="2">Proposed</th><th colspan="2">After expansion</th></tr>
<tr><th>Ha.</th><th>Acres</th><th>Ha.</th><th>Acres</th><th>Ha.</th><th>Acres</th></tr>
<tr><td>1</td><td>Built up area</td><td>0.882</td><td>2.179</td><td>0.0357</td><td>0.0882</td><td>0.9177</td><td>2.2672</td></tr>
</table>
The layout of the project is enclosed as Annexure – 3.

Greenbelt development:
1. The greenbelt was developed in the existing premises over an extent of 12.51 Ha (30.913 acres), i.e., 24.66%.
2. Furthermore, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 of 6.70 Ha (16.55 acres) which is adjacent to the site. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.
3. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. The allocation letter from the SIPCOT is enclosed as the Annexure – 4.

The land document of the whole plant is enclosed as Annexure – 5.</td></tr>
<tr><td>8.</td><td>Water Requirement</td><td>The detailed water requirement of the project is as follows;
<table>
<tr><th>S. No</th><th>Details</th><th>Existing (KLD)</th><th>Proposed (KLD)</th><th>After expansion (KLD)</th></tr>
<tr><td>1</td><td>Process</td><td>338</td><td>302</td><td>640</td></tr>
<tr><td>2</td><td>Domestic</td><td>7</td><td>0.75</td><td>7.75</td></tr>
<tr><td colspan="2">Total</td><td>345</td><td>302.75</td><td>647.75</td></tr>
</table>
Source:
• The freshwater of 7 KLD is utilized for domestic purposes and TTRO water of 338 KLD is utilized for processes.
• The freshwater and TTRO water is being sourced from SIPCOT – Oragadam and the same will be followed after the expansion also. The water agreement between SIPCOT – Oragadam and ATL is enclosed as Annexure –6.

Water Balance Diagram for the existing and after expansion project is enclosed as Annexure – 7.</td></tr>
<tr><td>9.</td><td>Wastewater Generation and Disposal method</td><td>Effluent Management:
<table>
<tr><th>S. No</th><th>Details</th><th>Existing (KLD)</th><th>Proposed (KLD)</th><th>After expansion (KLD)</th></tr>
<tr><td>1</td><td>RO Reject</td><td>67.5</td><td>12.5</td><td>80.0</td></tr>
<tr><td>2</td><td>DM Plant regeneration</td><td>20.5</td><td>-12.5</td><td>8.0</td></tr>
<tr><td>3</td><td>Auxiliary Cooling Blow Down</td><td>24.0</td><td>2.0</td><td>26.0</td></tr>
</table></td></tr>
</table>

4	Boiler Blow Down	34.5	10.5	45.0
Total		**146.5**	**12.5**	**159.0**

Disposal method:

The generated effluent is being treated in RO followed by MEE of existing combined ETP capacity of 1100 KLD (300KLD X3; 200 KLD X 1) and the same will be followed after the expansion. In addition, ZLD is being followed, and the same will be followed after expansion as well.

Sewage Management:

S. No	Details	Sewage (KLD)	Treatment Unit capacity (KLD)	Disposal Method
1	Existing	7	350 (1X150 and 2X100)	The generated sewage is being treated in existing combined STP of capacity 350 KLD and the same will be followed after expansion. The treated water is being used greenbelt development.
2	Proposed	0.75		
3	After expansion	7.75		

10.	Power requirement	Construction phase: 50KVA from DG sets and fuel consumption is 100 liters per day. Operation Phase:

S. No	Details	Existing (MW)	Proposed (MW)	After expansion (MW)
1	Power requirement	4.6	10	14.6

Source: The power requirement is being met through the existing power plant and the same will be followed after expansion.

11.	Manpower requirement	Construction phase: 100 nos Operation phase:

S. No	Details	Existing (Nos)	Proposed (Nos)	After expansion (Nos)
1	Manpower	45	5	50

12.	Project Cost	INR. 40 crores

1.4 Scope of the Study – details of regulatory scoping carried out

The study is limited to the established site, covering 10km radius around this stretch. Thus in the current EIA the production of "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 10 MW" and the surrounding 10 km radius are considered in this impact assessment study.

This EIA is prepared for the EC clearance as per EIA notification 2006 and its amendments, it mainly consists of baseline study of project site covering 10km radius of the site, anticipated environmental impacts, risk assessment, disaster management plan and the environmental management plan.

The scope of the study has been based on EIA notification 2006, Generic Structure of Environmental Impact Assessment Document. Work mentioned includes an assessment study of and their impact on the region. This study puts forward the most effective ways to protect the environment from increasing pollution caused by the burgeoning industrial development and recommendations for environmental-friendly development initiatives in the region.

This EIA report presents the existing baseline scenario and the assessment and evaluation of the environmental impacts that may rise during the construction and operational phases of the project. This report also highlights the Environmental Monitoring Program of the project and the post project monitoring program. In terms of the EIA Notification of the MoEF&CC dated 14thSeptember 2006 and subsequent amendments.

1.4.1 Structure of the Report

The EIA report comprises of 12 chapters as under complying of EIA notification 2006 & its amendments.

Chapter 1: Introduction

Introductory information is presented in this Chapter. The introduction chapter provides background of the project, project proponent and describes the objective of this document. The purpose and organization of the report is also presented in this chapter.

Chapter 2: Project Description

This Chapter includes project Description and Facilities in detail.

Chapter 3: Description of the Environment

This Chapter provides baseline environmental status of Environmental Components (Primary data) delineating meteorological details of the project site and surrounding area.

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures

This Chapter presents the analysis of impacts on the environmental and social aspects of the project because of the establishment of the plan and thereby suggesting the mitigation measures.

Chapter 5: Analysis of Alternatives

This chapter includes the justification for the selection of the project site from Environmental point of view as well as from economic point of view so that the technology will be affordable.

Chapter 6: Environmental Monitoring Program

This chapter will include the technical aspects of monitoring the effectiveness of mitigation measures, which will include the measurement methodologies, frequency, location, data analysis, reporting schedules etc.

Chapter 7: Additional Studies

This chapter will detail about the Public Consultation sought regarding the project (if applicable). It will also identify the risks of the Project in relation to the general public and the surrounding environment during construction and operation phases of the plant and thereby presents Disaster Management Plan. Social impact assessment and R&R action plans and any other studies carried out for the project as specified in the ToR.

Chapter 8: Project Benefits

This chapter deals with the improvement in physical and social infrastructures, employment potential and other tangible benefits.

Chapter 9: Environmental cost Benefit Analysis

Not recommended during scoping stage

Chapter 10: Environmental Management Plan

This is the key Chapter of the report and presents the mitigation plan, covers the institutional and monitoring requirements to implement environmental mitigation measures and to assess their adequacy during project implementation.

Chapter 11: Summary and Conclusion

This chapter summarizes the information given in Chapters in this EIA/EMP report and the conclusion based on the environmental study, impact identification, mitigation measures and the Environmental Management Plan.

Chapter 12: Disclosure of Consultant

Names of consultants engaged in the preparation of the EIA/EMP report along with their brief resume and nature of Consultancy rendered are included in this Chapter.

1.4.2 Methodology Adopted for the Study

The Environmental Impact Assessment is a management tool to identify, frame and prioritize the environmental issues in such a way so as to work out the mitigation measures to allow the negative impacts to be minimized or to be avoided during actual operation of the established project. To conduct the Environmental Impact Assessment study, it is necessary to plan and execute the study in a scientific manner.

Baseline data was collected during January to March 2023

Ambient Air Quality (AAQ) was measured at eight (08) locations in the study area as per the methods and procedures recommended by Central Pollution Control Board (CPCB). Air quality sampling was undertaken for a period of 12 weeks with a total of 24 samples per site was taken as per the MoEF&CC guidelines. All 13 Parameters as per NAAQ standards were analysed. The measured ambient air quality data was compared with that of the prevailing National Ambient Air Quality Standards and this will also form the basis for predicting the cumulative air quality scenario due to the operation of the existing industrial area.

Hydro-geological status was studied based on the secondary published long-term data. Data on sub-surface soil profile and also bore-log data in the study area was obtained. Ground water samples from eight (08) locations were analysed as per the terms of reference for all the designated parameters. The measured values were compared with drinking water standards. Secondary data on the regional ground water status was also collected from the Central Ground Water Board and the State Ground Water Board. All seasonal streams, rivers and water bodies located within the study area were mapped through latest remote sensing data under land use and land cover study. Details about the major cropping pattern and irrigation methods etc were studied with secondary sources and also published district census data. Details of the surface water quality in the study area were studied with secondary sources.

Land use and land cover was mapped using remote satellite imagery. The data was processed using applicable software models and level 2 land use classification within the study area was developed. Soil samples were also collected at eight (08) locations and all relevant parameters such as texture, nutrients, heavy metals and other parameters were analysed in the soil samples.

Flora and fauna were undertaken with secondary sources in the study area. Bio-diversity density and abundance were estimated. Primary socio-economic survey was undertaken in the study area to capture the socio-economic conditions, major occupation of the people, drinking water and sanitation facilities, transportation and other amenities in the study area, with a specific reference to the villages located within five (5) km radius (Category-I) of the project site and villages located within 5 to 10 km radius (Category-II) of the project site.

In addition to the above, district level census data published by District Census Handbook was also collected for a detailed analysis on the socio-economic aspects. Since, there are no settlements at the proposed project site, detailed Rehabilitation and Resettlement studies are not envisaged under this study; however, the indirect impacts on the local and regional community due to land acquisition were studied.

A typical review on various pollution control systems proposed, details of wastes and discharges that are envisaged from the proposed project were also undertaken. Such inputs are adopted while

predicting various environmental impacts due to operation of the facility and also to suggest an appropriate environmental management plan and environmental monitoring plan.

As a part of the environmental impact assessment study, an attempt was made to predict the possible and likely impacts on background environment. Likely air quality impacts due to release of emissions from stacks were modelled using AERMOD model.

Ground level concentration of criteria pollutants such as Particulate Matter, Sulphur Dioxide, and Oxides of Nitrogen were estimated using MoEF&CC approved AERMOD model. Maximum ground level concentrations were predicted and concentration isopleths of the above mentioned pollutants were plotted.

The predicted ground level concentrations of the respective pollutants were added to the prevailing baseline concentrations of the designated pollutants to assess the likely cumulative post project scenario and such values were compared with the National Ambient Air Quality Standards.

In addition to the above aspects, the positive environmental benefits arising from community development plans, ecological and biodiversity enhancement aspects due to development of plantation and green-cover development in the project site were also studied. Based on a detailed environmental impact assessment study, a comprehensive report on the environmental management plan was developed covering the following aspects: construction phase environmental management plan, air quality management plan, noise and water quality management plan, wastewater treatment, reuse, recycling and disposal programme, rainwater harvesting plan, socio-economic and community development plan, ecological and biodiversity enhancement plan. An outline of the proposed environmental management systems, environmental cell and environmental monitoring programme were also presented in this report.

A preliminary risk assessment study and Disaster Management study, was undertaken to assess the residual risks, if any, due to storage and handling of diesel for DG sets. Based on the risk assessment study, a preliminary fire safety and occupational health management plan was suggested. A road map for onsite emergency and disaster management plan was suggested.

The EIA has been comprehended with detailed Environmental Baseline Monitoring (EBM) and Environmental Management Plan for scientific implementation of the existing project for water and wastewater management to have the operations in an environmentally compatible way.

The process followed for this EIA report is composed of the following stages:

- Study of project information.
- Collection of detailed project management plan/report.
- Secondary & Baseline data collection.

- Impact identification, Prediction & Evaluation.
- Mitigation measures & delineation of EMP.
- Risk assessment, safety & disaster management plan.
- Review & finalization of EIA Report.
- Submission of EIA report for implementation of mitigation measures & EMP as well as necessary clearances from relevant Authority.

The distinct features of methodology for the EMP are as follows,

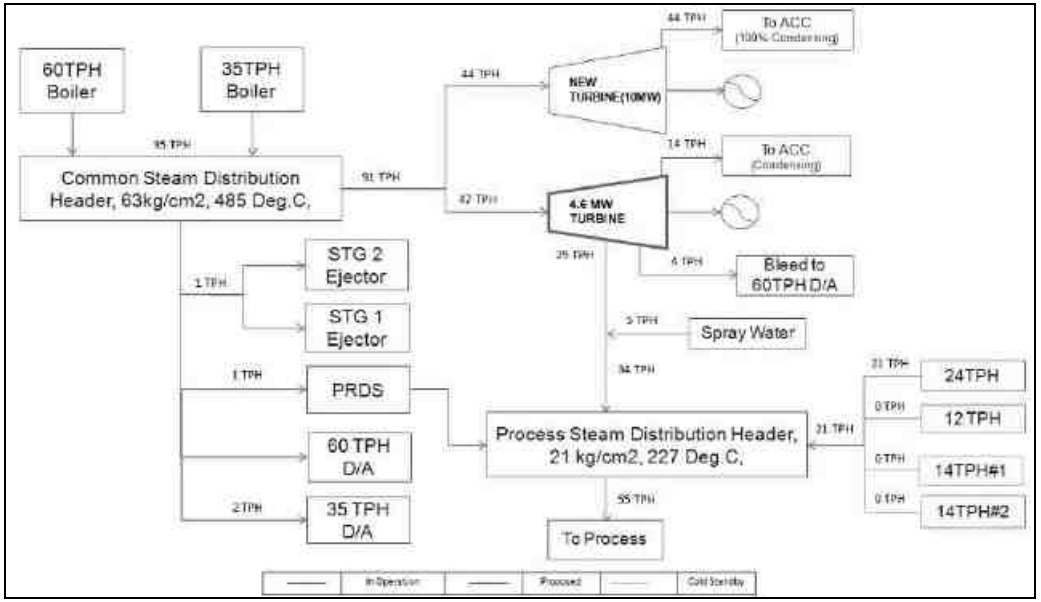
- The existing environmental quality was assessed based on primary and secondary data.
- Potential environmental impacts including potential benefits were identified and assessed.
- An EMP, comprising environmental management strategies was formulated to maintain and enhance the environmental quality around the project site.
- Risk Assessment (RA) to identify the risk involved in the project.
- A scheduled Disaster Management Plan (DMP) to enunciate a sequence of emergency response to preserve life and property which may be threatened in accidental damage of the which may result in fire to environment etc.

Keeping in view the nature of activities envisaged and the various environmental guidelines available, it was decided to cover an area of 10 km radius from the center of the existing project site for the purpose of Environmental Management Studies (EMS).

1.5 ToR Compliance

Table 1-3 ToR Compliance

i. Remarks by SEAC

<table>
<tr><th>S. No</th><th>ToR Conditions</th><th>Compliance</th></tr>
<tr><td>1.</td><td>Details of surplus steam generated from the tyre factory process and how much of it has been utilized in the 1X4.6MW Plant and whether any surplus steam would still be available for proposed 1X10MW Plant.</td><td>Process Steam Calculation:
<table>
<tr><th>S. No.</th><th>Description</th><th>UOM</th><th>Value</th></tr>
<tr><td>1</td><td>Predicted Plant Production
(12K TBR, 16K PCR, 1.7K LTR)</td><td>MT</td><td>960</td></tr>
<tr><td>2</td><td>Specific steam Consumption of Process</td><td>kg/kg</td><td>1.2</td></tr>
<tr><td>3</td><td>Average Steam Demand</td><td>TPH</td><td>48</td></tr>
<tr><td>4</td><td>Peak Steam Demand</td><td>% from Average</td><td>15</td></tr>
<tr><td>5</td><td>Total Process Steam Demand</td><td>TPH</td><td>55</td></tr>
</table>
Steam Balance Chart:

</td></tr>
</table>

<table>
<tr><td></td><td></td><td>As per our Steam Balance Chart, 47 TPH steam is being generated from the Boilers (60 TPH). 47 TPH is being utilized in 4.6 MW Plant.

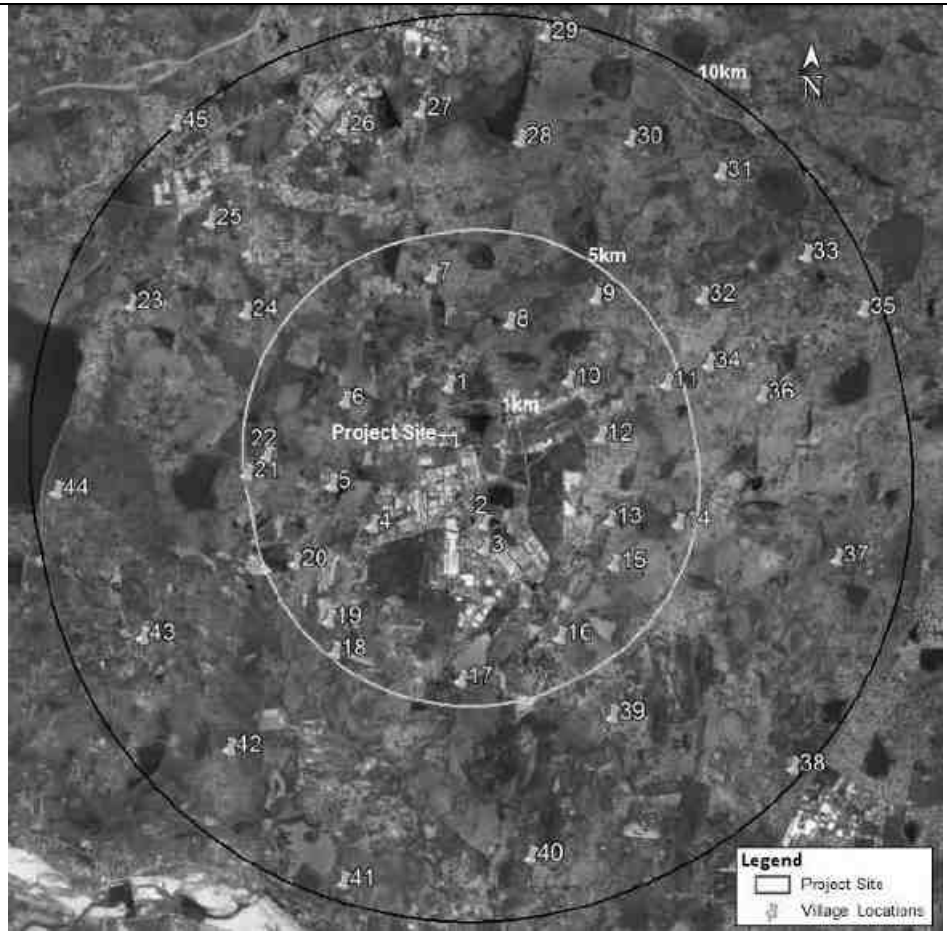
However as per the existing consent order we have the following boilers i.e., surplus steam already installed and available for service as follows

1. 35TPH Boiler*
2. 60TPH Boiler*
*Note: AFBC boilers of capacity 35TPH is available in main plant vide Consent order No. 2205243788473 dated 20.08.2022 and 60 TPH boiler is available for 4.6MW power plant vide Consent order No. 2108236606685 dated 11.11.2021. The combination of 35 TPH and 60 TPH boiler capacities will be utilized for the proposed expansion of 14.6MW power plant for which the CTE Amendment will be obtained.</td></tr>
<tr><td>2.</td><td>Details of steam proposed to be utilized in 1X10MW and its source</td><td>47 Tons Per Hour (TPH) steam from the Existing Boilers (60 TPH & 35 TPH) and its source is Coal. It is proposed to utilize coal and rice husk as fuel for the proposed expansion of 14.6 MW Plant. The quantity of coal and rice husk required for the proposed project will be 105MT/d and 95 MT/d respectively.</td></tr>
<tr><td>3.</td><td>As the proposal is to be located in fast growing urban habitat, the proponent should explore the usage alternate fuel viz, RLNG, Biomass, Municipal waste etc. for 1X10MW instead of coal</td><td>1. The usage of biomass (Rice husk) fuel as 35% of the total fuel quantity to be considered from the year 2025 and the estimated quantity in the upcoming year is given in the below table;
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Fuel Type</th><th colspan="2">FY'25</th><th colspan="2">FY'26</th><th colspan="2">FY'27</th><th colspan="2">FY'28</th><th colspan="2">FY'39</th></tr>
<tr><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th></tr>
<tr><td>1</td><td>Bio-mass (Rice Husk)</td><td>35</td><td>95</td><td>43</td><td>118</td><td>52</td><td>142</td><td>61</td><td>166</td><td>69</td><td>189</td></tr>
<tr><td>2</td><td>Coal</td><td>65</td><td>179</td><td>57</td><td>156</td><td>48</td><td>132</td><td>39</td><td>108</td><td>31</td><td>85</td></tr>
<tr><td colspan="2">Total</td><td>100</td><td>274</td><td>100</td><td>274</td><td>100</td><td>274</td><td>100</td><td>274</td><td>100</td><td>274</td></tr>
</table></td></tr>
<tr><td>4.</td><td>Details of habitation already in existence and DTCP approved layouts – existing and proposed its populations and impact of the proposed activity on them.</td><td>In study area of 10 km radius from the project site totally 45 villages are there. As per Census 2011 the total population of the 45 villages is 45467 No’s.

List of nearby villages are given below;
<table>
<tr><th>S. No</th><th>Name</th><th>Population</th><th>Dist (~km)</th><th>Dire.</th></tr>
<tr><td>1</td><td>Mattur</td><td>1628</td><td>0.63</td><td>N</td></tr>
<tr><td>2</td><td>Oragadam</td><td>819</td><td>0.93</td><td>S</td></tr>
</table></td></tr>
</table>

			3	Sennakuppam	965	1.41	S
			4	Kandigai	Under Panrutti	2.38	WSW
			5	Panrutti	1946	3.02	W
			6	Mettupalaiyam	1068	2.55	WNW
			7	Vallam	2837	3.38	NNW
			8	Eraiyur	Under Mattur	1.71	NNE
			9	Perinjambakkam	379	3.97	NE
			10	Vaipur	Under Mattur	2.26	ENE
			11	Sarappananjeri	976	4.23	ENE
			12	Panappakkam	458	2.34	E
			13	Vattambakkam	663	2.56	ESE
			14	Kanjivakkam	Under Umaiyaparanacheri	4.3	ESE
			15	Umaiyaparanacheri	696	3.34	SE
			16	Sendamangalam	726	4.15	SSE
			17	Vadakkupattu	2715	4.32	S
			18	Eluchur	1373	4.97	SW
			19	Panayur	Under Eluchur	4.18	SW
			20	Venpakkam	974	4.4	WSW
			21	Kunnavakkam	1397	5	W
			22	Elakkamangalam	Under Kunnavakkam	4.22	W
			23	Kunnam	2037	7.71	WNW
			24	Echur	2698	5.42	WNW
			25	Sirumangadu	Under Santhavelur (1011)	7.41	NW
			26	Araneri	748	7.31	NNW
			27	Pondur	2347	7.22	NNW
			28	Kuduvanjeri	484	6.59	N
			29	Pillappakkam	Under venkadu (1741)	8.87	N
			30	Vellarai	Under Gunduperumbedu (426)	7.51	NNE
			31	Manganiyam	Under Alagoor (302)	7.96	NE
			32	Nariyambakkam	566	5.67	ENE
			33	Sirumattur	1034	8.03	ENE
			34	Vanjivanjeri	Under Sarappananjeri	5.01	ENE
			35	Padappai	14063	6.93	ENE
			36	Arambakkam	1242	5.85	ENE

			37	Kavanur	Under Kattupakkam (1586)	8.16	ESE
			38	Maraimalai Nagar	Under Valarkundram (390)	9.7	SE
			39	Appur	1244	5.96	SSE
			40	Venpakkam	1099	8.64	S
			41	Palur	6964	9.27	SSW
			42	Ullavur	1749	8.12	SW
			43	Devariyambakkam	Under Nathanallur (875)	8.42	WSW
			44	Tenneri	2101	9.04	W
			45	Sunguvarchattram	Under Santhavelur 4817	9.43	NW
		The Google Earth maps showing nearby villages are shown below;					



Water Impact:

In the proposed project the domestic waste water (7.7 KLD) will be treated in existing combined STP (Capacity: 150 KLD X 1; 100 KLD X 2) and reused for developing greenbelt and the effluent water (159KLD) will be treated in existing combined ETP (Capacity: 300 KLD X 3; 200 KLD X1) & will be reused in utilities. So there is no effluent discharged outside the industry.

Noise Impact:

In the proposed project all the equipment will be covered with perfect acoustic and vibration arrester. Thus we can conclude that, the operation of proposed project will not result in an adverse impact to the environment.

Air Impact:

As per the existing consent order we have the following boilers already installed and available for service as surplus steam.

1. 35TPH Boiler
2. 60TPH Boiler

35 TPH & 60 TPH Coal fired Boilers will be utilized for production of Steam for the proposed project. The major air pollution sources from the industry will Boilers for proposed project. The boilers are provided with stacks of adequate height so as to disperse the emanating flue gases containing particulate matters, oxides of sulfur and nitrogen without affecting the ground level concentrations.

Emission from the proposed project Stack and Transportations Emission

S. No	Source	Fuel Type	Fuel Quantity (TPD)	Stack Details						Emission (g/s)		
				No. of stacks	Height (m)	Dia (m)	Temp (°C)	Exit velocity (m/s)	Flow rate (Nm^3/hr)	PM	SO_2	NO_X
1	35TPH Boiler	Coal	131.25	1	65	2.5	130	8	94,861	0.1148	8.8867	6.8359
2	60TPH Boiler	Coal	168.75	1	75	2.5	129	7.64	90,818	0.1477	11.4258	8.7891
Transportations												
S. No	**Type of Vehicle**	**No.of.Vehicle**								**PM**	**SO_2**	**NO_X**
1	Truck	20								5.56E-04	-	2.56E-02
Total										**0.2631**	**20.3125**	**15.6506**

Conclusion:

Maximum pollutant concentrations of PM, SO_2 and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in below table.

Maximum GLCs from the Stack & Transportation Emissions

Pollutant	Max. Base line Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard (µg/m^3)
PM_{10}	83.09	0.10	83.19	100
SO_2	15.97	8.07	24.04	80
NO_x	31.94	6.30	38.24	80

Summary:

As seen the isopleths, only minimal effect is observed around 1 to 3 km and the resultant air quality is within the limits of NAAQs.

Soil Impact:

In the proposed project no hazardous waste will be generated. Ash will be generated from combustion of coal and it will be stored in designated area and sent to TNPCB Authorized Recyclers.

5.	The proponent shall justify whether setting up of coal based thermal power plant in the midst of various automobile, electronic industries and other green category industries in the vicinity and whether any consultation has taken place with these industries.	The information about the proposed project has been informed to all the below listed industriesand in addition to it the same has beem communicated to all the industries by electronic communication. There was no objection from them. Hence, the proposed project doesn't have objection from the nearby industries. In study area of 10 km radius from the project site totally 143 Industries are there. List of nearby Industries are given below,

Industry	Dist (~km)	Dire.
Johnson Lifts & Escalators	adjacent to site	E
National Poly Plast India Ltd	0.06	W
Kyungshin Industrial Motherson Pvt Ltd	0.06	W
National Autoplast	0.14	W
Magal Engineering Tech Pvt Ltd	0.14	NW
Auto International India Pvt Ltd	0.18	W
KGK Jet India Pvt Ltd	0.23	W
Rice Lake Weighing Systems India Ltd	0.23	W

			NSK Bearing India Pvt Ltd	0.23	NW
			Calsonic Kansei Motherson	0.25	W
			Tide Water Oil	0.26	E
			PreBo Automotive Pvt Ltd	0.28	SW
			Renault Nissan Automotive India Pvt Ltd	0.3	SSW
			Chennai Radha Engineering Works Pvt Ltd	0.31	NNW
			Iberapa India Pvt Ltd	0.32	W
			Mangal Industries Ltd	0.33	W
			Besmak Components Pvt Ltd	0.33	SW
			Sharpline Automation Pvt Ltd	0.34	W
			Doowon Electronics India Pvt Ltd	0.35	E
			Nhk. F . Krishna Automotive Seating Pvt Ltd	0.4	WSW
			Seoyon E-HWA Automotive India Pvt Ltd	0.41	W
			Doowon Automotives Systems India Pvt Ltd	0.43	E
			Subros Ltd	0.44	W
			Zetek Castings Pvt Ltd	0.46	NNW
			Nippon Steel chemical & Materials India Pvt Ltd	0.53	N
			CTM India Ltd	0.56	W
			Bosch Electrical Drives India Pvt Ltd	0.6	W
			Katsushiro Matex Pvt Ltd	0.6	W
			Sanmina - SCI India Pvt Ltd (DTA unit)	0.62	W
			Sumika Polymer Compounds India Pvt.Ltd	0.65	WSW
			Cape Electric Pvt Ltd	0.68	WSW
			ShinEtsu Polymer India Pvt Ltd	0.7	W
			Essar Steel India Ltd	0.71	WNW

			Lohmann Adhesive Tapes India Pvt. Ltd	0.71	W	
			Stanley Engineered Fastening India Pvt Ltd	0.73	W	
			Severn Glocon Valves Pvt Ltd	0.73	SW	
			Industrias Del Recambio India Pvt Ltd	0.81	NW	
			Polymatech Electronics Pvt Ltd	0.81	W	
			Precision Machines & Equipments Unit 3 Pvt Ltd	0.81	WSW	
			Obo Bettermann India Pvt Ltd	0.83	WSW	
			Annai Sakthi Enterprises - Civil Contractor	0.84	W	
			Right Tight Fasteners Pvt Ltd,	0.85	SW	
			DELPHI-TVS Technologies Ltd	0.85	NE	
			Uniproducts India Ltd	0.87	NE	
			Punch Ratna Fasteners Pvt Ltd	0.99	NE	
			Steel Strips Wheels Ltd	1.00	W	
			Rico Auto Chennai plant	1.06	WNW	
			Eicher Motors Ltd	1.12	SW	
			Danfoss Industries Pvt Ltd	1.16	WSW	
			Sundaram - Clayton Ltd	1.21	NE	
			Daimler India Commercial Vehicles Pvt Ltd	1.23	S	
			Komatsu India Pvt Ltd	1.24	WSW	
			Komos Automotive India Pvt Ltd	1.43	ENE	
			RD Brown Box Packaging	1.5	ENE	
			Sundaram Auto Components Ltd	1.57	NE	
			Amalgamations Valeo Clutch Pvt Ltd	1.64	ENE	
			Nokia Solutions & Networks India Pvt Ltd	1.68	W	
			JCBL Marrel Tippers Pvt Ltd	2.02	ENE	

			Stellar Plastic	2.41	ENE	
			Lear Automotive India Pvt Ltd	2.45	S	
			Tenneco Automotive India Pvt Ltd	2.48	S	
			Unipres India Pvt. Ltd	2.56	S	
			BSA Corporation Ltd.(Mfg. Plant)	2.67	ENE	
			Sandhar Technologies Ltd	2.73	ENE	
			Momentive Performance Material India Pvt Ltd	2.75	ENE	
			Polyplastics Auto Components Pvt Ltd	2.95	S	
			Autoneum Nittoku Sound-Proof Products India Pvt Ltd	2.97	S	
			M M Forgings Ltd-Plant 4	3.02	ENE	
			Flashkart India Pvt Ltd	3.03	N	
			Mindarika Pvt Ltd	3.06	S	
			SSMPL SS Manufacturing Pvt Ltd	3.1	W	
			Kosei Minda Aluminum Company Ltd	3.25	S	
			Aggreko Energy Rental India Pvt Ltd	3.38	ENE	
			Yusen logistics Nissan Warehouse	3.43	WSW	
			Jeongun Chennai Pvt Ltd	3.59	WNW	
			Kasai India Pvt Ltd	3.95	SW	
			Royal Enfield Vallam Vadagal Plant	3.96	NNW	
			TPI Composites India	3.98	WNW	
			Vestas Wind technology India Pvt Ltd	4.07	S	
			Vikram Solar Ltd (FAB 3)	4.37	SW	
			EL Forge Ltd	4.97	SSE	
			Flyjac Logistics Pvt Ltd	5.02	WSW	
			Donaldson India Filter Systems Pvt Ltd	5.1	WSW	

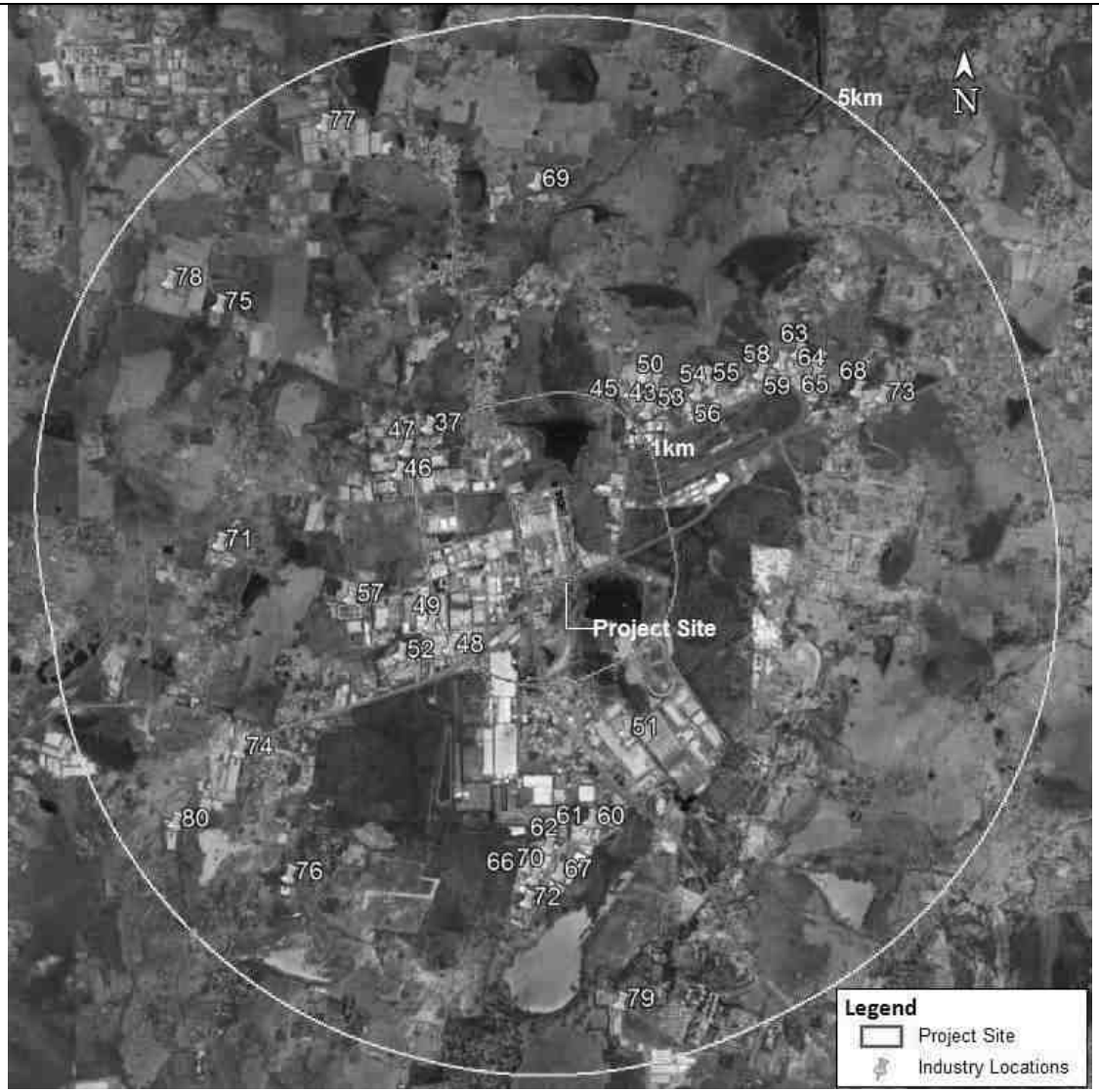
			Nippon Express Warehouse	5.21	WSW	
			KONE Elevator India Pvt Ltd	5.28	WSW	
			MI Steel Processing India Pvt Ltd	5.47	WSW	
			SAN Logistik Park	5.64	WSW	
			Sakura Autoparts India Pvt. Ltd	5.72	NW	
			India Yamaha Motor Pvt Ltd	5.82	NW	
			SMRC Automotive Products India Pvt Ltd	6.09	NW	
			Varroc Polymers Pvt Ltd	6.39	SSW	
			GE T&D India Ltd	6.49	ENE	
			Vassmaan Automotive Pvt Ltd	6.87	ENE	
			Rane Madras Ltd	7.19	WSW	
			Asian Paints Ltd	7.78	NNW	
			Carborundum Universal Ltd	7.84	NNW	
			Saint Gobain Glass India Ltd	8.15	NNW	
			YCH Logistics India Pvt Ltd	8.27	NW	
			Motherson Automotive Technologies and Engineering	8.41	N	
			Samsung India Electronics Pvt Ltd	8.43	NW	
			Amcol Minerals and Materials India Pvt Ltd	8.45	NNW	
			Inox Air Product	8.52	NNW	
			Foxconn Technology India Pvt Ltd	8.54	NW	
			Apex Laboratories Pvt Ltd	8.56	WNW	
			Flex India	8.65	NW	
			Visen Industries Ltd. Chennai	8.67	NNW	
			KwangJin India	8.75	NNW	
			J.K. Fenner India Ltd	8.77	NNW	

			Dell International Services India Pvt Ltd	8.79	NW	
			Interarch Building Products Pvt Ltd	8.97	NNW	
			Faurecia Automotive Seating India Pvt Ltd	9.17	N	
			Wheels India Ltd	9.28	N	
			KM Seats Co Pvt Ltd	9.29	WSW	
			Salcomp manufacturing india Pvt Ltd	9.39	N	
			JTEKT India Ltd	9.51	NNW	
			Prabhu Laser Components	9.54	NNE	
			Jamna Auto Industries Ltd	9.6	NNE	
			Thaai Casting	9.68	NNE	
			CMR Toyotsu Aluminium India Ltd	9.71	N	
			Zsivira Chemie Merk Pvt Ltd	9.83	NNE	
			Surin Automotive Pvt Ltd	9.88	NNE	
			MEI Foundry	9.9	NNE	
			Asian Sealing Products	9.91	N	
			Infac India Pvt Ltd	10.02	ENE	
			Ford India Pvt.Ltd	10.48	SE	
			United Industries Plastic Pvt Ltd	10.73	NNE	
			Mando Automotive India Pvt Ltd	10.74	NNE	
			KONE Elevator India Pvt Ltd	10.77	NNE	
			Hanon Systems Pvt Ltd	10.79	SE	
			BSH Household Appliances Manufacturing Ltd	10.96	NNE	
			Tamil Nadu Steel Tubes	10.97	SE	
			Yorozu JBM Automotive Tamil Nadu Pvt Ltd	11.03	NNE	
			Minda Corporation Limited	11.10	NNE	

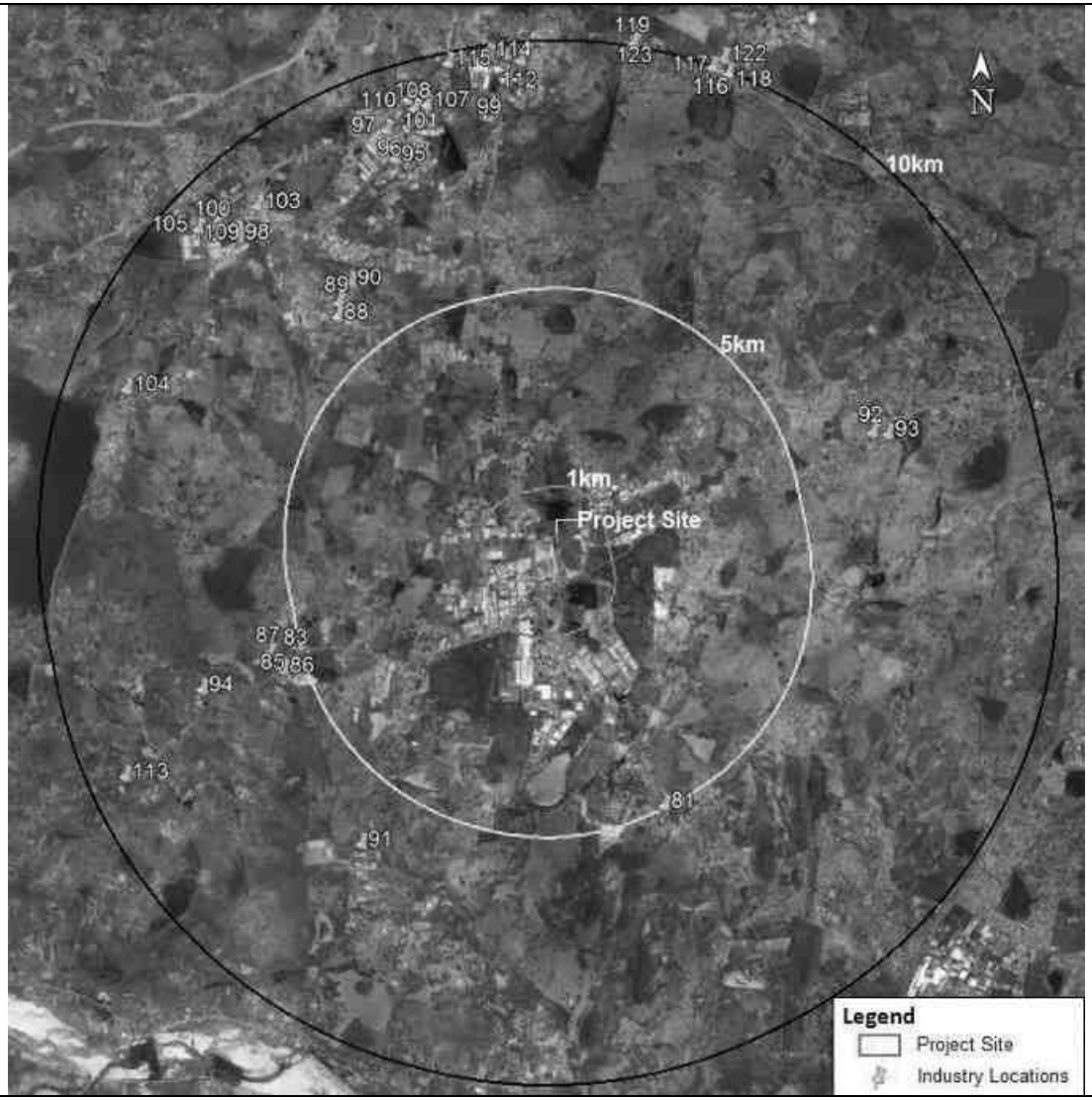
Blasto Metal Spray Processors	11.13	NNE
Visteon Electronics India Pvt Ltd	11.15	SE
Gestamp Automotive Pvt Ltd	11.49	NNE
The Hindu	11.51	SE
UCAL Fuel System Ltd Plant 6	11.75	SE
Sundaram Industries	11.80	SE
Mahle Engine Components India Pvt ltd	12.06	SE
BASF Catalyst India Pvt. Ltd	13.62	SSE
Wheels India Limited	14.11	NNE
Sharda Motor Industries Limited	14.39	SSE

Google Earth maps showing nearby industries of 1km radius is shown below;

Google Earth maps showing nearby industries of 5km radius is shown below;



Google Earth maps showing nearby industries of 10km radius is shown below;



ii. Additional ToR by SEAC

<table>
<tr><th>S. No</th><th>ToR Conditions</th><th>Compliance</th></tr>
<tr><td>1.</td><td>As the proposal is to be located in fast growing urban habitat, the proponent should explore the usage of alternate fuel viz R LNG, Bio mass, brick earth, municipal waste etc.,</td><td>1. The usage of biomass (Rice husk) fuel as 35% of the total fuel quantity to be considered from the year 2025 and the estimated quantity in the upcoming year is given in the below table;
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Fuel Type</th><th colspan="2">FY'25</th><th colspan="2">FY'26</th><th colspan="2">FY'27</th><th colspan="2">FY'28</th><th colspan="2">FY'39</th></tr>
<tr><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th></tr>
<tr><td>1</td><td>Bio-mass (Rice Husk)</td><td>35</td><td>95</td><td>43</td><td>118</td><td>52</td><td>142</td><td>61</td><td>166</td><td>69</td><td>189</td></tr>
<tr><td>2</td><td>Coal</td><td>65</td><td>179</td><td>57</td><td>156</td><td>48</td><td>132</td><td>39</td><td>108</td><td>31</td><td>85</td></tr>
<tr><td colspan="2">Total</td><td>100</td><td>274</td><td>100</td><td>274</td><td>100</td><td>274</td><td>100</td><td>274</td><td>100</td><td>274</td></tr>
</table></td></tr>
<tr><td>2.</td><td>The proponent shall study and justify whether the setting up of coal based thermal power plant in the midst of various automobile, electronic industries and other green category industries in the vicinity and shall consult with those industries.</td><td>The proposed project will be carried out in the existing facility and all the control measures will be followed after the proposed project. Hence, the proposed project will not affect the industries in the vicinity of the project.</td></tr>
<tr><td>3.</td><td>The PP shall use biomass like bagasse, agro-based industrial residue, crop residues, wood produced through energy plantations, weed, wood waste produced in industrial operations, Municipal solid waste etc., for a minimum of 30% of total fuel requirement.</td><td>1. The usage of biomass (Rice husk) fuel as 35% of the total fuel quantity to be considered from the year 2025 and the estimated quantity in the upcoming year is given in the below table;
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Fuel Type</th><th colspan="2">FY'25</th><th colspan="2">FY'26</th><th colspan="2">FY'27</th><th colspan="2">FY'28</th><th colspan="2">FY'39</th></tr>
<tr><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th><th>%</th><th>MT / Day</th></tr>
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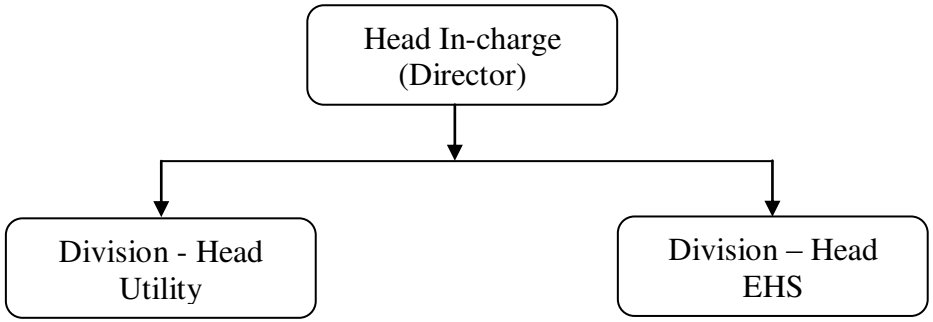
</table></td></tr>
<tr><td>4.</td><td>The PP shall also furnish a five year action plan to reduce use of coal to 0% and also submit an affidavit affirming</td><td>We are in the process of utilising biomass (Rice husk) as the alternative fuel for coal. However, based on the efficiency, the usage of biomass (rick husk) as a fuel will be increased in the further.</td></tr>
</table>

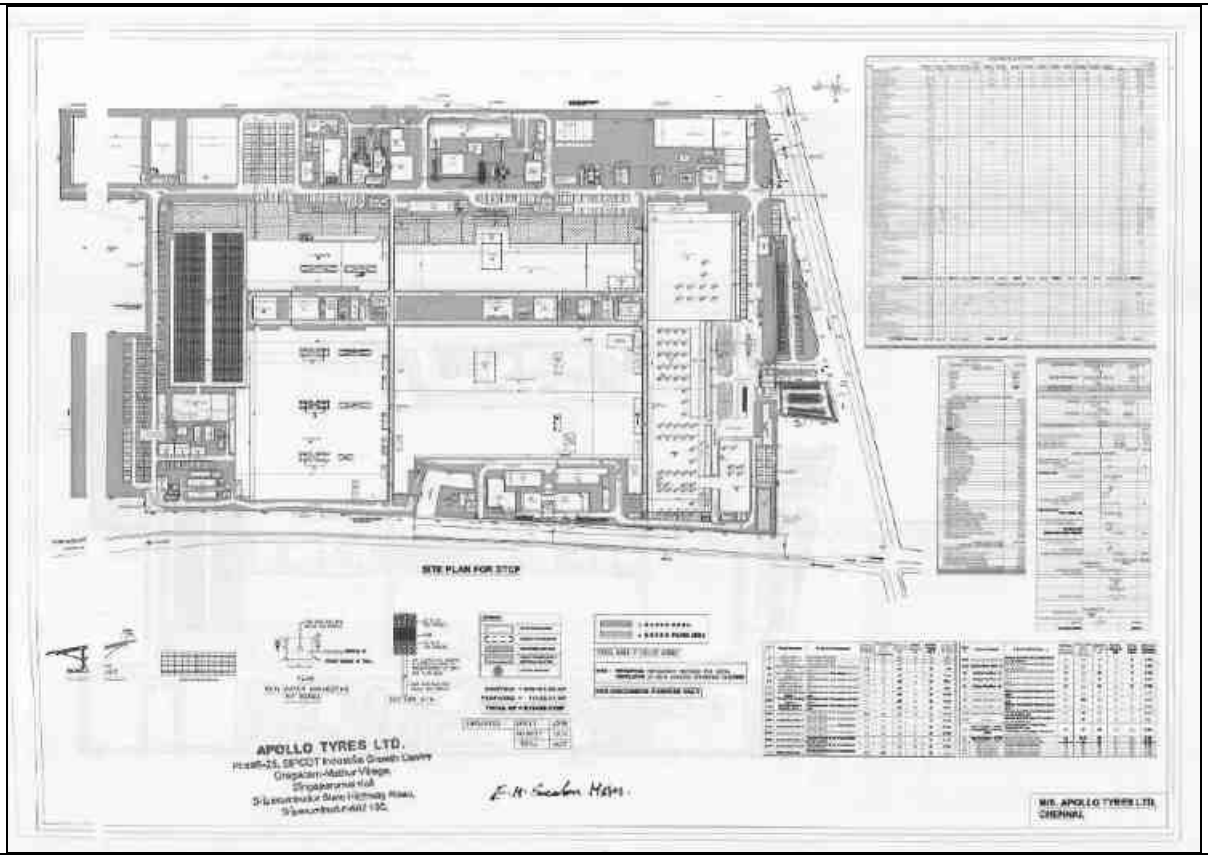
<table>
<tr><td></td><td>his commitment to adhere to the action plan.</td><td></td></tr>
<tr><td>5.</td><td>The PP shall not withdraw ground water as committed.</td><td>Ground water extraction is not being done as committed; only approval has been obtained from the CGWB Authority.</td></tr>
<tr><td>6.</td><td>Details of the type of the industries located in the SIPCOT and monitored pollution levels shall be furnished.</td><td>Cumulative impact assessment study was carried out for existing industries using AERMOD model to predict maximum concentration due to existing industries and proposed Apollo Tyres industry 10km industry.

In this view two scenario were generated. Scenario one is the contribution by existing industries without the Apollo Tyres Industry, the contribution of PM, SO_2 and NO_X are 2.10 µg/m^3, 1.97 µg/m^3 and 30.47 µg/m^3 scenario two with all industries, including the Apollo Tyres, the contribution of PM, SO_2 and NO_X are 2.12 µg/m^3, 8.81 µg/m^{3}and 31.27 µg/m^3.
<table>
<tr><th>Pollutant</th><th>Estimated Incremental Conc. (µg/m^3) (Without Apollo Tyres)</th><th>Estimated Incremental Conc. (µg/m^3) (With Apollo Tyres)</th><th>NAAQ Standard(µg/m^3)</th></tr>
<tr><td>PM</td><td>2.10</td><td>2.12</td><td>100</td></tr>
<tr><td>SO_2</td><td>1.97</td><td>8.81</td><td>80</td></tr>
<tr><td>NO_x</td><td>30.47</td><td>31.27</td><td>80</td></tr>
</table>
The type of industries located around M/s. Apollo Tyres Limited of 10km of radius along with the pollution load is enclosed as Annexure – 8.</td></tr>
<tr><td>7.</td><td>The proponent shall form an Environmental Cell and furnish the detail along with EIA.</td><td>Environmental Management Cell:

An organizational set up of Environmental Management Cell will be formed to ensure the effective implementation of mitigation measures and to conduct environmental monitoring.

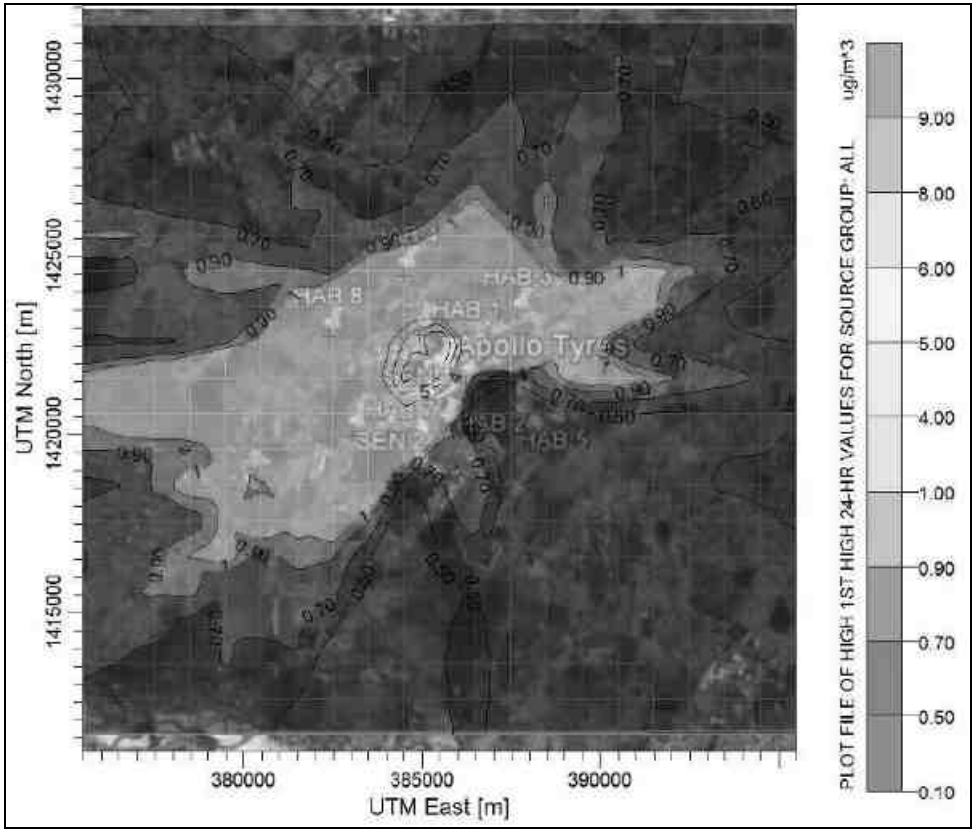
The major duties and responsibilities of Environmental Management Cell will be as follows:
• To establish the present environmental scenario.
• To prepare a detailed action plan for implementation of mitigation measures.
• To suggest preventive and mitigation measures to minimize adverse impact and to maximize beneficial impacts.
• To prepare an afforestation or Greenbelt Development scheme.</td></tr>
</table>

		• To suggest a rain water harvesting scheme and energy conservation actions • To suggest a monitoring programmed to evaluate the effectiveness of mitigation measures. • To suggest the formation of a core group (Environment Management Cell) responsible for implementation of environmental control & protective measures as well as monitoring of such implementation. • To prepare a capital cost estimate and annual recurring cost for Environmental Management Plan. **Structure of an EMC:**  Further details are elaborated in **Chapter 10, Section 10.1.3.1.**
8.	The proponent shall furnish the layout plan for the greenbelt area earmarked with GPS coordinates with maximum area on the periphery of the unit and the greenbelt area should not less than 33% of the total land area of the project.	The total area of the site is 50.71 Ha (125.307 acres), out of which 12.51 Ha (30.913 acres) of land is earmarked to develop greenbelt of 24.66% in the site premises. Currently, total of 3314 no of trees were developed in the allocated area for greenbelt. Additionally, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 to an extent of 16.55 acres (6.70 Ha) which is adjacent to the site. Hence, the additional land allocated by SIPCOT for the development of greenbelt is considered as the proposed greenbelt development for this project. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%. The allocation letter from the SIPCOT is attached as the **Annexure - 4**. The existing greenbelt development in the plant is shown in the layout given below;

		
9.	Details of the procedures adopted for the regular health check-up for the staff shall be furnished.	The regular health check-up is being carried out for the staffs periodically. An Occupational Health Center comprises a total built up area of 1000 sq.ft with a carpet area of 850 sq.ft with two Doctor consultation rooms, one Physiotherapy room, one nursing station and a separate Counseling room. The services are offered by the OHC are 24/7. Further details of Occupational Health Center is furnished in **Chapter 10, Section 10.3.8.3.**
10.	A letter from DFO concerned shall be obtained from the proposed project site to the nearest ESA like national	Not applicable since the site is located inside the SIPCOT Industrial Growth Center, Oragadam and there is no Eco-Sensitive Area like national park/Sanctuary within 15km of radius from the proposed project area.

	park/Sanctuary etc.,	

iii. Remarks by SEIAA

S. No	ToR Conditions	Compliance
1.	The PP shall conduct detailed study on impact of coal combustion onsite and offsite.	The Study on impact of coal combustion on on-site and offsite was carried out using AERMOD software. The impact of SO_2 during the coal combustion in and around the project site is shown below; 

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	385479	1422598	8.0717	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	5.81559	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	1.00615	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	1.46041	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	1.27462	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.12904	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.89524	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	1.80524	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	1.56988	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	1.09218	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	2.50275	1.6	SW

Furthermore, Onsite Emergency Plan has been prepared and the same is attached as **Annexure - 14**

2.	The PP shall study the impact of SO_2, NO_x, and particulate matter that cause smog, haze, lung disease, cardiovascular diseases and health related issues to the inhabitant, wildlife flora and fauna.	**Impact:** Maximum pollutant concentrations of PM, SO_2 and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in below table. **Maximum GLCs from the Stack & Transportation Emissions**

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><th>Pollutant</th><th>Max. Base line Conc. (µg/m^3)</th><th>Estimated Incremental Conc. (µg/m^3)</th><th>Total Conc. (µg/m^3)</th><th>NAAQ standard (µg/m^3)</th></tr>
<tr><td>PM_{10}</td><td>83.09</td><td>0.10</td><td>83.19</td><td>100</td></tr>
<tr><td>SO_2</td><td>15.97</td><td>8.07</td><td>24.04</td><td>80</td></tr>
<tr><td>NO_x</td><td>31.94</td><td>6.30</td><td>38.24</td><td>80</td></tr>
</table>
The detailed study has been carried out and elaborated in Chapter 4, section 4.1.3.2.2.
</td>
</tr>
<tr>
<td>3.</td>
<td>The anticipated CO_2 release and temperature rise due to combustion of coal, the anticipated toxic pollutants from the combustion may also be studied and its impact on respiratory illness may also be studied.</td>
<td>
Air Emissions:

The main sources of CO_2 release are Boilers, coal crushing and process.
The emission of air includes PM, SO_2, NO_x, CO_2 and fly ash.

Mitigation Measures:

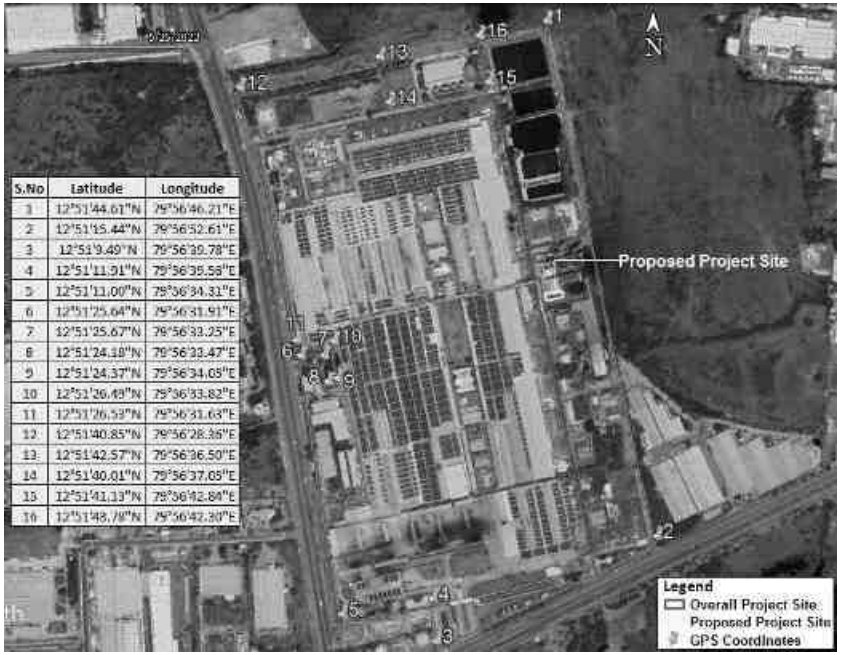
To control the CO_2 emission, 24.66% of greenbelt was developed insite the existing whole site premises. Additionally, greenbelt is being developed over extend of 16.55 acres (6.70 Ha) as OSR maintenance. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.
Fugitive emissions from the coal crusher and coal transporation is being prevented using bag filter and enclosed system / belt transfer system respectively.
Electrostatic Precipitator is provided with adequate stack height of 75m from ground level

The impact on respiratory illness of workers has also studied and the health report is enclosed as Annexure – 10.
</td>
</tr>
</table>

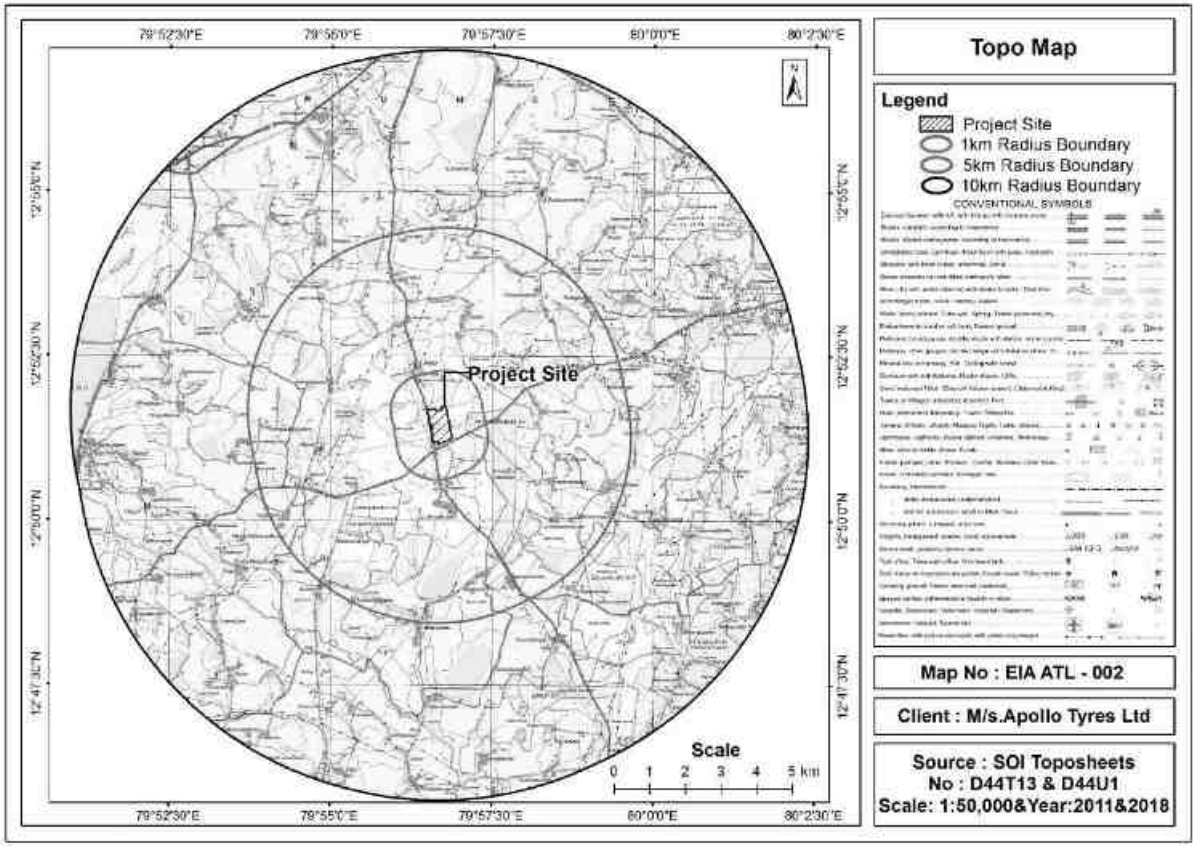
iv. Standard ToR

S. No	ToR Conditions	Compliance
1	The proposed project shall be given a unique name in consonance with the name submitted to other Government Departments etc. for its better	Not Applicable

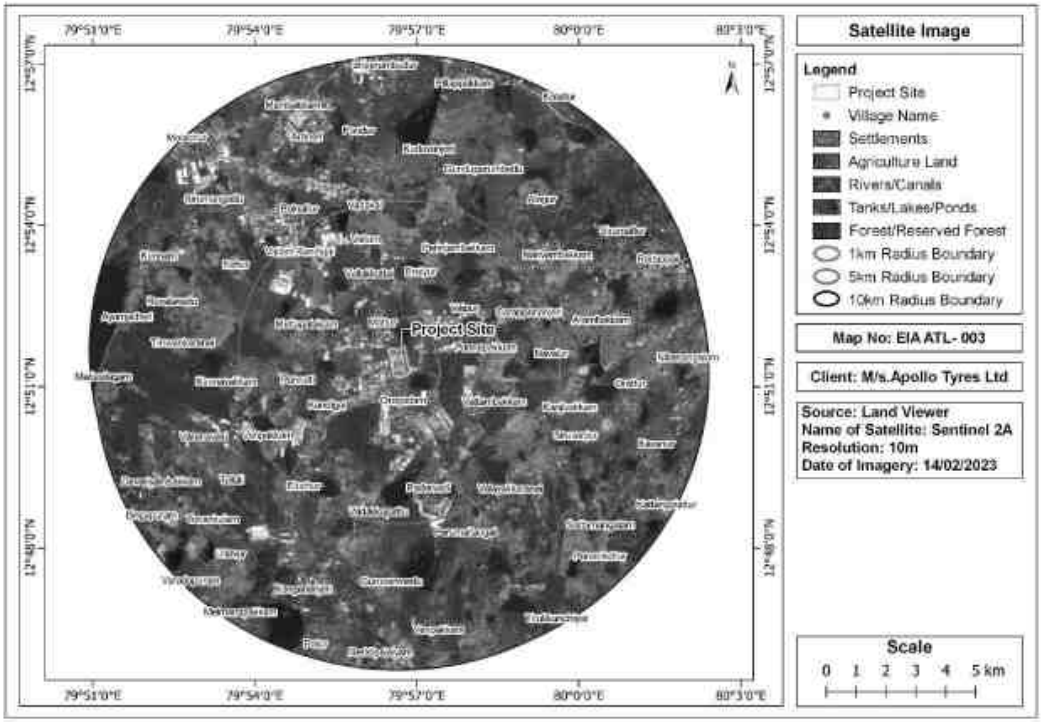
	identification and reference.	
2	Vision document specifying prospective long term plan of the project shall be formulated and submitted.	**Vision:** The purpose of having a captive power plant at Apollo Tyres Limited at Oragadam is to reduce the cost on buying power from the Tamil Nadu grid and also reduce the already existing stress on the district power supply. Thus such a project would help reduce stress on the power deficient condition of the state of Tamil Nadu.
3	Latest compliance report duly certified by the Regional Office of MoEF&CC for the conditions stipulated in the environmental and CRZ clearances of the previous phase(s) for the expansion projects shall be submitted.	Not Applicable since the project is being operated with the valid CTO and the same is enclosed as **Annexure -2.**
4	The project proponent needs to identify minimum three potential sites based on environmental, ecological and economic considerations, and choose one appropriate site having minimum impacts on ecology and environment. A detailed comparison of the sites in this regard shall be submitted.	Not Applicable, since the expansion project will be carried out within the existing plant premises.
5	Executive summary of the project indicating relevant details along with recent photographs of the proposed site (s) shall be provided. Response to the issues raised during Public Hearing and the written representations (if any), along with a time bound Action Plan and budgetary allocations to address the same, shall be provided in a tabular form,	Executive summary of the proposed project is enclosed as **Annexure-9.** The proposed project is termed under 1(d) – Thermal Power Plant, Category – 'B' as per the EIA Notification, 2006 and its amendments. Also, Public Hearing is mandatory as per the obtained ToR. The draft EIA report was prepared as per the ToR issued for the project vide SEIAA-TN/F.No. 7412/SEAC/1(d)/ToR – 1298/2022 dated 26 October, 2022 and submitted to TNPCB for public hearing.

<table>
<tr><td></td><td>against each action proposed.</td><td></td></tr>
<tr><td>6</td><td>Harnessing solar power within the premises of the plant particularly at available rooftops and other available areas shall be formulated and for expansion projects, status of implementation shall also be submitted.</td><td>Harnessing solar power is being done and the details are mentioned below;
<table>
<tr><th>Location</th><th>Name</th><th>Capacity (DC capacity, MWp)</th><th>Consumption mode</th></tr>
<tr><td>On site - roof top</td><td>Phase -1 (premises)</td><td>1.80</td><td>In-house</td></tr>
<tr><td>On site - roof top</td><td>Phase -2 (premises)</td><td>10.3</td><td>In-house</td></tr>
<tr><td>Off site - ground mounted</td><td>Tirunelveli site</td><td>30</td><td>Through group captive mode</td></tr>
</table>
For the proposed project, there is no addition of Solar power plant. The existing solar power plant will be maintained after expansion as well.</td></tr>
<tr><td>7</td><td>The geographical coordinates (WGS 84) of the proposed site (plant boundary), including location of ash pond along with topo sheet (l:50,000 scale) and IRS satellite map of the area, shall be submitted. Elevation of plant site and ash pond with respect to HFL of water body/nallah/River and high tide level from the sea shall be specified, if the site is located in proximity to them.</td><td>Geographical Coordinates of the project site indicating the proposed project is given below;

</td></tr>
</table>

Topo Map of the Project site:



Satellite Area of the Project Site:



8 Layout plan indicating break-up of plant area, ash pond, green belt, infrastructure, roads etc, shall be provided.

Land Area details:

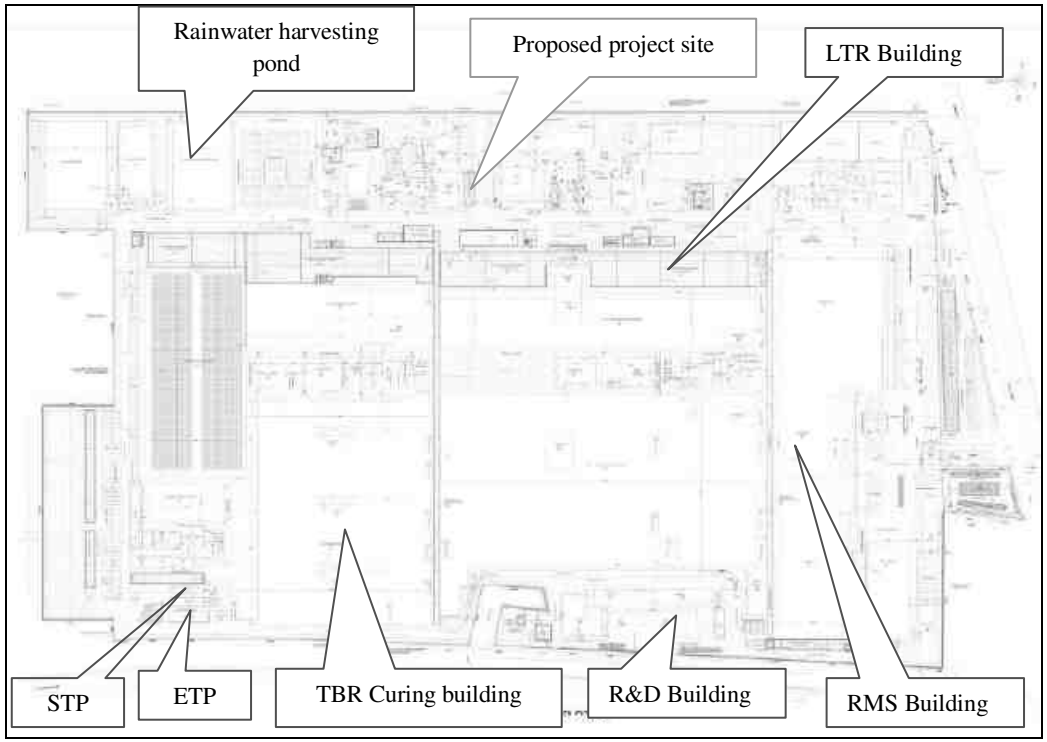
The total area and built-up area of the whole plant are 50.72 Ha (125.35 acres) and 27.304 Ha (67.469 acres). The built-up area of the existing project of 1X4.6MW is 0.882 Ha (2.179 acres).

Land area details for the proposed project is tablulated below;

S. No	Details	Existing		Proposed		After expansion	
		Ha.	Acres	Ha.	Acres	Ha.	Acres
1	Built up area	0.882	2.179	0.0357	0.0882	0.9177	2.2672

The fly ash generated from the process is being collected in the storage silo and disposed to the authorised brick manufacturer by truck covered in tarpaulin and the same is proposed to follow after expansion. Hence, there is no ash pond in the existing project site.

Layout of the Project Site demarcating the site features are shown below;

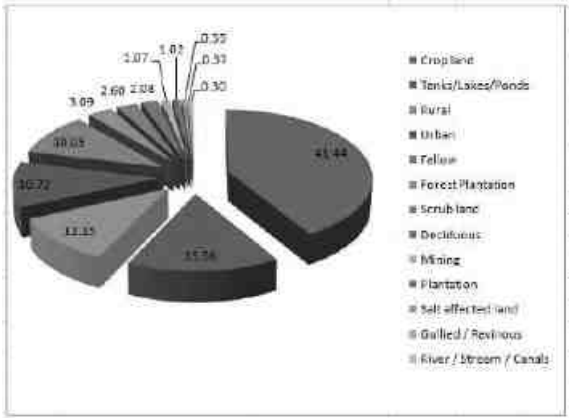


Land document of the project is attached as **Annexure – 3.**

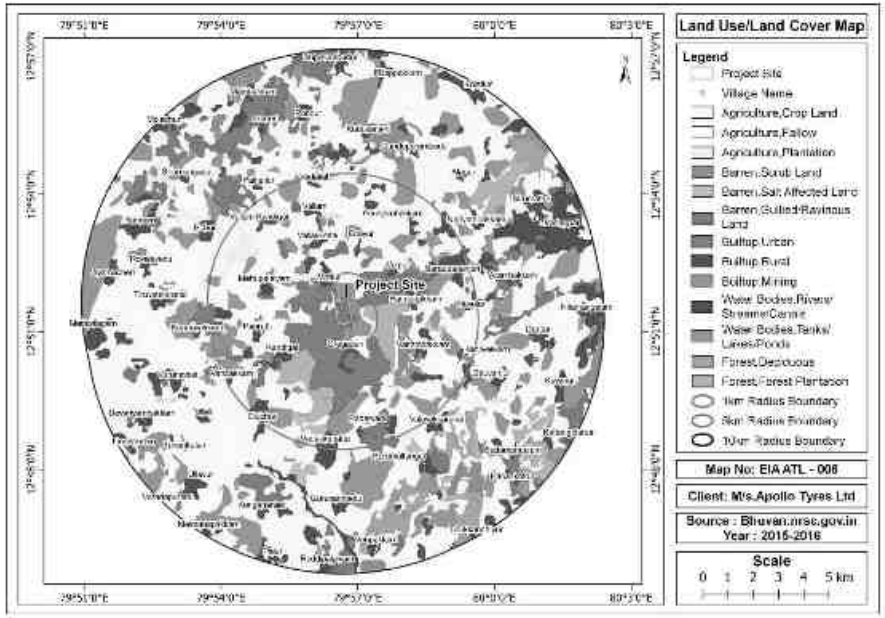
i. Greenbelt Area:

1. The greenbelt was developed in the existing premises over an extent of 12.51 Ha (30.913 acres), i.e., 24.66%.
2. Furthermore, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 of 6.70 Ha (16.55 acres) which is adjacent to the site. Including the SIPCOT OSR land, the

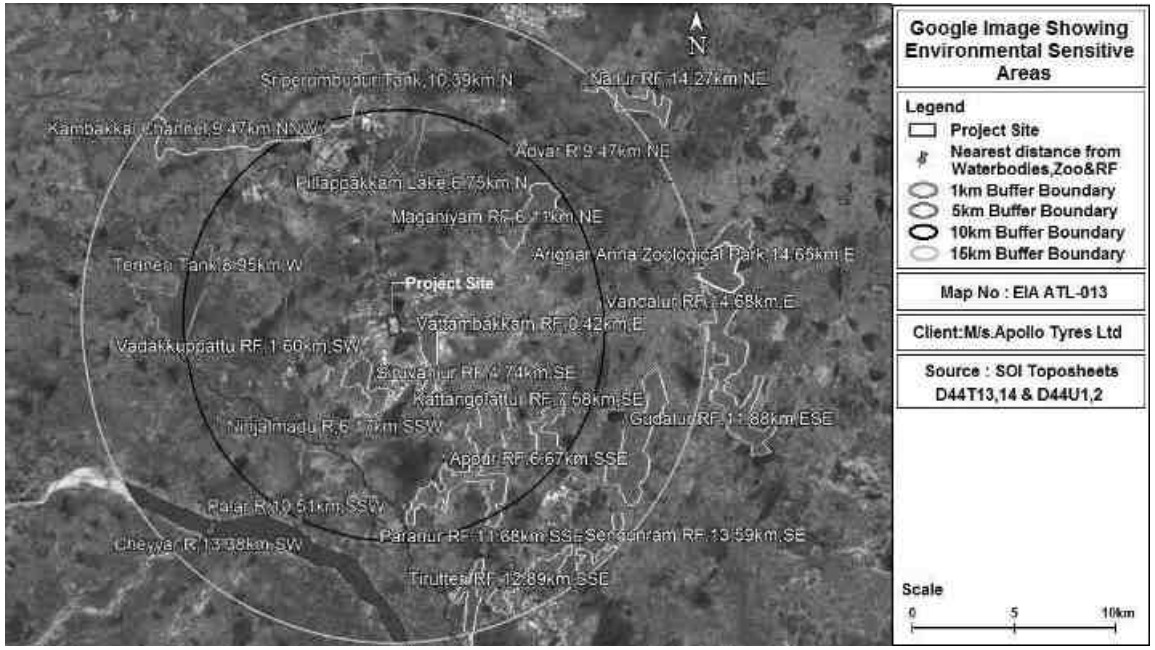
<table>
<tr><td></td><td></td><td>overall greenbelt percentage will be 37.87%.
3. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. The allocation letter from the SIPCOT is attached as the Annexure – 4.</td></tr>
<tr><td>9</td><td>Land requirement for the project shall be optimized and in any case not more than what has been specified by CEA from time to time. Item wise break up of land requirement shall be provided.</td><td>There is no additional land required as the proposed project is within the existing facility.</td></tr>
<tr><td>10</td><td>Present land use (including land class/kism) as per the revenue records and State Govt. Records of the proposed site shall be furnished. Information on land to be acquired including coal transportation system, laying of pipeline, ROW, transmission lines etc. shall be specifically submitted. Status of land acquisition and litigation, if any, should be provided.</td><td>Land Use of the Study Area:
Total Project area is 345.99 sq.m
<table>
<tr><th>S. No</th><th>Description</th><th>%</th><th>Sq.m</th><th>Acre</th><th>Ha.</th></tr>
<tr><td>1.</td><td>Crop land</td><td>41.44</td><td>143.37</td><td>35427.4</td><td>14337</td></tr>
<tr><td>2.</td><td>Tanks/Lakes/Ponds</td><td>15.56</td><td>53.83</td><td>13301.7</td><td>5383</td></tr>
<tr><td>3.</td><td>Rural</td><td>11.15</td><td>38.59</td><td>9535.78</td><td>3859</td></tr>
<tr><td>4.</td><td>Urban</td><td>10.72</td><td>37.08</td><td>9162.65</td><td>3708</td></tr>
<tr><td>5.</td><td>Fallow</td><td>10.05</td><td>34.77</td><td>8591.84</td><td>3477</td></tr>
<tr><td>6.</td><td>Forest Plantation</td><td>3.09</td><td>10.69</td><td>2641.55</td><td>1069</td></tr>
<tr><td>7.</td><td>Scrub land</td><td>2.60</td><td>9</td><td>2223.95</td><td>900</td></tr>
<tr><td>8.</td><td>Deciduous</td><td>2.08</td><td>7.21</td><td>1781.63</td><td>721</td></tr>
<tr><td>9.</td><td>Mining</td><td>1.07</td><td>3.7</td><td>914.289</td><td>370</td></tr>
<tr><td>10.</td><td>Plantation</td><td>1.02</td><td>3.52</td><td>869.81</td><td>352</td></tr>
<tr><td>11.</td><td>Salt affected land</td><td>0.55</td><td>1.92</td><td>474.442</td><td>192</td></tr>
<tr><td>12.</td><td>Gullied / Ravinous</td><td>0.37</td><td>1.28</td><td>316.294</td><td>128</td></tr>
<tr><td>13.</td><td>River / Stream / Canals</td><td>0.30</td><td>1.03</td><td>254.518</td><td>103</td></tr>
<tr><td colspan="2">Total</td><td>100.00</td><td>345.99</td><td>85495.9</td><td>34599</td></tr>
</table></td></tr>
</table>



Land Use of the Study Area:



11	If the project involves forest land, details	Not Applicable

	of application, including date of application, area applied for, and application registration number, for diversion under FCA and its status should be provided along with copies of relevant documents.	
12	The land acquisition and R&R scheme with a time bound Action Plan should be formulated and addressed in the EIA report.	Land Acquisition and R & R are not applicable as expansion of co-gen (Captive) Thermal power plant from 4.6 MW to 14.6 MW with additional installation of 10MW power plant is proposed within the existing Apollo Tyres Premises in SIPCOT Industrial area, Oragadam. Hence, there is no additional land is required for the proposed project.
13	Satellite imagery and authenticated topo sheet indicating drainage, cropping pattern, Water bodies (wetland, river system, stream, nallahs, ponds etc.), location of nearest habitations (villages), creeks, mangroves, rivers, reservoirs etc. in the study area shall be provided.	Satellite imagery and authenticated topo sheet indicating drainage, cropping pattern, Water bodies (wetland, river system, stream, nallahs, ponds etc.), location of nearest habitations (villages), creeks, mangroves, rivers, reservoirs etc. in the study area is given below: 

List of Environmental Sensitive Areas around the project site is tabulated below;

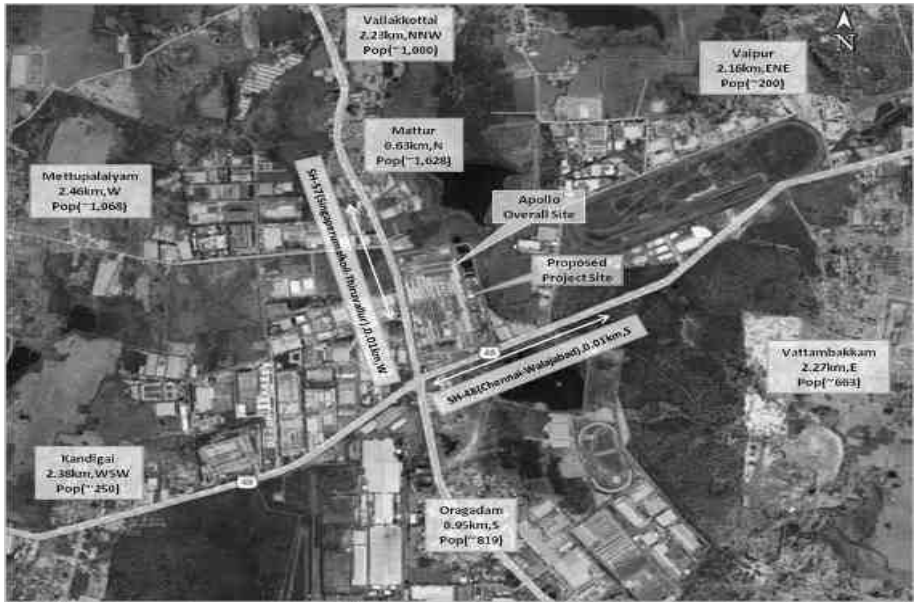
Water Bodies:

S. No	Water Bodies	Distance (~km)	Direction
1	Lake near Oragadam	0.06	S
2	Lake near Mattur	0.12	NE
3	Vadakkupattu Lake	2.57	SSE
4	Lake near Perinjambakkam	2.75	NE
5	Lake near Gunduperumbedu	4.26	NNE
6	Venpakkam Lake	4.28	WSW
7	Lake near Guruvanmedu	5.27	SSE
8	Ninjalmadu R	6.17	SSW
9	Pillappakkam Lake	6.75	N
10	Lake near Kongananjeri	8.59	SSW
11	Tenneri Tank	8.95	W
12	Adyar R	9.47	NE
13	Kambakkal Channel	9.47	NNW
14	Manimangalam Lake	9.95	ENE
15	Sriperumbudur Tank	10.39	N
16	Palar R	10.51	SSW
17	Cheyyar R	13.38	SW

Reserved Forest & Zoological Park:

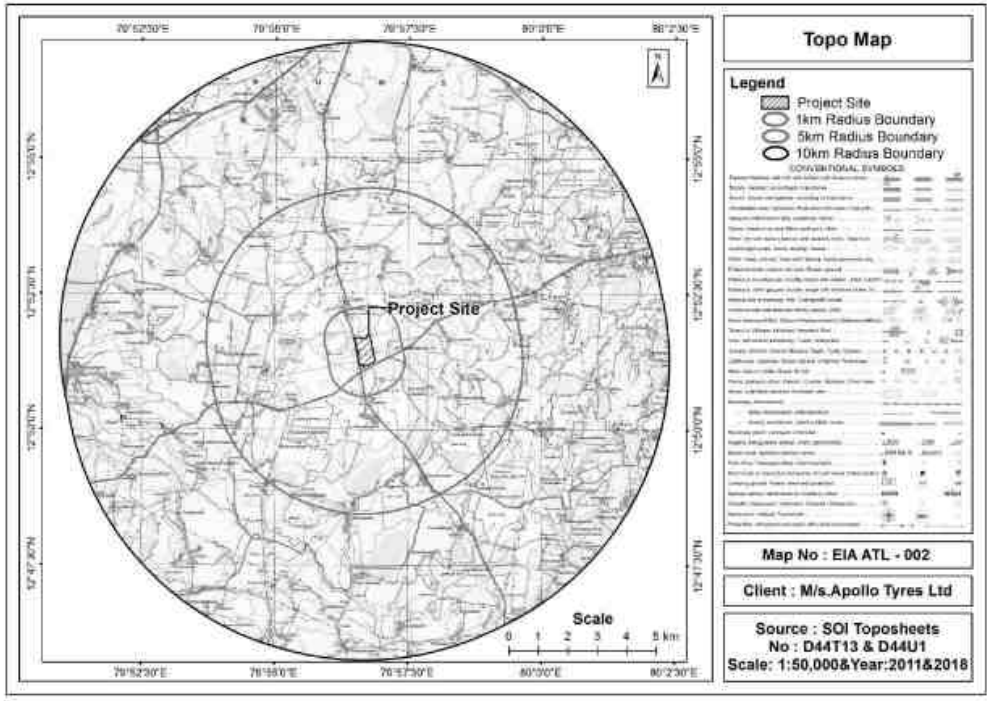
S. No	Reserved Forest & Zoological Park	Distance (~Km)	Direction
1	Vattambakkam RF	0.42	E
2	Vadakkuppattu RF	1.60	SW
3	Siruvanjur RF	4.74	SE
4	Maganiyam RF	6.11	NE
5	Appur RF	6.67	SSE
6	Kattangolattur RF	7.58	SE
7	Paranur RF	11.68	SSE

8	Gudalur RF	11.88	ESE
9	Tirutteri RF	12.89	SSE
10	Sengunram RF	13.59	SE
11	Nallur RF	14.27	NE
12	Arignar Anna Zoological Park	14.65	E
13	Vandalur RF	14.68	E



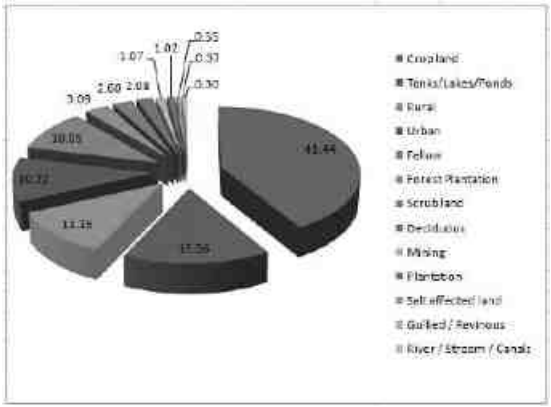
Details of nearby villages from the project site is given below;

S. No	Villages	Distance (~km)	Direction	Population
1.	Mattur	0.63	N	1,628
2.	Oragadam	0.95	S	819
3.	Vaipur	2.16	ENE	200
4.	Vallakkottai	2.23	NNW	1,000
5.	Vattambakkam	2.27	E	663

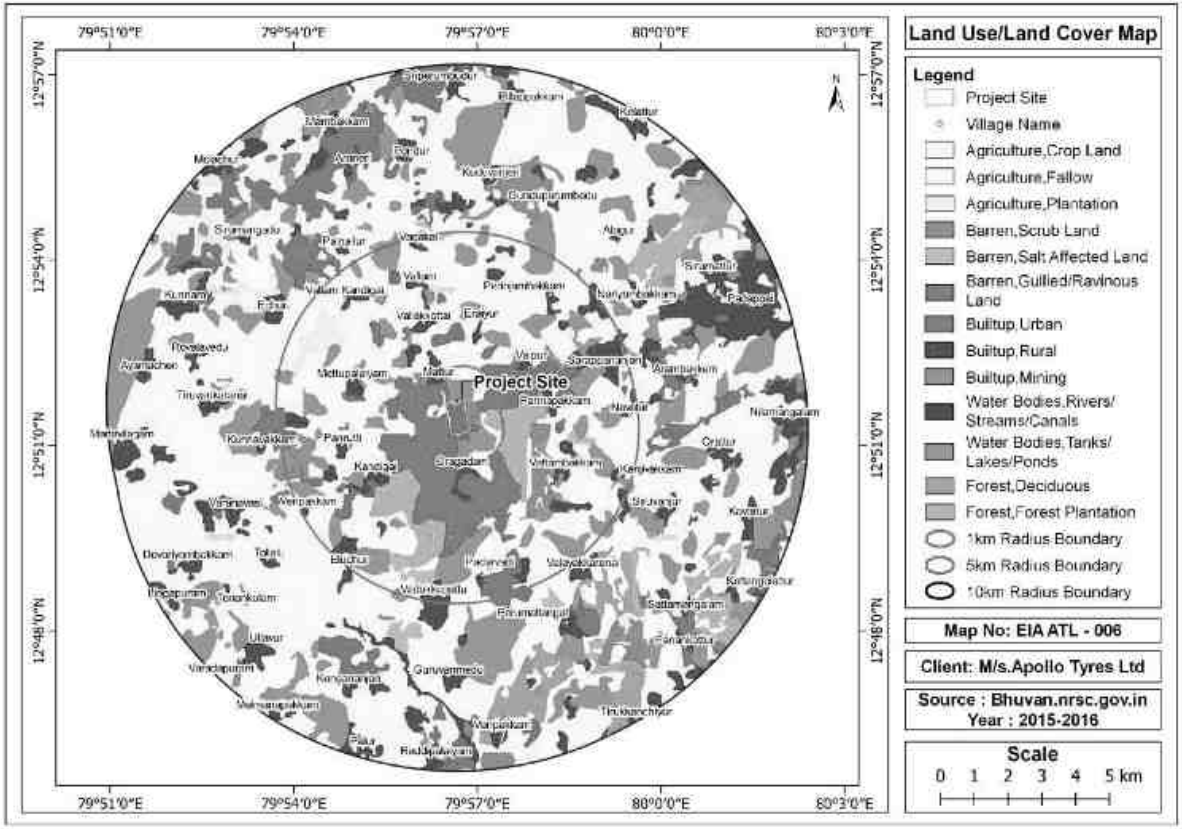
14	Location of any National Park, Sanctuary, Elephant/Tiger Reserve (existing as well as proposed), migratory routes / wildlife corridor, if any, within l0 km of the project site shall be specified and marked on the map duly authenticated by the Chief Wildlife Warden of the State or an officer authorized by him.	Not applicable
15	Topography of the study area supported by topo sheet on l: 50,000 scale of Survey of India, along with a large scale map preferably of 1:25,000 scale and the specific information whether the site requires any filling shall be provided. In that case, details of filling, quantity of required fill material; its source, transportation etc. shall be submitted.	**Topo Map on 1:50,000 scale:**  The site doesn't require any filling as the proposed project will be carried out in the existing premises.

16	A detailed study on land use pattern in the study area shall be carried out including identification of common properly resources (such as grazing and community land, water resources etc.) available and Action Plan for its protection and management shall be formulated. If acquisition of grazing land is involved, it shall be ensured that an equal area of grazing land be acquired and developed and detailed plan submitted.	**Land Use of the Study Area:** Total Project area is 345.99 sq.m

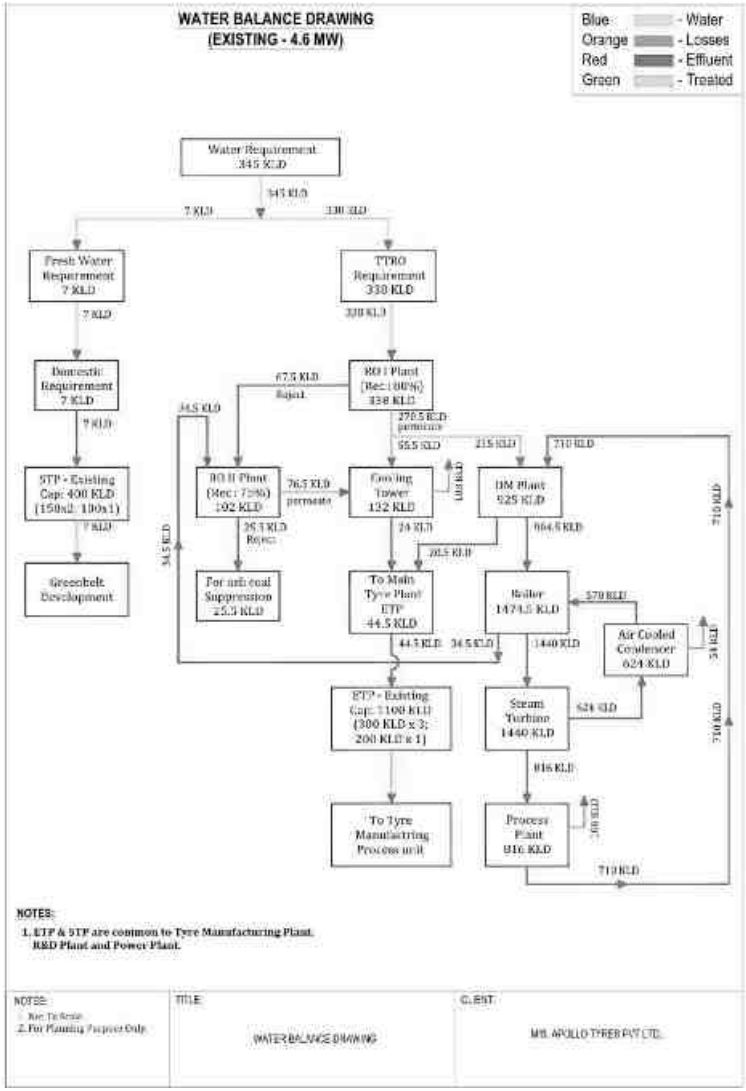
S. No	Description	%	Sq.m	Acre	Ha.
1.	Crop land	41.44	143.37	35427.4	14337
2.	Tanks/Lakes/Ponds	15.56	53.83	13301.7	5383
3.	Rural	11.15	38.59	9535.78	3859
4.	Urban	10.72	37.08	9162.65	3708
5.	Fallow	10.05	34.77	8591.84	3477
6.	Forest Plantation	3.09	10.69	2641.55	1069
7.	Scrub land	2.60	9	2223.95	900
8.	Deciduous	2.08	7.21	1781.63	721
9.	Mining	1.07	3.7	914.289	370
10.	Plantation	1.02	3.52	869.81	352
11.	Salt affected land	0.55	1.92	474.442	192
12.	Gullied / Ravinous	0.37	1.28	316.294	128
13.	River / Stream / Canals	0.30	1.03	254.518	103
Total		**100.00**	**345.99**	**85495.9**	**34599**



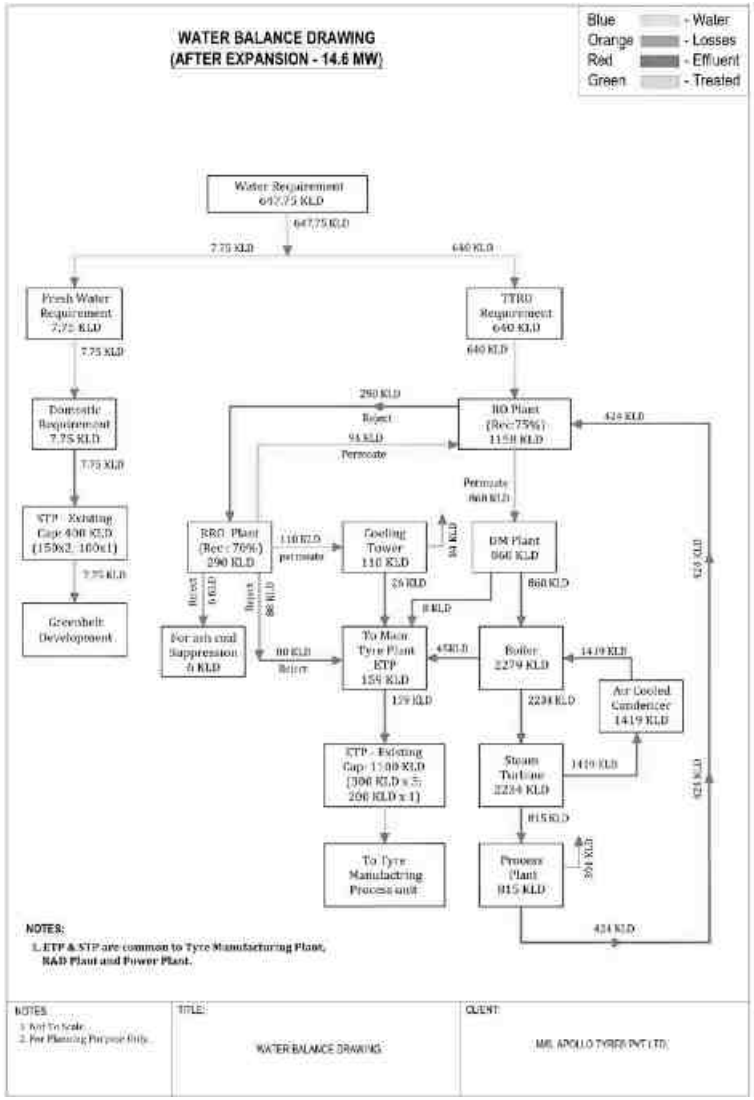
Land Use of the Study Area:

		
17	A mineralogical map of the proposed site (including soil type) and information (if available) that the site is not located on potentially mineable mineral deposit shall be submitted	Not Applicable, since the expansion project will be carried out within the existing plant premises.
18	Details of fly ash utilization plan as per the latest fly ash Utilization Notification of GOI along with firm agreements /	The generated fly ash is being collected from Electrostatic Precipirator using ash handling system and stored at different storage silo for each. Then the stored ash is being safely disposed to the authorised brick manufacturer by truck covered in tarpaulin. Hence, the ash utilisation achieved is 100% in the

<table>
<tr><td></td><td>MoU with contracting parties including other usages etc. shall be submitted. The plan shall also include disposal method / mechanism of bottom ash.</td><td>existing facility and the same will be followed after expansion.</td></tr>
<tr><td>19</td><td>The water requirement shall be optimized (by adopting measures such as dry fly ash and dry bottom ash disposal system, air cooled condenser. concept of zero discharge) and in any case not more than that stipulated by CEA from time to time, to be submitted along with details of source of water and water balance diagram. Details of water balance calculated shall take into account reuse and re-circulation of effluents.</td><td>Water requirement during Operation Phase:
The total fresh water requirement for the existing project is 345 KLD including domestic purposes. After expansion, 647.75 KLD of fresh water requirement will be required. The freshwater of 7 KLD is utilized for domestic purposes and TTRO water of 338 KLD is utilized for processes.
Source:
• The freshwater of 7 KLD is utilized for domestic purposes and TTRO water of 338 KLD is utilized for processes.
• The freshwater and TTRO water is being sourced from SIPCOT – Oragadam and the same will be followed after the expansion also. The water agreement between SIPCOT – Oragadam and ATL is enclosed as Annexure – 6.
Details of water requirement
<table>
<tr><th>S. No</th><th>Details</th><th>Existing (KLD)</th><th>Proposed (KLD)</th><th>After expansion (KLD)</th></tr>
<tr><td>1</td><td>Process</td><td>338</td><td>302</td><td>640</td></tr>
<tr><td>2</td><td>Domestic</td><td>7</td><td>0.75</td><td>7.75</td></tr>
<tr><td colspan="2">Total</td><td>345</td><td>302.75</td><td>647.75</td></tr>
</table>
Water Balance Diagram – Existing:</td></tr>
</table>



Water Balance Diagram – After Expansion:

		
20	Water body Nallah (if any) passing across the site should not be disturbed as far as	Not applicable, since no water bodies are passing across the site.

<table>
<tr>
<td></td>
<td>possible. In case any Nallah / drain is proposed to be diverted, it shall be ensured that the diversion does not disturb the natural drainage pattern of the area. Details of proposed diversion shall be furnished duly approved by the concerned Department of the State.</td>
<td>The details of nearby water bodies are given below:
<table>
<tr><th>S. No</th><th>Water Bodies</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Lake near Oragadam</td><td>0.06</td><td>S</td></tr>
<tr><td>2</td><td>Lake near Mattur</td><td>0.12</td><td>NE</td></tr>
<tr><td>3</td><td>Vadakkupattu Lake</td><td>2.57</td><td>SSE</td></tr>
<tr><td>4</td><td>Lake near Perinjambakkam</td><td>2.75</td><td>NE</td></tr>
<tr><td>5</td><td>Lake near Gunduperumbedu</td><td>4.26</td><td>NNE</td></tr>
<tr><td>6</td><td>Venpakkam Lake</td><td>4.28</td><td>WSW</td></tr>
<tr><td>7</td><td>Lake near Guruvanmedu</td><td>5.27</td><td>SSE</td></tr>
<tr><td>8</td><td>Ninjalmadu R</td><td>6.17</td><td>SSW</td></tr>
<tr><td>9</td><td>Pillappakkam Lake</td><td>6.75</td><td>N</td></tr>
<tr><td>10</td><td>Lake near Kongananjeri</td><td>8.59</td><td>SSW</td></tr>
<tr><td>11</td><td>Tenneri Tank</td><td>8.95</td><td>W</td></tr>
<tr><td>12</td><td>Adyar R</td><td>9.47</td><td>NE</td></tr>
<tr><td>13</td><td>Kambakkal Channel</td><td>9.47</td><td>NNW</td></tr>
<tr><td>14</td><td>Manimangalam Lake</td><td>9.95</td><td>ENE</td></tr>
<tr><td>15</td><td>Sriperumbudur Tank</td><td>10.39</td><td>N</td></tr>
<tr><td>16</td><td>Palar R</td><td>10.51</td><td>SSW</td></tr>
<tr><td>17</td><td>Cheyyar R</td><td>13.38</td><td>SW</td></tr>
</table>
</td>
</tr>
<tr>
<td>21</td>
<td>It shall also be ensured that a minimum of 500 m distance of plant boundary is kept from the HFL of river system / streams etc. and the boundary of site should also be located 500 m away from railway track and National Highways.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>22</td>
<td>Hydro-geological study of the area shall be carried out through an institute/ organization of repute to assess the impact on ground and surface water regimes. Specific mitigation measures</td>
<td>Ground water extraction is not being done as committed; only approval has been obtained from the CGWB Authority.</td>
</tr>
</table>

	shall be spelt out and time bound Action Plan for its implementation shall be submitted.	
23	Detailed Studies on the impacts of the ecology including fisheries of the River/Estuary/Sea due to the proposed withdrawal of water / discharge of treated wastewater into the River/Sea etc shall be carried out and submitted along with the EIA Report. In case of requirement of marine impact assessment study, the location of intake and outfall shall be clearly specified along with depth of water drawl and discharge into open sea.	Not Applicable as Zero Liquid Discharge method is being followed in the existing project site. Hence, impact on the ecology is not envisaged.
24	Source of water and its sustainability even in lean season shall be provided along with details of ecological impacts arising out of withdrawal of water and taking into account inter-state shares (if any). Information on other competing sources downstream of the proposed project and commitment regarding availability of requisite quantity of water from the Competent Authority shall be provided along with letter / document stating firm allocation of water.	**Water requirement:** The total fresh water requirement for the existing project is 345 KLD including domestic purposes. After expansion, 647.75 KLD of fresh water requirement will be required. **Source:** The freshwater of 7 KLD is utilized for domestic purposes and TTRO water of 338 KLD is utilized for processes. The freshwater is being sourced from SIPCOT – Oragadam and the same will be followed after the expansion also. The water agreement between SIPCOT – Oragadam and ATL is enclosed as **Annexure – 6.**
25	Detailed plan for rainwater harvesting and its proposed utilization in the plant shall be furnished.	**Rain water Harvesting:** Rain water harvesting is one of the ways to recharge the ground water and to reduce the use of fresh

		water. Hence, the Apollo Tyres Limited has developed numerous recharge pits in the site for the collection of rain water from the roof top and lane area. All the recharge pits are internally connected and directed towards rainwater harvesting tanks. Furthermore, the three rain water harvesting ponds are developed over an area of 1.3010 Ha (3.23acres) in its premises. Further details are furnished in **Chapter – 10, Section – 10.3.2.1.**
26	Feasibility of near zero discharge concept shall be critically examined and its details submitted.	**Zero Liquid Discharge:** The generated effluent is being treated in RO followed by MEE of existing ETP capacity of 1100 KLD (300KLD X3; 200 KLD X 1) and the same will be followed after the expansion. In addition, ZLD is being followed, and the same will be followed after expansion as well. The schematic diagram of process flow of ETP is enclosed as **Annexure - 16.**
27	Optimization of Cycles of Concentration (COC) along with other water conservation measures in the project shall be specified.	1. Cycle of Concentration (COC) is optimized and running continuously with 4 to 5. 2. Recycling of effluents to process using primary, secondary and tertiary treatment system
28	Plan for recirculation of ash pond water and its implementation shall be submitted.	Not Applicable
29	Detailed plan for conducting monitoring of water quality regularly with proper maintenance of records shall be formulated. Detail of methodology and identification of monitoring points (between the plant and drainage in the direction of flow of surface / ground water) shall be submitted. lt shall be ensured that parameter to be monitored also include heavy metals. A provision for long-term monitoring of ground water	**Ground water quality:** Total Eight (08) ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. **Groundwater Quality Monitoring Locations**

<table>
<tr>
<td></td>
<td>table using Peizometer shall be incorporated in EIA, particularly from the study area.</td>
<td>
<table>
<tr><th>Station Code</th><th>Location</th><th>Distance (~km) from Project boundary</th><th>Directions</th></tr>
<tr><td>GW1</td><td>Project Site</td><td colspan="2">Within Site</td></tr>
<tr><td>GW2</td><td>Mattur</td><td>1.01</td><td>N</td></tr>
<tr><td>GW3</td><td>Vaipur</td><td>2.44</td><td>NE</td></tr>
<tr><td>GW4</td><td>Umaiyaparanacheri</td><td>3.74</td><td>SE</td></tr>
<tr><td>GW5</td><td>Panayur</td><td>4.38</td><td>SW</td></tr>
<tr><td>GW6</td><td>Panrutti</td><td>3.45</td><td>W</td></tr>
<tr><td>GW7</td><td>Sirumangadu</td><td>7.64</td><td>NW</td></tr>
<tr><td>GW8</td><td>Vallam Kandigai</td><td>4.27</td><td>NW</td></tr>
</table>

The detailed monitoring results and observations are discussed in Chapter – 3, Section 3.8.2.1 and Table – 3.18. The map showing monitoring location of ground water quality is given in Figure – 3.27.
</td>
</tr>
<tr>
<td>30</td>
<td>Socio-economic study of the study area comprising of l0 km from the plant site shall be carried out through a reputed institute / agency which shall consist of detail assessment of the impact on livelihood of the local communities.</td>
<td>
Socio-economic study

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

The parameters are:
• Demographic structure
• Infrastructure Facility
• Economic Status
• Health status
• Cultural attributes
• Awareness and opinion of people about the project and Industries in the area.

The below shows some important Social Indicators of Kancheepuram District in Tamilnadu.
</td>
</tr>
</table>

Social Indicators of Kancheepuram District

S.No	Social Indicators	Kancheepuram District
1	Decadal variation %	38.95
2	Urban population %	63.49
3	Sex ratio	986
4	0-6 age group %	10.79
5	Population density (Persons per square Km)	892
6	Scheduled caste population %	23.71
7	Scheduled tribe population %	1.03
8	Literacy rate %	84.49
9	Work Participation rate %	41.86
10	Main Workers %	81.69
11	Marginal Workers %	18.31
12	Cultivators %	5.34
13	Agricultural labourers %	16.28
14	Workers in household industries %	3.27
15	Other workers %	75.11

According to the 2011 Census, 63.49% constituted the urban population of Kancheepuram district and 36.51 %, the rural population. The total population of Kancheepuram district was 39,98,252 in 2011, registering a growth of 39.0 per cent over 2001. There was an increase in the sex ratio in the district from 975 in 2001 to 985 in 2011 in which is, however, still lower than the state sex ratio of 996 women per men (Census 2011).

As per the 2011 Census, the total population of Kancheepuram district was 3,998,252 and it was the 2nd most populous out of the 32 districts in Tamil Nadu. The population density of Kancheepuram was 910 persons per sq.km and it was the 4th most densely populated district in Tamil Nadu. The rate of urbanization in the district has been very swift and quite haphazard. The 2011 Census states that, the Kancheepuram district has 63.49% urban population and 36.51 % rural population. The 2011 Census also states that the urban population in Kancheepuram district has increased almost 10.3% as compared to 2001.

31	Action Plan for identification of local employable youth for training in skills,	**Manpower required:**

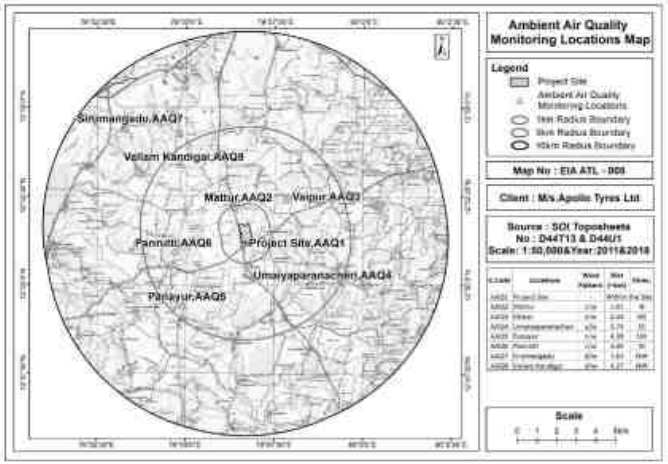
<table>
<tr><td></td><td>relevant to the project, for eventual employment in the project itself shall be formulated and numbers specified during construction & operation phases of the Project.</td><td>Construction phase: During construction phase, 100 nos. of manpower will be employed for the construction activities.

Operation phase: During the operation phase, the total man power required for the project is 50 nos. The detailed manpower requirement is given in the following table:

Manpower requirement for the project
<table><tr><th>S. No</th><th>Details</th><th>Existing (Nos)</th><th>Proposed (Nos)</th><th>After Expansion (Nos)</th></tr><tr><td>1</td><td>Manpower</td><td>45</td><td>5</td><td>50</td></tr></table></td></tr>
<tr><td>32</td><td>If the area has tribal population it shall be ensured that the rights of tribal are well protected. The project proponent shall accordingly identity tribal issues under various provisions of the law of the land.</td><td>Not Applicable since the proposed project will be carried out in the existing premises.</td></tr>
<tr><td>33</td><td>A detailed CSR plan along with activities wise break up of financial commitment shall be prepared. CSR component shall be identified considering need based assessment study and Public Hearing issues. Sustainable income generating measures which can help in upliftment of affected section of society, which is consistent with the traditional skills of the people shall be identified. Separate budget for community development activities and income generating programmes shall be specified.</td><td>Vision of CSR:
“Corporate Social Responsibility (CSR)” means the activities undertaken by a Company in pursuance of its statutory obligation laid down in section 135 of the Act in accordance with the provisions contained in these rules, but shall not include the activities specified in clauses (i) to (vi) of the Rules. Apollo Tyres Ltd has a company vision of being “Driving Progress & Together”.

The detailed CSR activities being carried by the M/s. Apollo Tyres Limited are mentioned in Chapter – 8, Section 8.4.1.</td></tr>
<tr><td>34</td><td>While formulating CSR schemes it shall be ensured that an in-built monitoring mechanism for the schemes identified are</td><td>The detailed CSR activities being carried by the M/s. Apollo Tyres Limited are mentioned in Chapter – 8, Section 8.4.1.</td></tr>
</table>

	in place and mechanism for conducting annual social audit from the nearest government institute of repute in the region shall be prepared. The project proponent shall also provide Action Plan for the status of implementation of the scheme from time to time and dovetail the same with any Govt. scheme(s). CSR details done in the past should be clearly spelt out in case of expansion projects.	
35	R&R plan, as applicable, shall be formulated wherein mechanism for protecting the rights and livelihood of the people in the region who are likely to be impacted, is taken into consideration. R&R plan shall be formulated after a detailed census of population based on socio economic surveys who were dependant on land falling in the project. As well as, population who were dependant on land not owned by them.	Land Acquisition and R & R are not applicable as 1 x 10 MW thermal power plant is proposed within the existing Apollo Tyres Limited premises in SIPCOT Industrial area, Oragadam. Hence, there is no additional land is required for the proposed project.
36	Assessment of occupational health and endemic diseases of environmental origin in the study area shall be carried out and Action Plan to mitigate the same shall be prepared.	Not applicable, since the proposed project will be carried out in the existing premises.
37	Occupational health and safety measures for the workers including identification of work related health hazards shall be formulated. The company shall engage	**Occupational Health:** In large industries during operation and maintenance, the men, materials and machineries are the basic inputs. Along with the boons, the industrialization has brought several problems like occupational health and safety. The industry planner, therefore, has to properly plan and take the steps to minimize the

	full time qualified doctors who are trained in occupational health. Health monitoring of the workers shall be conducted at Periodic intervals and health records maintained. Awareness programme for workers due to likely adverse impact on their health due to working in non-conducive environment shall be carried out and precautionary measures like use of personal equipments etc. shall be provided. Review of impact of various health measures undertaken at intervals of two to three years shall be conducted with an excellent follow up plan of action wherever required.	impacts of industrialization to ensure appropriate occupational health safety including fire. All these activities again may be classified under construction, erection and operation and maintenance. Occupational health needs attention both in construction and erection and operation and maintenance phases. However, the problems vary in magnitude and variety in the above phases. Health monitoring of the works has been monitoring at the regular interval of time and the same is being recorded. The health reports of the workers are enclosed as **Annexure – 10.** Further details are mentioned in **Chapter – 10, Section 10.3.8.3.**
38	One complete season site specific meteorological and AAQ data (except monsoon season) as per latest MoEF&CC Notification shall be collected and the dates of monitoring shall be recorded. The parameters to be covered for AAQ shall include PM l0, PM2.5, SO2, NOx, CO and Hg. The location of the monitoring stations should be so decided so as to take into consideration the upwind direction, pre-dominant downwind direction, other dominant directions, habitation and sensitive receptors. There should be at least one monitoring station each in the upwind and	**Air Quality Monitoring:**  **Ambient Air Quality Monitoring Locations**

in the pre - dominant downwind direction at a location where maximum ground level concentration is likely to occur.

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Directions
AAQ1	Project Site	-	Within the Site	
AAQ2	Mattur	c/w	1.01	N
AAQ3	Vaipur	c/w	2.44	NE
AAQ4	Umaiyaparanacheri	u/w	3.74	SE
AAQ5	Panayur	c/w	4.38	SW
AAQ6	Panrutti	c/w	3.45	W
AAQ7	Sirumangadu	d/w	7.64	NW
AAQ8	Vallam Kandigai	d/w	4.27	NW

Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Mattur	Vaipur	Umaiyaparanacheri	Panayur	Panrutti	Sirumangadu	Vallam Kandigai
			A1	A2	A3	A4	A5	A6	A7	A8
PM_{10} Conc. (µg/m³)	Min.	100 (24 Hours)	58.30	57.43	51.16	49.09	47.35	45.87	48.69	55.84
	Max.		83.09	81.85	72.91	69.96	67.48	65.37	69.39	79.58
	Avg.		**69.91**	**68.87**	**61.35**	**58.87**	**56.79**	**55.00**	**58.39**	**66.96**
	98th 'tile		82.60	81.37	72.49	69.55	67.09	64.99	68.99	79.11
$PM_{2.5}$ Conc. (µg/m³)	Min.	60 (24 Hours)	34.98	33.88	30.18	29.45	27.46	26.60	29.21	34.06
	Max.		49.85	48.29	43.02	41.98	39.14	37.91	41.63	48.54
	Avg.		**41.95**	**40.64**	**36.20**	**35.32**	**32.94**	**31.90**	**35.04**	**40.85**
	98th 'tile		49.56	48.01	42.77	41.73	38.91	37.69	41.39	48.26
SO_2 Conc. (µg/m³)	Min.	80 (24 Hours)	9.64	11.21	8.46	9.69	8.89	9.58	8.08	8.90
	Max.		13.73	15.97	12.05	13.82	12.67	13.65	11.52	12.69
	Avg.		11.56	13.44	10.15	11.63	10.67	11.49	9.70	10.68
	98th 'tile		13.65	15.88	11.98	13.74	12.60	13.57	11.45	12.61

NO_2 Conc. ($\mu g/m^3$)	**Min.**	**80 (24 Hours)**	18.91	22.41	16.92	19.39	17.63	19.14	15.99	19.14
	Max.		26.94	31.94	24.11	27.63	25.12	27.27	22.79	27.27
	Avg.,		**22.68**	**26.88**	**20.29**	**23.25**	**21.14**	**22.95**	**19.18**	**22.95**
	98th 'tile		26.79	31.75	23.97	27.47	24.97	27.12	22.66	27.12
Carbon monoxide (CO) (mg/m^3)	**Avg.**	**4 (1hour)**	0.62	0.53	0.21	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	0.38	0.58	0.56
Mercury (Hg) (Mg/Nm3)	**Avg.**	**-**	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)

Note:*BLQ (Below Limit Of Quantification), LOQ (Limit of Quantification).*

Observations:

The ambient air quality has been monitored at 8 locations as per NAAQS, 2009 within the study area. The results obtained are summarised as below:

- The average baseline levels of PM_{10} vary from 55.00 to 69.91 µg/m³.
- The average baseline levels of $PM_{2.5}$ vary from 31.90 µg/m³ to 41.95 µg/m³.
- The average baseline levels of SO_2 vary from 9.70 µg/m³ to 13.44 µg/m³.
- **2.** The average baseline levels of NO_2 vary from 19.18 µg/m³ to 26.88 µg/m³**.**

39	In case of expansion project. Air quality monitoring data of 104 observations a year for relevant parameters at air quality monitoring stations as identified/stipulated shall be submitted to assess for compliance of AAQ Standards (annual average as well as 24 hrs).	Air Quality Monitoring is being carried out at the existing project site and report for the same from April 2023 to August 2023 is enclosed as **Annexure – 11.**
40	A list of industries existing and proposed in the study area shall be furnished.	Existing Industries in the study area are tabulated below;

Industry	Distance (~km)	Dire.
Johnson Lifts & Escalators	adjacent to site	E
National Poly Plast India Ltd	0.06	W
Kyungshin Industrial Motherson Pvt Ltd	0.06	W
National Autoplast	0.14	W

			Magal Engineering Tech Pvt Ltd	0.14	NW
			Auto International India Pvt Ltd	0.18	W
			KGK Jet India Pvt Ltd	0.23	W
			Rice Lake Weighing Systems India Ltd	0.23	W
			NSK Bearing India Pvt Ltd	0.23	NW
			Calsonic Kansei Motherson	0.25	W
			Tide Water Oil	0.26	E
			PreBo Automotive Pvt Ltd	0.28	SW
			Renault Nissan Automotive India Pvt Ltd	0.3	SSW
			Chennai Radha Engineering Works Pvt Ltd	0.31	NNW
			Iberapa India Pvt Ltd	0.32	W
			Mangal Industries Ltd	0.33	W
			Besmak Components Pvt Ltd	0.33	SW
			Sharpline Automation Pvt Ltd	0.34	W
			Doowon Electronics India Pvt Ltd	0.35	E
			Nhk. F . Krishna Automotive Seating Pvt Ltd	0.4	WSW
			Seoyon E-HWA Automotive India Pvt Ltd	0.41	W
			Doowon Automotives Systems India Pvt Ltd	0.43	E
			Subros Ltd	0.44	W
			Zetek Castings Pvt Ltd	0.46	NNW
			Nippon Steel chemical & Materials India Pvt Ltd	0.53	N
			CTM India Ltd	0.56	W
			Bosch Electrical Drives India Pvt Ltd	0.6	W
			Katsushiro Matex Pvt Ltd	0.6	W
			Sanmina - SCI India Pvt Ltd (DTA unit)	0.62	W
			Sumika Polymer Compounds India Pvt.Ltd	0.65	WSW
			Cape Electric Pvt Ltd	0.68	WSW
			ShinEtsu Polymer India Pvt Ltd	0.7	W
			Essar Steel India Ltd	0.71	WNW

			Lohmann Adhesive Tapes India Pvt. Ltd	0.71	W
			Stanley Engineered Fastening India Pvt Ltd	0.73	W
			Severn Glocon Valves Pvt Ltd	0.73	SW
			Industrias Del Recambio India Pvt Ltd	0.81	NW
			Polymatech Electronics Pvt Ltd	0.81	W
			Precision Machines & Equipments Unit 3 Pvt Ltd	0.81	WSW
			Obo Bettermann India Pvt Ltd	0.83	WSW
			Annai Sakthi Enterprises - Civil Contractor	0.84	W
			Right Tight Fasteners Pvt Ltd,	0.85	SW
			DELPHI-TVS Technologies Ltd	0.85	NE
			Uniproducts India Ltd	0.87	NE
			Punch Ratna Fasteners Pvt Ltd	0.99	NE
			Steel Strips Wheels Ltd	1	W
			Rico Auto Chennai plant	1.06	WNW
			Eicher Motors Ltd	1.12	SW
			Danfoss Industries Pvt Ltd	1.16	WSW
			Sundaram - Clayton Ltd	1.21	NE
			Daimler India Commercial Vehicles Pvt Ltd	1.23	S
			Komatsu India Pvt Ltd	1.24	WSW
			Komos Automotive India Pvt Ltd	1.43	ENE
			RD Brown Box Packaging	1.5	ENE
			Sundaram Auto Components Ltd	1.57	NE
			Amalgamations Valeo Clutch Pvt Ltd	1.64	ENE
			Nokia Solutions & Networks India Pvt Ltd	1.68	W
			JCBL Marrel Tippers Pvt Ltd	2.02	ENE
			Stellar Plastic	2.41	ENE
			Lear Automotive India Pvt Ltd	2.45	S
			Tenneco Automotive India Pvt Ltd	2.48	S
			Unipres India Pvt. Ltd	2.56	S

			BSA Corporation Ltd.(Mfg. Plant)	2.67	ENE
			Sandhar Technologies Ltd	2.73	ENE
			Momentive Performance Material India Pvt Ltd	2.75	ENE
			Polyplastics Auto Components Pvt Ltd	2.95	S
			Autoneum Nittoku Sound-Proof Products India Pvt Ltd	2.97	S
			M M Forgings Ltd-Plant 4	3.02	ENE
			Flashkart India Pvt Ltd	3.03	N
			Mindarika Pvt Ltd	3.06	S
			SSMPL SS Manufacturing Pvt Ltd	3.1	W
			Kosei Minda Aluminum Company Ltd	3.25	S
			Aggreko Energy Rental India Pvt Ltd	3.38	ENE
			Yusen logistics Nissan Warehouse	3.43	WSW
			Jeongun Chennai Pvt Ltd	3.59	WNW
			Kasai India Pvt Ltd	3.95	SW
			Royal Enfield Vallam Vadagal Plant	3.96	NNW
			TPI Composites India	3.98	WNW
			Vestas Wind technology India Pvt Ltd	4.07	S
			Vikram Solar Ltd (FAB 3)	4.37	SW
			EL Forge Ltd	4.97	SSE
			Flyjac Logistics Pvt Ltd	5.02	WSW
			Donaldson India Filter Systems Pvt Ltd	5.1	WSW
			Nippon Express Warehouse	5.21	WSW
			KONE Elevator India Pvt Ltd	5.28	WSW
			MI Steel Processing India Pvt Ltd	5.47	WSW
			SAN Logistik Park	5.64	WSW
			Sakura Autoparts India Pvt. Ltd	5.72	NW
			India Yamaha Motor Pvt Ltd	5.82	NW
			SMRC Automotive Products India Pvt Ltd	6.09	NW
			Varroc Polymers Pvt Ltd	6.39	SSW

			GE T&D India Ltd	6.49	ENE
			Vassmaan Automotive Pvt Ltd	6.87	ENE
			Rane Madras Ltd	7.19	WSW
			Asian Paints Ltd	7.78	NNW
			Carborundum Universal Ltd	7.84	NNW
			Saint Gobain Glass India Ltd	8.15	NNW
			YCH Logistics India Pvt Ltd	8.27	NW
			Motherson Automotive Technologies and Engineering	8.41	N
			Samsung India Electronics Pvt Ltd	8.43	NW
			Amcol Minerals and Materials India Pvt Ltd	8.45	NNW
			Inox Air Product	8.52	NNW
			Foxconn Technology India Pvt Ltd	8.54	NW
			Apex Laboratories Pvt Ltd	8.56	WNW
			Flex India	8.65	NW
			Visen Industries Ltd. Chennai	8.67	NNW
			KwangJin India	8.75	NNW
			J.K. Fenner India Ltd	8.77	NNW
			Dell International Services India Pvt Ltd	8.79	NW
			Interarch Building Products Pvt Ltd	8.97	NNW
			Faurecia Automotive Seating India Pvt Ltd	9.17	N
			Wheels India Ltd	9.28	N
			KM Seats Co Pvt Ltd	9.29	WSW
			Salcomp manufacturing india Pvt Ltd	9.39	N
			JTEKT India Ltd	9.51	NNW
			Prabhu Laser Components	9.54	NNE
			Jamna Auto Industries Ltd	9.6	NNE
			Thaai Casting	9.68	NNE
			CMR Toyotsu Aluminium India Ltd	9.71	N
			Zsivira Chemie Merk Pvt Ltd	9.83	NNE

Surin Automotive Pvt Ltd	9.88	NNE
MEI Foundry	9.9	NNE
Asian Sealing Products	9.91	N
Infac India Pvt Ltd	10.02	ENE
Ford India Pvt.Ltd	10.48	SE
United Industries Plastic Pvt Ltd	10.73	NNE
Mando Automotive India Pvt Ltd	10.74	NNE
KONE Elevator India Pvt Ltd	10.77	NNE
Hanon Systems Pvt Ltd	10.79	SE
BSH Household Appliances Manufacturing Ltd	10.96	NNE
Tamil Nadu Steel Tubes	10.97	SE
Yorozu JBM Automotive Tamil Nadu Pvt Ltd	11.03	NNE
Minda Corporation Limited	11.10	NNE
Blasto Metal Spray Processors	11.13	NNE
Visteon Electronics India Pvt Ltd	11.15	SE
Gestamp Automotive Pvt Ltd	11.49	NNE
The Hindu	11.51	SE
UCAL Fuel System Ltd Plant 6	11.75	SE
Sundaram Industries	11.80	SE
Mahle Engine Components India Pvt ltd	12.06	SE
BASF Catalyst India Pvt. Ltd	13.62	SSE
Wheels India Limited	14.11	NNE
Sharda Motor Industries Limited	14.39	SSE

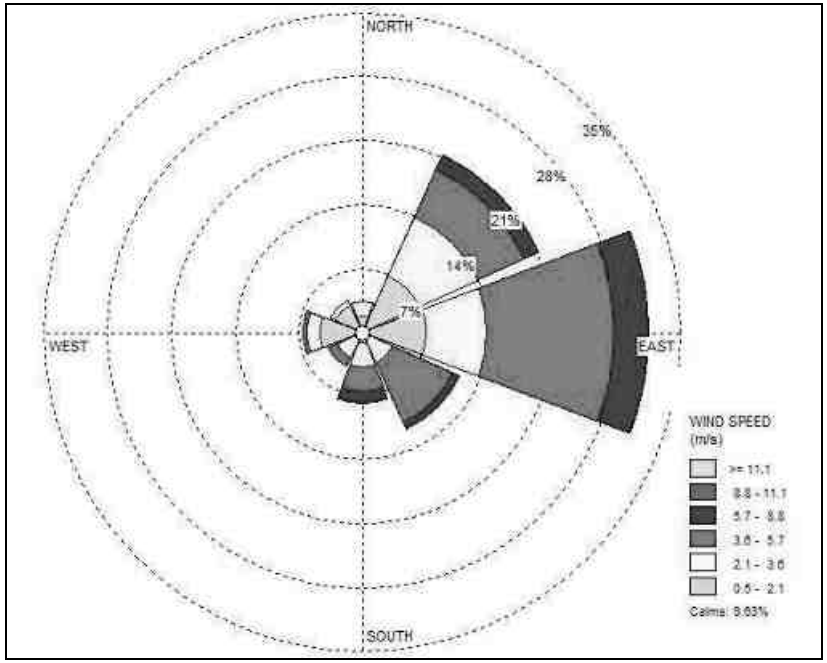
41	Cumulative impacts of all sources of emissions including handling and transportation of existing and proposed projects on the environment of the area shall be assessed in detail. Details of the Model used and the input data used for	**Cumulative Impacts:** Maximum pollutant concentrations of PM, SO_2 and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in below;

	modeling shall also be provided. The air quality contours should be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. The wind rose and isopleths should also be shown on the location map. The cumulative study should also include impacts on water, soil and socioeconomics.	**Total Maximum GLCs from the Stack & Transportations Emissions**

Pollutant	Max. Base line Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard (µg/m^3)
PM_{10}	83.09	0.10	83.19	100
SO_2	15.97	8.07	24.04	80
NO_x	31.94	6.30	38.24	80

Further details are mentioned in **Chapter 4, Section 4.1.3.2.1.**

Wind rose:

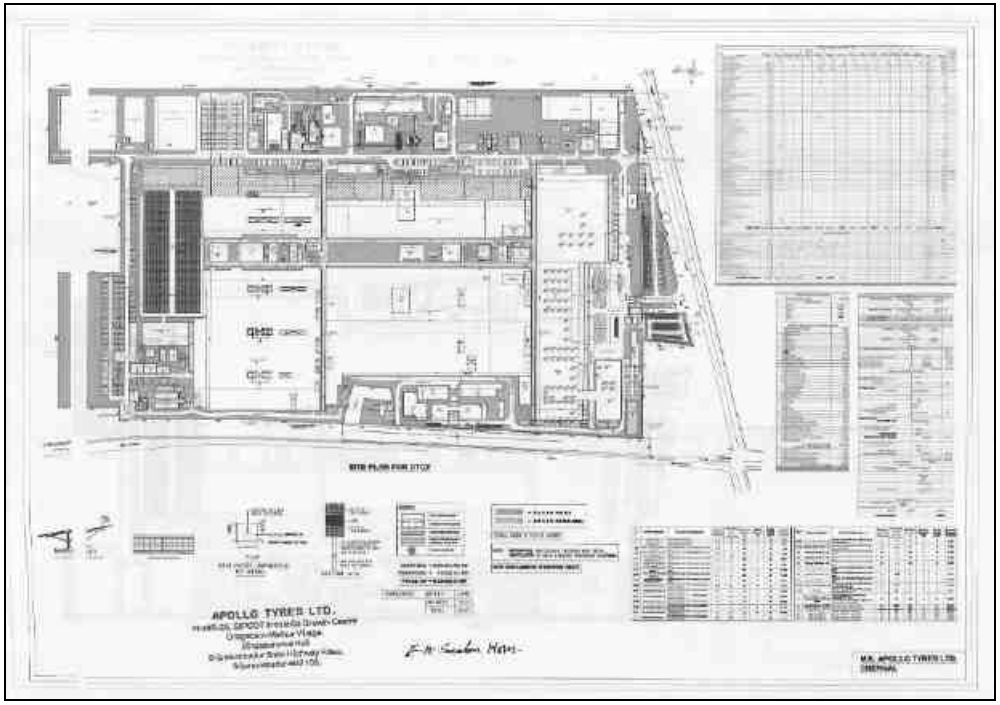


The isopleths are given in **Figure 4-2** to **Figure 4-9** and details are mentioned in **Chapter - 4, Section 4.1.3.2.1.** Further details of impacts on water, soil and socio economic were mentioned in **Chapter – 4,**

<table>
<tr><td></td><td></td><td>Section 4.1.3.4 & 4.1.3.5.</td></tr>
<tr><td>42</td><td>Radio activity and heavy metal contents of coal to be sourced shall be examined and submitted along with laboratory reports.</td><td>The analysis report of the coal is enclosed as Annexure – 12.</td></tr>
<tr><td>43</td><td>Fuel analysis shall be provided. Details of auxiliary fuel, if any, including its quantity, quality, storage etc should also be furnished.</td><td>The analysis report of the coal is enclosed as Annexure – 12.</td></tr>
<tr><td>44</td><td>Quantity of fuel required, its source and characteristics and documentary evidence to substantiate confirmed fuel linkage shall be furnished. The Ministry's Notification dated 02.01.2014 regarding ash content in coal shall be complied. For the expansion projects, the compliance of the existing units to the said Notification shall also be submitted</td><td>Fuel Requirement:
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Details</th><th colspan="3">Quantity (MT/day)</th><th rowspan="2">Source</th></tr>
<tr><th>Existing</th><th>Proposed</th><th>After expansion</th></tr>
<tr><td>1</td><td>Coal</td><td>74</td><td>105</td><td>179</td><td>Local supplier/ Indonesian coal</td></tr>
<tr><td>2</td><td>Biomass (Rice husk)*</td><td>-</td><td>95</td><td>95</td><td>Local supplier</td></tr>
<tr><td colspan="2">Total</td><td>74</td><td>200</td><td>274</td><td></td></tr>
</table>
*Note: The utilisation of biomass will be increased with time.
The analysis report of the source coal is enclosed as Annexure – 12.</td></tr>
<tr><td>45</td><td>Details of transportation of fuel from the source (including port handling) to the proposed plant and its impact on ambient AAQ shall be suitably assessed and submitted. If transportation entails a long distance it shall be ensured that rail transportation to the site shall be first assessed. Wagon loading at source shall preferably be through silo/conveyor belt.</td><td>Transportation of fuel i.e., coal, is being carried out from Ennore port by trucks.
Maximum pollutant concentrations of PM and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in below table
Total Maximum GLCs from the Transportations Emissions
<table>
<tr><th>Pollutant</th><th>Max. Base line Conc. (µg/m^3)</th><th>Estimated Incremental Conc. (µg/m^3)</th><th>Total Conc. (µg/m^3)</th><th>NAAQ standard (µg/m^3)</th></tr>
<tr><td>PM_{10}</td><td>83.09</td><td>0.01</td><td>83.1</td><td>100</td></tr>
<tr><td>NO_x</td><td>31.94</td><td>0.73</td><td>32.67</td><td>80</td></tr>
</table></td></tr>
<tr><td>46</td><td>For proposals based on imported coal, inland transportation and port handling</td><td>Not applicable</td></tr>
</table>

<table>
<tr><td></td><td>and rail movement shall be examined and details furnished. The approval of the Port and Rail Authorities shall be submitted.</td><td></td></tr>
<tr><td>47</td><td>Details regarding infrastructure facilities such as sanitation, fuel, restrooms, medical facilities, safety during construction phase etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase should be adequately catered for and details furnished.</td><td>Infrastructure Facility:
Infrastructure facilities such as sanitation, fuel, restrooms, medical facilities, safety are already available. Hence, no infrastructure facility is proposed for the expansion project.</td></tr>
<tr><td>48</td><td>EMP to mitigate the adverse impacts due to the project along with item - wise cost of its implementation in a time bound manner shall be specified.</td><td>The detailed Environmental Management Plan to mitigate the adverse impacts during the construction and operation phase is elaborated in Chapter – 10, Section 10.2 and 10.3.
The cost estimate for the Environmental Management Plan is provided in the following table;
Budget estimation for EMP
<table>
<tr><th>S. No.</th><th>Description</th><th>Capital Cost (Rs. In Lakhs)</th><th>Operating cost (Rs. In Lakhs)</th></tr>
<tr><td>1.</td><td>Landscaping & Gardening</td><td>5.0</td><td>1.0</td></tr>
<tr><td>2.</td><td>Solid waste Management (Organic waste converter)</td><td>10.0</td><td>2.5</td></tr>
<tr><td>3.</td><td>Rainwater harvesting</td><td>8.0</td><td>0.5</td></tr>
<tr><td>4.</td><td>Air pollution Control measures</td><td>3.5</td><td>1.0</td></tr>
<tr><td>5.</td><td>Energy Conservation (Solar Panel)</td><td>15.0</td><td>1.5</td></tr>
<tr><td>6.</td><td>Miscellaneous</td><td>8.5</td><td>4.0</td></tr>
<tr><td colspan="2">Total Cost</td><td>50.0</td><td>10.5</td></tr>
</table></td></tr>
<tr><td>49</td><td>A Disaster Management Plan (DMP) along with risk assessment study</td><td>A detailed risk assessment and Disaster management study has been conducted and enclosed as Annexure – 13.</td></tr>
</table>

	including fire and explosion issues due to storage and use of fuel should be carried out. It should take into account the maximum inventory of storage at site at any point of time. The risk contours should be Plotted on the plant layout map clearly showing which of the proposed activities would be affected in case of an accident taking place. Based on the same, proposed safeguard measures should be provided. Measures to guard against fire hazards should also be invariably provided. Mock drills shall be suitably carried out from time to time to check the efficiency of the plans drawn.	The major hazards identified during the below activities are given in the report and proper mitigation measures have also be suggested in the report. • Coal storage and Handling • Handling of Coal in Conveyor • Crusher Operation • Working nearby hot surfaces • Working in the transformer and power house • Operation of Boiler • Handling of ash generated • Operation of DM Pant • Operation of Generator and Turbines • Activities in Switch Yard etc.
50	The DMP so formulated shall include measures against likely Fires/Tsunami/Cyclones/Storm surges/ Earthquakes etc, as applicable. It shall be ensured that DMP consists of both On-site and Off-site plans, complete with details of containing likely disaster and shall specifically mention personnel identified for the task. Smaller version of the plan for different possible disasters shall be prepared both in English and local languages and circulated widely.	A detailed on site and off site Emergency Response and Disaster Management Plan, with roles and responsibilities, is prepared and given in **Chapter – 7, Section - 7.3** of EIA Report. This covers all types of emergencies viz • Fire & Explosions • Toxic Releases • Natural Calamities like flood, Cyclones, Earthquake etc. This plan includes training programme and Public Awareness programme, as well. The procedure and duties of external offices/Emergency department have also been explained in on-site emergency plan (enclosed as **Annexure – 14**).
51	Detailed scheme for raising green belt of native species of appropriate width (50 to	**Greenbelt development:** The total area of the site is 50.71 Ha (125.307 acres), out of which 12.51 Ha (30.913 acres) of land is

	100 m) and consisting of at least 3 tiers around plant boundary with tree density of 2000 to 2500 trees per ha with a good survival rate of around 80% shall be submitted. Photographic evidence must be Created and submitted periodically including NRSA reports in case of expansion projects. A shrub layer beneath tree layer would serve as an effective sieve for dust and sink for CO2 and other gaseous pollutants and hence a stratified green belt should be developed.	earmarked to develop greenbelt of 24.66% in the site premises. Currently, total of 3314 no of trees were developed in the allocated area for greenbelt. Additionally, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 to an extent of 16.55 acres (6.70 Ha) which is adjacent to the site. Hence, the additional land allocated by SIPCOT for the development of greenbelt is considered as the proposed greenbelt development for this project. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%. The allocation letter from the SIPCOT is attached as the **Annexure - 4**. Layout showing the existing greenbelt development in the site is given below; 
52	Over and above the green belt, as carbon sink, plan for additional plantation shall	Along with the existing greenbelt development in the existing premises, ATL also maintaining greenbelt to an extent of 16.55 acres (6.70 Ha) which is allocated by SIPCOT – Oragadam, adjacent to the site.

	be drawn by identifying blocks of degraded forests, in close consultation with the District Forests Department. In pursuance to this the project proponent shall formulate time bound Action Plans along with financial allocation and shall submit status of implementation to the Ministry every six months.	
53	**Corporate Environment Policy**	
53(a)	Does the company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.	We consider environment as a key stakeholder and are proactive in developing the stock of Natural Capital. The focus lies in prudent utilisation of resources and replenishment, whereby concerted efforts have been made to monitor the footprint. We invest in state-of-the-art operations, backed by robust R&D to ensure net positive impact on the Environment. The work in Environment management is governed by the **Corporate Environment Policy** and steered by the cross functional **Environment Working Group** with representations from various functions. All the plants are certified to environment management system as per the international standard of ISO 14001. The priority areas of the work in Environment management encompasses resource conservation, pollution control and circular economy.
53(b)	Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.	**Integrated Management System Policy:** We, at Apollo Tyres, will ensure that all our manufacturing and associated functions use a fact based approach to continually improve systems and processes, which create excellence in product and services, minimizes environmental impact, safeguards employee health and safety and strives to exceed requirement and expectations of our customers, business partners and statutory authorities. Further details are mentioned in **Chapter – 10, section – 10.1.3.**
53(c)	What is the hierarchical system or Administrative order of the company to	**Hierarchical system** Head In-charge (Director)

	deal with the environmental issues and for ensuring compliance with the environmental clearance Conditions. Details of this system may be given.	Further detailed hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the Environmental Clearance Conditions are mentioned in **Chapter 10, Section 10.1.3.**
53(d)	Does the company has compliance management system in place wherein compliance status along with compliances / violations of environmental norms are reported to the CMD and the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report. All the above details should be adequately brought out in the EIA report and in the presentation to the Committee.	**Environmental Management Cell** ➢ In order to plan and implement projects, each industry should establish a Department/Section/Cell with trained personnel to take on model responsibility for environmental management. ➢ The environmental activities in the industry will be managed efficiently by an Environmental Cell comprising the Managing Director and department heads. ➢ The EMC is responsible for managing environmental and social issues within the project being undertaken. ➢ It is the responsibility of the EMC to plan, implement, and monitor all mitigation and compensation measures for the environment. The detailed reporting mechanism of the company is furnished in **Chapter – 10, section – 10.1.3.**
54	Details of litigation pending or otherwise with respect to project in any Court, Tribunal etc. shall invariably be furnished.	No litigation

1.5.1 Additional ToR for Coastal Based Thermal Power Plants Projects (TPPs)

S. No	ToR Conditions	Compliance
A	Low lying areas fulfilling the definition wetland as per Ramsar Convention shall be identified and clearly demarcated w.r.t the proposed site	Not Applicable
B	If the site includes or is located close Io marshy areas and backwaters, these areas must be excluded from the site and the project boundary should be away from the CRZ line. Authenticated CRZ map from any of the authorized agencies shall be submitted.	Not Applicable
C	The soil leveling should be minimum with no or minimal disturbance to the natural drainage of the area. If the minor canals (if any) have to be diverted, the design for diversion should be such that the diverted canals not only drains the plant area but also collect the volume of flood water from the surrounding areas and discharge into marshy areas/major canals that enter into creek. Major canals should not be altered but their embankments should be strengthened and desilted	Not Applicable
D	Additional soil required for leveling of the sites should as far as possible be generated within the site itself in such a manner that the natural drainage system of the area is protected and improved.	Not Applicable
E	Marshy areas which hold large quantities of flood water to be identified and shall not be disturbed.	Not Applicable
F	No waste should be discharged into creek, canal systems, Backwaters, Marshy areas and seas without appropriate treatment. Wherever feasible, the outfall should be first treated in a Guard Pond and then only discharged into deep sea (10 to l5 m depth). Similarly, the Intake should be from deep sea to avoid aggregation of fish and in no case shall be from the estuarine zone. The brine that comes out from Desalinization Plants (if any) should not be discharged into sea without adequate dilution**.**	Not Applicable
G	Mangrove conservation and regeneration plan shall be formulated and Action plan with details of time bound implementation shall be specified, if mangroves are present in Study Area.	Not Applicable
H	A common Green Endowment Fund should be created by the project proponents out of EMP budgets. The interest earned out of it should be used for the development and management of green cover of the area.	Not Applicable
I	Impact on fisheries at various socio economic level shall be assessed.	Not Applicable
J	An endowment Fishermen welfare Fund should be created out of CSR grants not only to enhance their quality of life by creation of facilities for Fish Landing Platforms / Fishing Harbour / cold storage, but also to provide relief in case of emergency situations such as missing of fishermen on duty due to rough seas, tropical cyclones and storms etc.	Not Applicable
K	Tsunami Emergency Management Plan shall be prepared wherever applicable and Plan submitted	Not Applicable

	prior to the commencement of construction work.	
L	There should not be any contamination of soil, ground and surface waters (canals & village pond) with sea water in and around the project sites. In other words necessary preventive measures for spillage from pipelines, such as lining of Guard Pond used for the treatment of outfall before discharging into the sea and surface RCC channels along the pipelines of outfall and intake should be adopted. This is just because the areas around the projects boundaries could be fertile agricultural land used for paddy cultivation.	Not Applicable

CHAPTER – 2

PROJECT DESCRIPTION

2. PROJECT DESCRIPTION

2.1 Type of Project

M/s. Apollo Tyres Limited (ATL) is an international tyre manufacturer and the leading tyre brand in India. The tyre manufacturing facility at Oragadam, Sriperumbudur, Chennai has R & D plant along with 4.6MW of coal based Co-generation plant in it which is operating with the valid CTO. Due to the increasing need in the power requirement, ATL is proposed to set up a "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x10 MW". The Components of existing Co-generation plant has the AFBC boilers of capacity 35TPH and 60 TPH, 4.6MW turbine and compressors. In addition to the above, for the proposed project, turbine of capacity 10MW with suitable Air Cooled Condenser will be installed with the existing facility.

The proposed project involves the Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x10 MW, which falls under Schedule 1(d) i.e. Thermal Power Plants, of Category "B" (i.e. less than 500 MW, coal based) as per the EIA notification 2006 and its subsequent Amendment. The details of existing and proposed products with capacities are given in below table;

Table 2-1 Existing and Proposed Product details

S. No	Product	Existing (MW)	Proposed (MW)	After expansion (MW)
1	Co Gen power generation through Captive power plants	1 x 4.6	1 x 10	1 x 4.6 1 x 10

2.2 Project Justification

The purpose of having a captive power plant at Apollo Tyres Limited at Oragadam is to reduce the cost on buying power from the Tamil Nadu grid and also reduce the already existing stress on the district power supply. Thus such a project would help reduce stress on the power deficient condition of the state of Tamil Nadu. Also, transmission and distribution losses continue to remain a problem throughout the country, which is not the case in captive power plants. Moreover Oragadam being an industrial area, a captive power plant for this Apollo tyre project will avoid usage of power for the other smaller industries in the area, along with safeguarding power supply for the localities. The project being a co-generation project, envisages utilization of steam for both power production as well as steam consumption for process requirements. Consequently, thermal energy is utilized more efficiently than a conventional power plant.

2.3 Project Location

The proposed project is expansion of thermal power plant from 4.6 MW to 14.6 MW, which is located within the M/s.Apollo Tyres Limited at S.F No.491, Plot No.B-25 SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudur Taluk, Kanchipuram District, Tamil Nadu. The project site is falls in D44T13 & D44U1 of Topo sheet and lies between the latitude 12°51'27.25"N and longitude 79°56'40.59"E.

The index map of the project site and Google image of the project site along with co-ordinates are given in **Figure 2-1** and **Figure 2-2** respectively. Google image showing the nearby habitants from the project site of radius 1 km, 5 km and 10 km are shown in **Figure 2-3**, **Figure 2-4** and **Figure 2-5** respectively. The Layout of the project site indicating the proposed project is given in **Figure 2-6**.

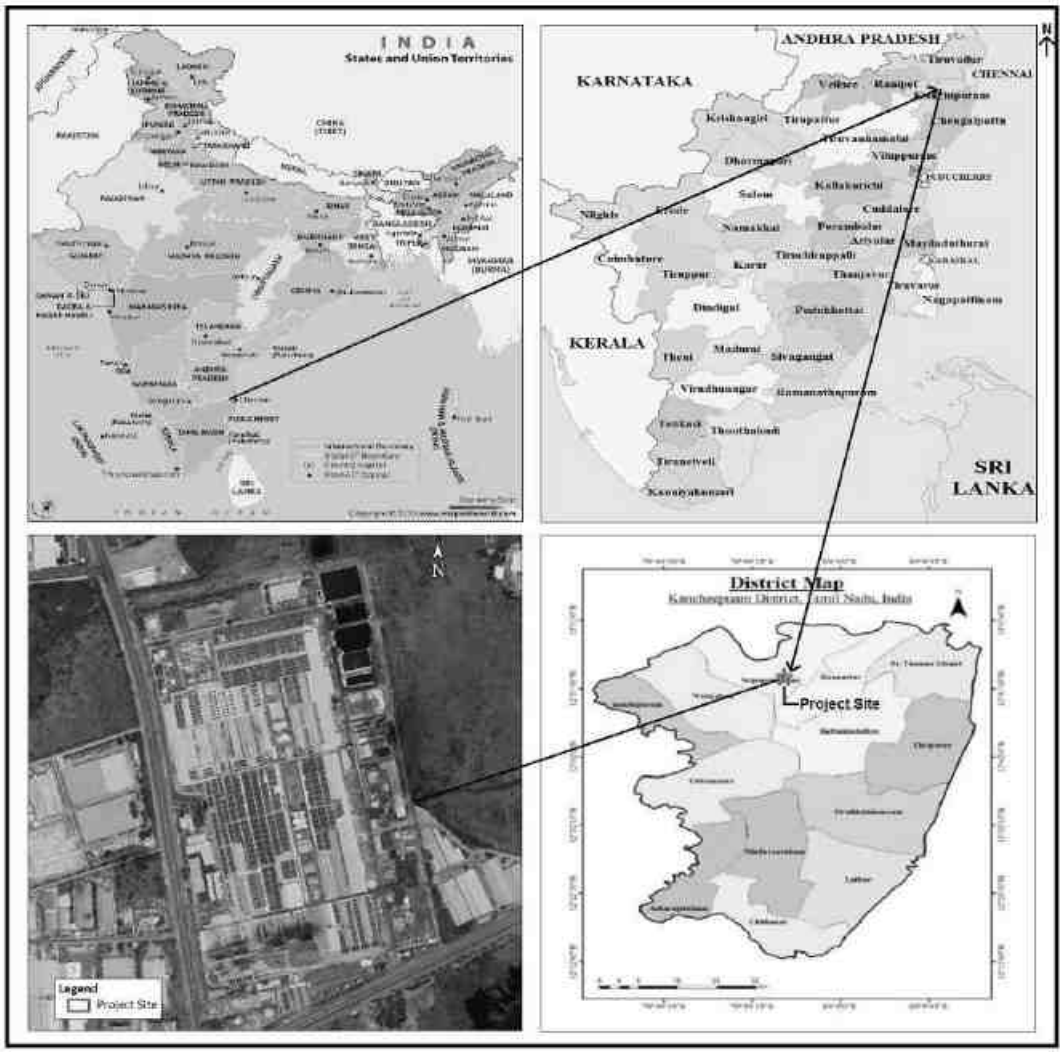
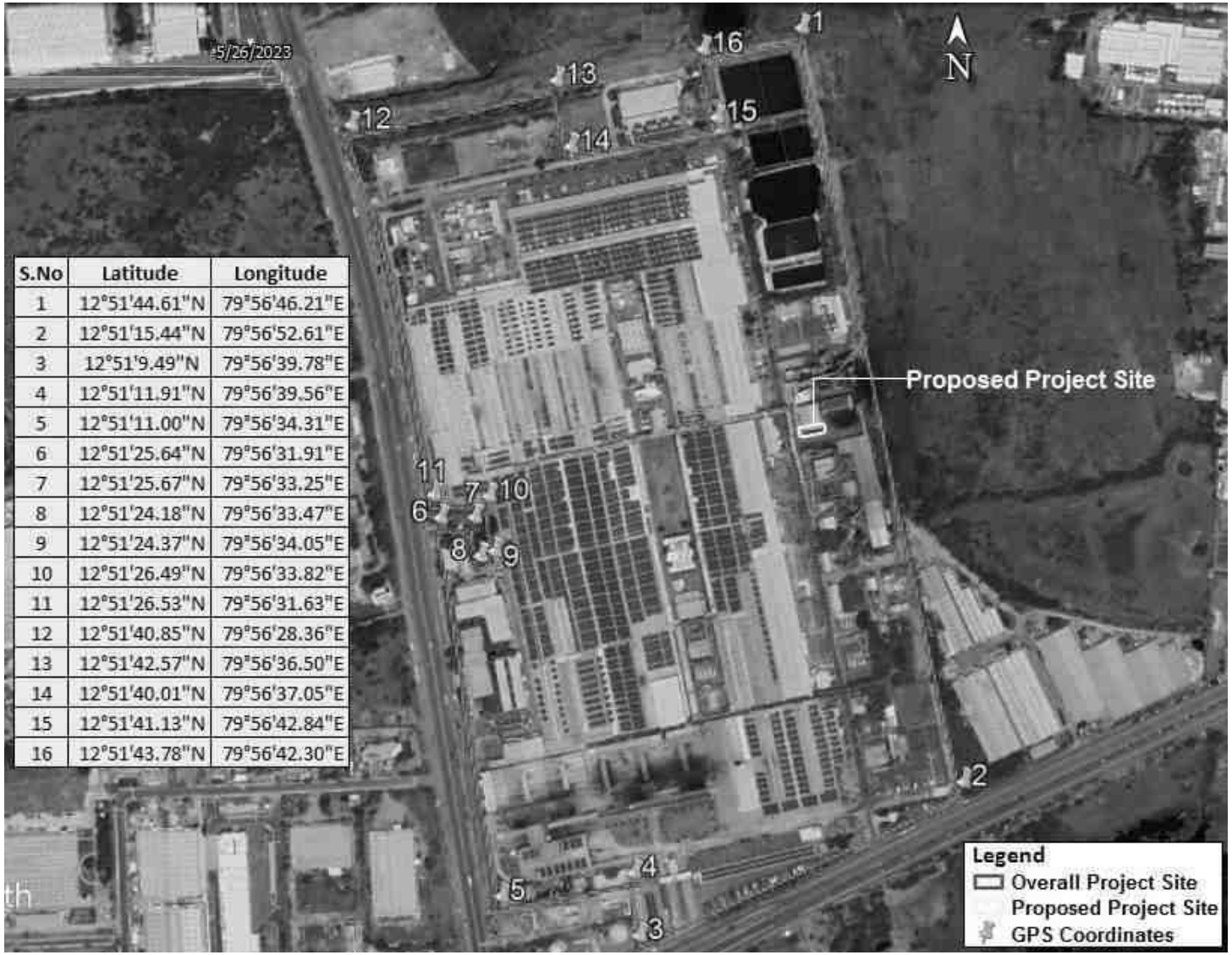


Figure 2-1 Location of the Project



S.No	Latitude	Longitude
1	12°51'44.61"N	79°56'46.21"E
2	12°51'15.44"N	79°56'52.61"E
3	12°51'9.49"N	79°56'39.78"E
4	12°51'11.91"N	79°56'39.56"E
5	12°51'11.00"N	79°56'34.31"E
6	12°51'25.64"N	79°56'31.91"E
7	12°51'25.67"N	79°56'33.25"E
8	12°51'24.18"N	79°56'33.47"E
9	12°51'24.37"N	79°56'34.05"E
10	12°51'26.49"N	79°56'33.82"E
11	12°51'26.53"N	79°56'31.63"E
12	12°51'40.85"N	79°56'28.36"E
13	12°51'42.57"N	79°56'36.50"E
14	12°51'40.01"N	79°56'37.05"E
15	12°51'41.13"N	79°56'42.84"E
16	12°51'43.78"N	79°56'42.30"E

Figure 2-2 Google imagery of the project site with Coordinates

Figure 2-3 Google image showing nearby habitants of 1 km radius from the project site

Figure 2-4 Google image showing nearby habitants of 5 km radius from the project site

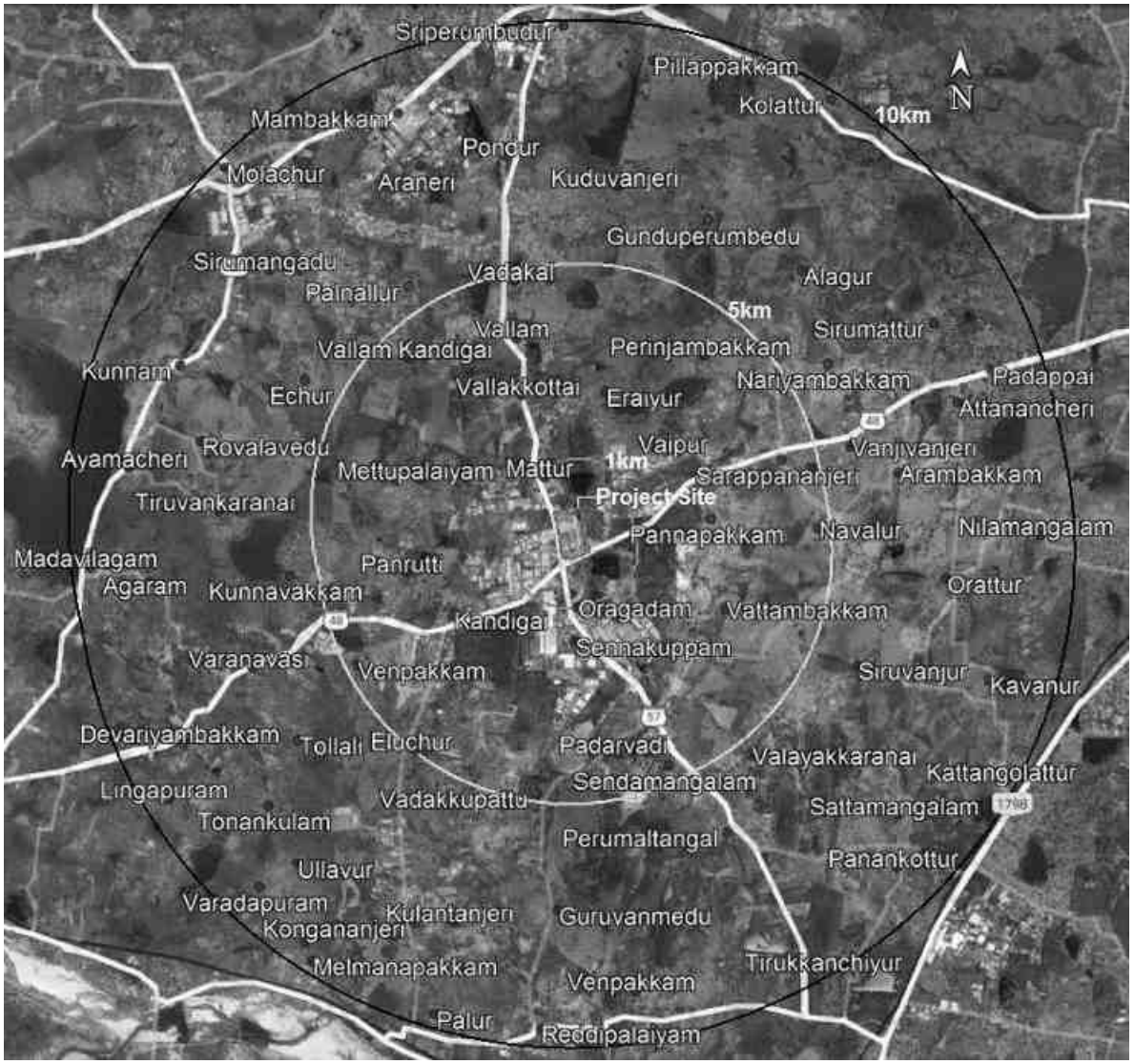


Figure 2-5 Google image showing nearby habitants of 10 km radius from the project site

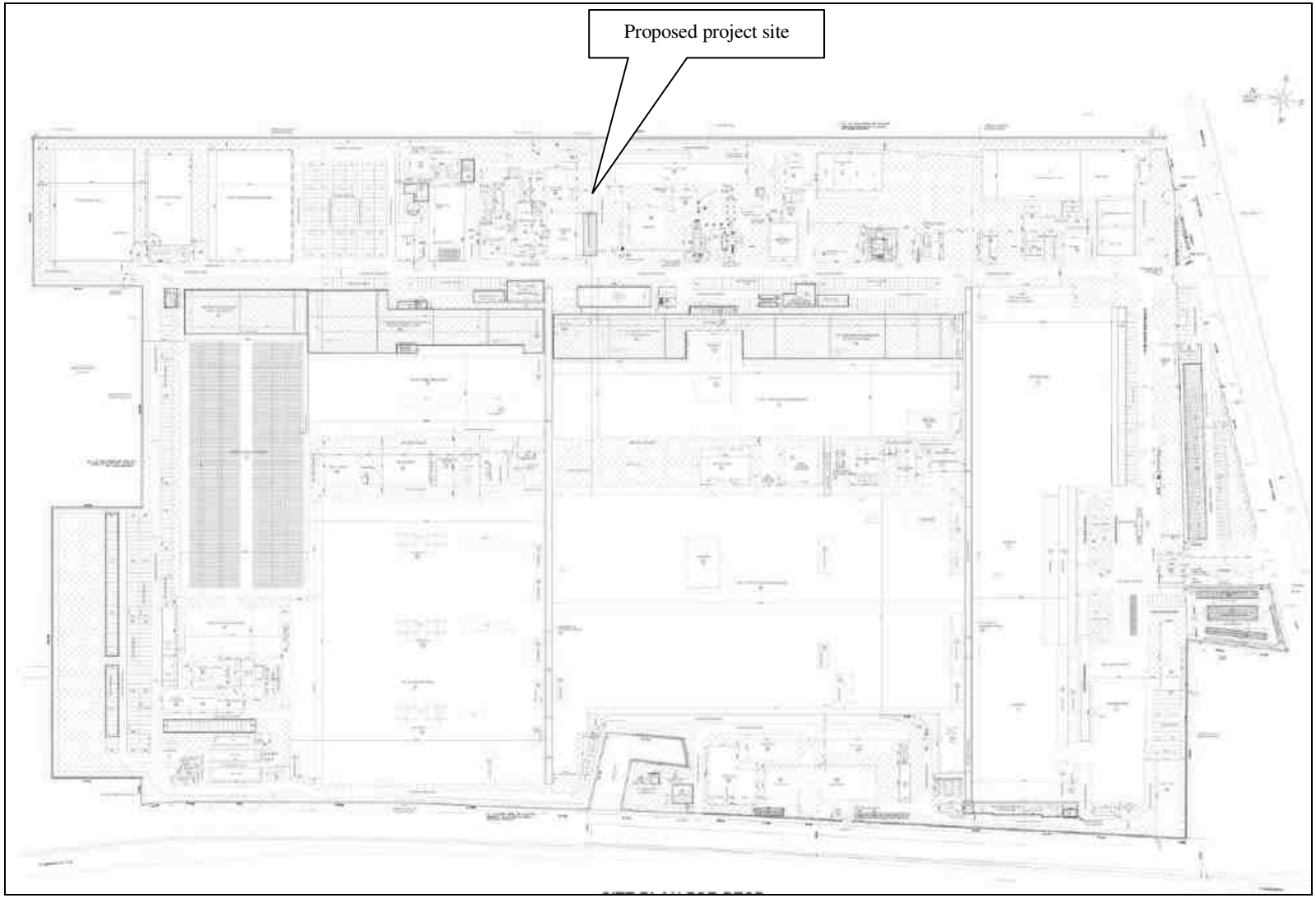


Figure 2-6 Layout of the project site

2.3.1 Land Requirement

i. Land area of the project site:

The total area and built-up area of the whole plant are 50.72 Ha (125.35 acres) and 27.304 Ha (67.469 acres). The built-up area of the existing project of 1 x 4.6MW is 0.882 Ha (2.179 acres). The layout of the project site indicating the proposed project site and land document of the project site is attached as **Annexure – 3** and **Annexure – 5** respectively**.** The built up area of proposed project details are tabulated below;

Table 2-2 Land Area Details

S. No	Details	Existing		Proposed		After expansion	
		Ha.	Acres	Ha.	Acres	Ha.	Acres
1	Built up area	0.882	2.179	0.0357	0.0882	0.9177	2.2672

ii. Greenbelt Area:

1. The greenbelt was developed in the existing premises over an extent of 12.51 Ha (30.913 acres), i.e., 24.66%.
2. Furthermore, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 of 6.70 Ha (16.55 acres) which is adjacent to the site. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.
3. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. The allocation letter from the SIPCOT is attached as the **Annexure – 4.**

2.4 Size or Magnitude of Operation

Currently ATL is producing power using 4.6MW coal power plant and proposed to increase the capacity of 10MW to the existing power plant. Hence, after expansion, there will be 14.6MW coal based captive power plant.

A Preliminary cost estimate showing cost under major heads for the various alternatives has been furnished under. The total capital cost of the proposed project is Rs. 40 crore and cost break up for this given below.

Table 2-3 Cost break-up of the proposed project

S.No	Particulars	Cost (in Crores)
1	Civil work	06
2	Turbines	25
3	Miscellanous	09
Total		**40**

2.5 Proposed Schedule for Approval & Implementation

The proposed project involves the production of "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW" which falls under schedule 1(d) of Category "B" (i.e. Less than 500 MW, coal based) as per the EIA Notification 2006 and its amendment. The terms of reference application was submitted in the PARIVESH portal vide proposal no. SIA/TN/THE/50607/2020 dated 03.02.2020. Subsequently, TN-SEAC issued the terms of reference after having detailed deliberations vide SEIAA - TN/F.No. 7412/SEAC/1(d)/ToR – 1298/2022 dated 26 October, 2022 (**Annexure – 1**).

Baseline monitoring for the project was undertaken from January 2023 – March 2023. As per the issued ToR, EIA has been prepared and submitted for favour of appraisal, after due appraisal and after issuance of EC, all the EC conditions will be complied.

Besides, all the regulatory approvals will be obtained and schedule for implementation is given below;

Table 2-4 Time Schedule for Completion of Project

S.No	Particulars	Time Schedule
1	Obtaining EC	April 2025
2	Obtaining Consent to Operate	May 2025
3	Implementation of Proposed Expansion	June 2025
4	Completion	July 2025

2.6 Technology and Process Description

A) BOILER: This section indicates the details of the steam generator, all associated piping and systems, The de aerator, Economizer, Air pre heater etc and the auxiliaries like ESP, Coal handling system, Water treatment plant, Dense phase pneumatic ash handling system, chimney etc. All pressure parts, subsystems and auxiliaries are designed, manufactured, inspected, tested, to well establish engineering practices and safety codes.

a. The steam generating unit is designed for 100% MCR flow of 60 TPH at 67 kg/cm^2 (a) and 485+/- 5°C while firing Imported Coal or Indian Coal or any combination of these two coals.
b. The boiler is designed to operate with any one or a combination of the above fuels and with the feed water temperature of 130°C.
c. Basically the boiler is of Atmospheric Fluidized Bed Combustor (AFBC) type, radiant furnace, single drum, natural circulation, semi outdoor type with two stage super heater. The boiler is designed with water- cooled membrane/fin welded walls and the refractory work is kept to the barest minimum possible.
d. All headers in the boiler are having flat end covers, and a minimum of two hand holes for the purpose of cleaning and inspection.

e. No header is placed in the flue gas path.
f. The drive motor rating for all pumps and fans is at least Ten percent (10%) higher than the maximum power consumption of the respective driven equipment.
g. The boiler is top supported with adequate provisions for the thermal expansion of the boiler in all directions.
h. The boiler is capable of operating with an output 110% of the MCR rating for a period of 30 minutes in each Eight (8) Hour shift. All components and equipment of the boiler is designed to operate under this peak load requirement without any design or operational limitations.
i. The boiler is designed for fully automated operation from the Distributed Control System in the central control room. To facilitate this, all Valves required to be operated during the starting or the normal running of the boiler shall be provided with Electrical motor actuators.
j. The start up of the boiler will be with LDO assisted charcoal firing k. The boiler is provided with over bed feeding arrangement to handle higher moisture content in coal, during rainy seasons. In view of this, the boiler shall basically be designed for either both under bed and over bed feeding or only over bed feeding.

2.6.1 Pressure Parts

The complete system of boiler pressure parts covers:

a) Steam drum
b) Furnace water wall & Bed Evaporator system and other circulating system components
c) Super heater system
d) Economizer system

The complete system of pressure parts tubing, piping and headers is of seamless construction, as per reputed international material specifications and bought from renowned suppliers. The thickness of pressure parts and materials to be used meets the requirements of the Indian Boiler Regulations (IBR) in all aspects of design, fabrication, heat treatment and inspection. Notwithstanding the approval and inspection by the Inspector of Boilers, the Owner / Owner's Engineer reserve their right to review the documents and inspect the components during manufacture and testing.

The Circulating system essentially comprising of the drum, water walls, furnace tubes, in bed evaporator tubes, boiler banks, down comers and relief tubes is designed to provide an adequate circulation ratio in the system and to prevent DNB. The down comers and the relief tubes is sized and routed to offer minimum pressure drop and to aid the improvement in the circulation ratio. The sizing of the circulation system components shall be adequate to ensure safe 34 circulation ratios even under peak loading conditions.

A) Steam Drum

The boiler is provided with one steam drum and the drum shall be of fusion-welded type. The drum shall be provided with Torispherical / Semi-Ellipsoidal dished ends fitted with 305 X 410 mm Oblong man ways at either end. The drum shell, dished ends and the man way doors shall conform to SA 516 Gr. 70 or equivalent material specification. The steam drum is liberally sized to assure low steam space loading, with adequate space to accommodate the internals. The drum design pressure is having a minimum margin of 7% over drum operating pressure.

The steam drum is provided with internals of proven design, is of bolted type, and of size that will enable removal through the man ways. The system of internals consisting of the primary and secondary separators shall ensure steam of highest purity with dissolved silica carry over limited to a maximum of 0.02 ppm, at all loads of the boiler. The internals design will be optimized to give the required steam purity. All the components of the internals, except the dryer screens, is of carbon steel. The dryer screen, if provided, is of 304 stainless steel.

All necessary nozzle connections on the drums is provided which includes, but not be limited to, steam outlets, safety valves, feed water inlets, continuous blow down, level indicators, chemical feeding, vents and drains, sampling connections, down comers, etc. as applicable. All nozzle connections on the drums are of welded type and the feed water inlet shall be provided with a suitably designed thermal sleeve. The necessary drum suspension / support arrangements are provided.

B) Furnace Water Wall And In-Bed Evaporator System

The Furnace envelope will be constructed of fully water-cooled membrane/fin welded walls and adequately supported. The design is such as to prevent distortion of steel work due to thermal expansion. The construction is fully gas pressure tight, and the furnace is strengthened by providing buckstay and tie bar system. The furnace and the in-bed evaporator is adequately sized for burning the identified fuel individually and in combination in any proportion as specified elsewhere in document and with fuels having high percentage of fines and volatiles.

The Combustor area of the furnace is of membrane wall/fin welded wall construction with refractory lining on the inside perimeter, for a height more than the expanded bed height. The spacing and arrangement of the bed evaporator coils, preferably with an in-line arrangement, is optimized to minimize high local velocities and to avoid erosion. The arrangement of the in-bed coils is also take into consideration the removal of clinkers in the event of clinker formation. The in-bed tubes is given adequate protection against erosion by high density stud welding (SS 310 studs or higher grade) on the tubes both on the straight and bend portions of the tubes. Careful attention is bestowed to the selection of the circulation ratio for the bed evaporator. Necessary provisions are made in the furnace for admitting the required quantity of over fire air at various levels.

The furnace EPRS and bed coil area is so selected to give acceptable furnace outlet temperatures while firing different fuels. The furnace design incorporates necessary manholes and peep holes. Adequate number of inlet and outlet headers, with the necessary stubs, commensurate with the arrangement of the furnace is provided. Each of the headers are having least two numbers of hand holes for inspection and cleaning. The down comers, supply pipes and raisers sizing is based on the circulation calculations.

C) Super Heater

The super heater (SH) system is of two (2) stage design with interstage desuperheating to achieve the rated steam temperature over 60% to 100% load range. The super heater shall be of convection or a combination of convection and radiation type. The super heater pressure drop, the inlet and outlet header sizing, arrangement and sizing of their respective inlet and take off connections is so as to give minimum unbalance and the tube element material selection is based on the actual metal temperature calculations. The metal temperature calculations and the material diagram are approved by ATL. The tube spacing of the super heater is designed to minimize bridging and tube erosion. Suitable spacers are provided both along and transverse to the gas flow directions.

The SH system is complete with required seamless pipe headers, inter connecting piping, vents, drains, supports, tube spacers, valves, fittings, etc. The super heater header material selection is based on the average fluid temperature in the header plus tolerance as per IBR. The sealing at the super heater tube penetrations with the boiler roof or the walls is 100 % leak tight. The unheated terminal portion of the super heater tubes is designed with adequate flexibility against thermal expansion differentials. The outlet header is suitably supported and anchored such that the piping forces and moments incident to the steam piping will not cause excessive stresses in the element tubes.

i. Common Steam Distribution Header (CSDH)

The CSDH is having 2 additional nozzles with blind flanges. All other tap off lines indicated below are having motorized isolation valves.

- Boiler I steam inlet
- Boiler II steam inlet
- Turbine I steam piping
- Turbine II steam piping
- Ejector & gland sealing steam piping for Turbine I
- Ejector & gland sealing steam piping for Turbine II
- Process steam piping -2 nos
- Desecrator pegging steam piping.

ii. Attemperator System

The attemperator system, to control the temperature of the final super heater outlet steam temperature, within the specified value, is provided in between the two stages of the super heater s. The interstage attemperator is of the spray type, using the boiler feed water tapped off at the outlet of the boiler feed water pumps, to control the final steam temperature at 485 + 5°C, between 60 % to 100 % MCR load.

The desuperheater is fixed / variable orifice spray type. The desuperheating system is be complete with all required, spray control valves, bypass regulating valves, piping and supports, etc. The arrangement of the desuperheater ensures complete evaporation of the sprayed water before the steam enters the final stage of the super heater. The attemperator incorporates suitable design features to withstand erosion and thermal shock due to feed water spray and also to prevent clogging of the nozzles.

iii. Economiser

The Economizer is located immediately downstream of the boiler. The design is of bare tube construction with inline, counter flow, and drainable arrangement. The economizer is designed for an inlet feed water temperature of 130°C. The economizer coil arrangement takes care of proper calculated end gaps to avert gas bypassing and the consequent erosion of the element tubes. The top most row of economizer tubes (in each bank of Economizer) is provided with protection shields of SS 304 3.15 mm thick, to minimize erosion. No gas side or water side bypass arrangement is provided. The flue gas velocity over the economizer tubes is limited to a maximum of 10 meters/sec. For the purpose of maintenance the economizer is divided into suitable number of banks. Broadly the individual bank height could be maintained at about 2000mm with the interbank gap at 700mm. The economizer is complete with seamless inlet/ outlet /intermediate headers with drains and vents, coil supports, supporting structures for the complete economizer, interconnecting piping for the inlet and the outlet, access galleries and stairs, etc. The Economizer casings are of minimum 6mm thick, mild steel plate suitably stiffened / reinforced. The economizer gas path is of the pressure tight construction with the proper design of the seals at the tube penetrations with the casing. The inlet and the outlet headers are adequately supported and anchored to take care of the loading from the connected piping.

2.6.2 Non Pressure Parts

2.6.2.1 Air Preheater

The Air Preheater is arranged as the last heat recovery section downstream of the economizer. The Air pre heater shall be recuperative type with flue gas flowing inside the tubes and the combustion air flowing over the tubes. The air pre heater is arranged with the tubes in the vertical direction. The material of tubes is of BS 6323 / IS 1161 / equivalent carbon steel (ERW) and the outer diameter of the tubes is of minimum of 50 mm and the minimum thickness of the tube is 2.2 mm. The tubes except those required for staying purposes are expanded into the tube sheets on both ends.

The air heater arrangement provides adequate access for replacing the tubes. Considering the sulphur content in the imported coal and the high moisture in the flue gases, suitable precautions are taken to prevent the tube corrosion at the air inlet side of the air heater.

The Low Temperature bank of the air preheater is designed to prevent corrosion and the cold end material of the air heater tubes shall be Corten Steel. A min. 6 row of corten steel is provided to prevent cold end corrosion. However to control the flue gas temperature at the air heater outlet during part loads and during start up, air side bypass with pneumatically operated damper is provided.

2.6.2.2 Fuel Feeding and Firing System

The boiler is provided with Atmospheric Fluidized Bed Combustor (AFBC) to ensure complete combustion. The enclosure of the combustor is membrane/fin welded water cooled panels, with refractory lining on the inner surface. The combustor is provided with a suitably sized wind box and a distributor plate at the bottom.

All fuel feed nozzles of the under bed feeding system shall be of stainless steel (SS 304) or higher grade. The coal nozzles shall be provided with suitable caps to prevent direct impingement of the coal particles with the in-bed tubes. The vertical distance between the coal feed nozzles top and the in-bed tube surface shall be a minimum of 200 mm.

Coal storage bunker of 350 Cu M capacity is provided on the sides of the boiler. The bunker construction is of M.S, the hopper section of the bunker is made of 1.5 mm thick SS 409 liner material to improve the flow ability and the feeding chute section is made of 4mm thick SS 304 plates. A separate bed material storage with 1 ton electric hoist and monorail to lift the bed material from ground level bunker and 1 nos vibrating screen is provided for proper screening of bed material.

The boiler will be started using LDO assisted charcoal firing system from the start up compartment. The system consists of oil storage day tank), oil pressuring pump (1 working + 1 stand by), required piping, valves, pressure control valve,, master trip valves, bed lance, instrumentation and controls. The startup oil tank capacity shall be sufficient for minimum one cold start up of both boilers. One mechanical flow totalizer to be installed in the line from tank to boiler.

2.6.3 Boiler Auxiliaries

2.6.3.1 Water Treatment Plant

The water treatment plant consists of a Reverse Osmosis (RO) and demineralization Plant (DM) plant. The filtered water from the filter water storage tank of capacity 200 Cu M would be to the Multigrade sand filter using a 80 Cu M/hr pump(1W + 1S) ,The Multi grade sand filter (MGF'S) is having a max operating pressure of 5Kg/cm^2 and temp of 50°C. The water from the MGF enter the 1 no's Activated carbon filters (ACF'S). The water from the ACF is stored in RCC tank of capacity

200Cu M from we're it is pumped using RO feed pumps 60CuM/hr, 25MWC pumps (2W+1S). The water is passed through micron filters of filter medium size 5 microns. 4 nos high pressure pumps of capacity 60Cu M/hr and 11.6 kg/cm^2, 2 each for each RO skids. The RO plant capacity is 42 Cu M /Hr X 2 streams. The RO permeate quality is TDS < 20Mg/L.

The degasser tower with blower capacity 46 Cu M/Min (1W+1S) is used for de gasification, the degassed water is stored in 100Cu M MS epoxy coated tank. The degassed water with quality CO_2 < 5 PPM will be fed to the inlet of Mixed Bed. The Degassed water is fed to DM plant by means of 3 pumps of capacity 50 Cu M /Hr , 30MWC (2 W+ 1 S). 2 nos Mixed Bed exchangers each of capacity 42 Cu M /Hr provide DM water to the boiler with guaranteed quality of Conductivity < 0.2 micro mhos/cm and pH in the range of 6.8 - 7.2. The DM water is stored in 3 X 150 Cu M MS tanks from where it is pumped using 2 pumps of capacity 84 Cu M/hr, 30MWC (1W +1 S) to the boiler. 2 nos Mixed Bed.

2.6.4 Electro Static Precipitator

The ESP for this AFBC Coal Fired boiler is designed for flue gas outlet dust concentration of 50mg/Nm3 with all fields in service and while firing of the any of fuel /fuel combinations specified above at 100% BMCR.

The ESP dust collecting system is provided on the downstream side of Air heater, for collection of the very substantial quantity of fly ash from the flue gases. The Electrostatic Precipitator is having 4 fields with all the fields in operation during normal running conditions. Collecting efficiency with all the fields in operation is 99.8%.The same shall be 96% with one field out of operation.

2.6.5 Coal Handling System

The coal handling system is of completely enclosed gallery type designed for a fuel handling capacity of 60TPH sufficient for both the boilers, the system consists of 2 nos grizzly hoppers from were the CB-1A Conveyor, Followed by main conveyor CB-1 transfers the coal to the crusher house. CB-1 is at an inclination of 14°. The coal reaches the vibrating screen in the crusher house were the coal particles of size - 6 mm passes to the product conveyor CB-3, the over size + 6 mm enter s the impact crusher .The crusher is having a capacity of 55 TPH. The Crusher is of rigid hammer impact or type capable of handling the amount of material as specified even under maximum moisture content conditions.

The crusher, in general, is such that:

- Noise and vibration levels are low.
- No clogging or building up of the material on the crushing element will develop.

Maximum crushing efficiency is assured, i.e. the amount of coal dust produced will be less, with guaranteed output distribution. After the impact crusher the crushed coal of desired size enters the

CB-2A conveyor which transfers the coal to CB-2 via transfer tower back to the crusher house. This crushed and properly sized coal passes through vibrating screen and passes to the product conveyor CB-3. The CB-3 conveyors pass the sized coal to conveyor CB-4 which transfers the coal to the coal bunker of storage capacity: 250CuM. The crusher/screen house is of RCC construction up to crusher floor level and above is of structural steel construction. All transfer towers are steel structures, providing sufficient space to accommodate the respective equipment like conveyor ends and their drive units, transfer chute system, supports for conveyor gantries, etc. Ample space is kept for maintenance purposes.

i. Features

Single/double-bladed counter weight balanced/ spring loaded type belt cleaners, complete with all accessories are installed below the discharge & tripper pulley of each conveyor. A V-plough type scraper made of fabric or fiber free hard rubber strip is provided on the upper side of the return belt, just ahead of the tail pulley of each conveyor. The included angle of the scraper is 60°. and the apex points towards the discharge end of the conveyor. Scraper blades cover the entire width of the belt.

Skirt boards having feed gap minimum two-thirds the width of the belt, is provided at all loading points. Minimum skirt board height above belting and extension of skirt boards beyond loading points, is 150 mm and 3m respectively. Pull cord (manually re-set type) emergency stop switches are located along the entire length of all conveyors. The spacing of these switches doesn't exceed 30 Entire length of conveyors (in-house/external) is covered with semi-circular hoods of minimum 1.5 mm thick CGI sheets. While on the gantries, the hoods are capable of being opened from the wider walkway side. Design and construction of all structural conforms to IS-800, with loading conditions, as specified in IS-875 & 1893 by rolled MS plates and sections, as per IS-226 & 2062.

ii. Walkways & Platforms

The walk ways are 750 mm wide for all conveyors.

iii. Dust Extraction System

The crusher / screen house, transfer towers, coal bunker area, etc. is provided with external dust extraction system, as required, to ensure dust-free working atmosphere. This comprises of suction hoods, multi-cyclone separator, with rotary air lock, vent fan, damper, blast gates and ductwork, as necessary. The location of the various dust / air handling equipment is such as to create minimum operational/maintenance difficulties.

2.6.6 Ash Handling System

The ash handling system is dense phase pneumatic type. The ash from the Economizer zone, Air preheater and from the four (4) nos ESP fields will be collected in hoppers below each zones This collected ash will be passed to the surge hoppers provided below based on the level probes

provided and further conveyed to the ash silos using compressed air. Fluidising pads are provided in the hoppers. The ash conveying pipes are all MS heavy duty with long radius alloy CI bends. 2 nos ash silos 1 each for bed ash and fly ash is provided with capacities 60 Cu M and 350 Cu M resp.

The conveying air is generated by using oil injected rotary screw compressors 2 nos 1 (W+1 S). A2CuM air receiver is provided to act as buffer storage of air from all the requirements for conveying the ash, instrument operations and fluidizing pads operation shall be met.

All necessary interlocks, logic and controls as required for the entire dense phase ash handling system is generated through the PLC system. Target box / terminal box with ACI wear back replaceable liner is provided for individual ash conveying lines to terminate at silo top. Silo shall be provided with suitable man hole and level transmitter for level control and disposal.

Reverse pulse jet type vent filter is provided on the ash silo for discharging air from the conveying medium. It is of outdoor installation. The dust is collected in a fabric filter designed to handle the dust load. The selected fabric is suitable dust releasing characteristics for the fly ash handled. The system is designed for a constant pressure drop across fabric for the required airflow rate and dust loading. It is ensured that the Fabric filter is having sufficient porosity to permit satisfactory airflow, mechanical strength, cleaning, resistance to heat, resist chemical action if any and dimensional stability. The fabric filter is of felt type and it is selected to suit the required temperature. Filter unit is provided with adequate access for servicing. Suitable rotary feeders capable of handling the ash at required rates are provided to dispose the ash.

The dust conditioner is located below rotary vane feeder in fly ash silo and is suitable for the continuous operation of 24 hours per day. The ash handling system is designed and constructed aiming for totally dust free operation. Fugitive dust emission in any area will not exceed 50 mg/m3 for all solid particles. The design of equipment will ensure that the measured noise level produced by any rotating equipment will not exceed 85 dB at a distance of 1 m from it in any direction.

2.7 Project Description including drawings showing project layout, components of project etc. Schematic representations of the feasibility drawings which give information important for EIA purpose

2.7.1 Co-Generation Plant

This section provides the details for the 1 nos 10 MW, 11KV, 3 PHASE, 50HZ steam turbine generators. The system included Two (2) numbers Steam Turbine Generator units with gear box and all other auxiliaries, with a nominal power output of 10 MW at the generator terminals at the site conditions at 0.8. Power factor, 11kV and 50 Hz. The unit will be operated in parallel with the Tamilnadu Electricity Board Grid or in isolation, with the frequency variation of ± 5 %. The critical

speed range shall not interfere for continuous operation at 47.5 Hz. The generator is designed at 10 MW, 0.8 p.f. (lag), at MCR. It shall be capable of safe operation at rated MVA with ±10% voltage variation & ±5% frequency variation and combined voltage & frequency variation of ±10% variation.

- ✓ Two (2) no's Air Cooled Condensers (one for each STG) with all accessories and auxiliaries.
- ✓ All interconnecting piping with valves & fittings, insulation & cladding including required PRDS systems within specified terminal points.

The turbine generator is capable of generating at least 105% of TG MCR during Valve Wide Open Condition with maximum extraction steam parameter. The Turbine will have one (1) no of controlled extraction to cater to the process steam demand. The system is complete with the necessary control valves, motorized isolation valve, full flow relief valves and non-return valves.

Single cylinder, single exhaust extraction cum condensing type steam turbine has been considered. The steam entry to the turbine would be through a set of emergency stop and control valves, which would govern the speed / load of the machine. The turbine control system would be of electro-hydraulic type with hydro- mechanical system as a backup.

The steam turbine would be complete with lube oil and control oil system, jacking oil system, governing system, protection system and gland sealing steam system. The lube oil system of the STG will be provided with 2x100% online centrifuge system. The gland sealing steam for the steam turbines would be taken from HP steam and will be de- pressurized and de-superheated before supply to turbine glands. The spray water for de-superheating would be taken from IP feed water line. The gland steam header of both power blocks would be interconnected to provide the flexibility during steam turbine start-up and reduce the start-up time.

i) Over speeds Trip

Dedicated electronic over speed device is provided with 2oo3 voting logic along with dual redundant sensor for speed governing to trip the device against excessive over speed protection. The logic will be realized in the DCS.

ii) Vibration Monitoring

Vibration monitoring system of SHINKAWA make with total 16 nos. probe for shaft radial vibration (1 Probe in X-Y direction /Bearing) & two nos. axial shift probe is provided.

iii) Gear Box

Gearbox shall be designed as per AGMA 6011:103. It is capable of transmitting the maximum rating of the set and be able to withstand 10% over speed over a period of minimum five minutes. Non illuminated type sight glass is provided for flow indication.

iv) Control system

The control system is having suitable facilities for On-line testing/trouble shooting through provision of diagnostic lamps, bypass lamps/switches, test switches, etc.

v) Air cooled condensers

The technical details of air cooled condensers are as below:

The finned tube bundles are fixed on a “roof" type structure with an angle of 60 °. Such an Air-cooled condenser is made of cells each cell consists of:

- The structure supporting the cells and bundles;
- The finned tube bundles;
- The main stream manifold feeding the bundles;
- The fan units with drive assembly and protection guards at the bottom of the A frame;
- The air inlet rings at an elevated level above the ground in order to provide a sufficient air inlet area;
- Condensate extraction pump and hot well drain pumps;
- Wind wall for prevention of air recirculation.

2.7.2 Fin Tube Bundles

Finned tubes bundles are rigid, self supporting and designed for handling as a complete assembly with lifting lugs. The main components are:

- The finned tubes
- Tube sheet.
- C-frame

Tube bundles are made of extended surface fin tubes with 4 rows of circular carbon steel tubes (SA-214) wounded with helical tension wrapped LL-shape (Overlapped) aluminium fins.

2.7.3 Speciality of LL- Overlapped Type Finned Tube

LL - Fins are ideally suitable for application up to160°C giving increased atmosphere corrosion rotection of the base tube. Fin foot is pre-formed into an LL-shape (overlapped LL) and applied to base tube under tension. However L foot is pre shaped to give overlap of onto another, thereby improving base tube protection and thermal contact area. Any moisture / water spray on the fins will not corrode the base tube because of aluminum fins overlapping. Therefore LL-Overlapped Fins are ideally suitable for your application & environment considering continuous water jet cleaning. The base tube external surface is fully covered by the aluminum overlapped fins and hence tube is not exposed to atmosphere. Even LL Overlapped fins are the cheaper alternative of more expansive Extruded Finned Tubes. Each bundle consists of two section i.e. primary and secondary sections. The steam condenses mainly in primary section while flowing from top to bottom. The balance steam condenses in secondary section while flowing from bottom to top. The non-condensable is extracted

from the top of the secondary section through air extraction line. The secondary section works as dephlagmator for air extraction and thus it ensures proper extraction of air from each bundle and ensures effective extraction. The upper tubular plate of primary bundles is fixed to the steam manifold but can freely expand to the bottom according to thermal expansion.

Steam Supply line

The steam supply line consists of the following;

- Carbon steel exhaust steam duct with transition piece, hot well, balance line, expansion bellows and a rupture disc.
- The steam manifold, located on top of the air-cooled condenser is welded to the bundles in order to prevent air leakage. The manifold can also expand freely with the help of sliding pads.

Structure and Sealing Plates

Steel structure material will be of mild steel grade to IS: 2062 Gr. A/B. Structural steel surface will be cleaned by sand blasting & then duly painted. Total assembly will be bolted assembly and cells are equipped with seal plates, which prevent the cooling air from bypassing the heat exchangers. The cells are also separated from each other with partition walls in order to run separately.

Wind walls

Wind walls made of color coated sheets (0.6 mm) will be provided from platform level to top of bundle level to prevent air re-circulation. The wind wall structures are extension to main structure for fixing of sheets.

Mechanical Equipment

Each cell is equipped at the bottom of the A- frame with:

- One axial fan, FRP blades;
- One Helical parallel shaft gear drive;
- One dual speed electric motor for optimizing power consumption
- One weather proof vibration switch;
- One support structure assembly

The fan deck level is designed to provide sufficient air inlet area.

Condensate pipe line and tank

Each module is equipped with condensate lines. The condensate is collected by gravity into a condensate tank. The required instruments for control of condensate flow and monitoring of temperature, pressure and level are provided on condensate tank.

Extraction of Non Condensable

- 1 x 100% hogger ejector
- 1 x 100% operating ejector with 1 x 100% Common Inter/After condenser and required pipings
- Two (2) Nos. steam jet air ejectors will be provided to maintain the vacuum in the condenser bby expelling the non- condensable gases. In the alternative option of using steam jet ejector, one starting steam jet air ejector of higher capacity will be provided for quick evacuation of gases from the condenser during start-up. Steam for the ejectors will be supplied from the HP steam header after de-pressurizing and de-superheating. Further, the steam headers of steam jet air ejectors of both the blocks will be interconnected to have the flexibility of operation during start-ups. The design of vacuum system and it's sizing will be as per requirement of HEI.

2.7.4 Land Requirement

The land requirement for the proposed project is 0.0357 Ha (0.0882Acres). Since the proposed expansion is within the existing facility, hence there will be no change in land use pattern.

2.7.5 Infrastructure Facility

Proposed facility is coming inside the Tyre manufacturing Unit which is already having sufficient infrastructures.

2.7.6 Raw Materials Requirement

The major raw material required for this project includes coal and Rice husk as fuel. The quantity required for the proposed project is mentioned in **Table 2-5**. The raw materials will be used in the construction phase is given as construction material.

Table 2-5 Raw Materials Requirement

S. No	Details	Quantity (MT/day)			Source
		Existing	Proposed	After expansion	
1	Coal	74	105	179	Local supplier/ Indonesian coal
2	Biomass (Rice husk)*	-	95	95	Local supplier
Total		**74**	**200**	**274**	

S. No	Details	Quantity (MT)	Source
3	Construction material	1. Cement: 630	From local market
		2. Blue metal: 2085	From approved quarries.
		3. River sand: 2001	From approved sand mining site.

*Note: The utilisation of biomass will be increased with time and the action plan for the usage of biomass in the upcoming year is tabulated in **Table 2-6**.

Table 2-6 Total usage of Biomass & Coal in the upcoming year

S. No	Fuel Type	FY'25		FY'26		FY'27		FY'28		FY'39	
		%	MT / Day	%	MT / Day	%	MT / Day	%	MT / Day	%	MT / Day
1	Bio-mass (Rice Husk)	35	95	43	118	52	142	61	166	69	189
2	Coal	65	179	57	156	48	132	39	108	31	85
Total		**100**	**274**	**100**	**274**	**100**	**274**	**100**	**274**	**100**	**274**

2.8 Resource Optimization / Recycling and Re-use envisaged in the project

2.8.1 Water Requirement

Construction Phase: The water required for the construction phase of the proposed project is 10 KLD and the water will be sourced from the SIPCOT – Oragadam.

Operation Phase:

The total fresh water requirement for the existing project is 345 KLD including domestic purposes. After expansion, 647.75 KLD of fresh water requirement will be required. The freshwater of 7 KLD is utilized for domestic purposes and TTRO water of 338 KLD is utilized for processes. The freshwater is being sourced from SIPCOT – Oragadam and the same will be followed after the expansion also. The water agreement between SIPCOT – Oragadam and ATL is enclosed as **Annexure – 6.** The freshwater required for the existing and proposed project is given in **Table 2-7**. The water balance diagram showing the fresh water and recycle water requirement for existing and proposed project is shown in **Figure 2-7** and **Figure 2-8** respectively (attached as **Annexure – 7**).

Table 2-7 Details of water requirement

S. No	Details	Existing (KLD)	Proposed (KLD)	After expansion (KLD)
1	Process	338	302	640
2	Domestic	7	0.75	7.75
Total		**345**	**302.75**	**647.75**

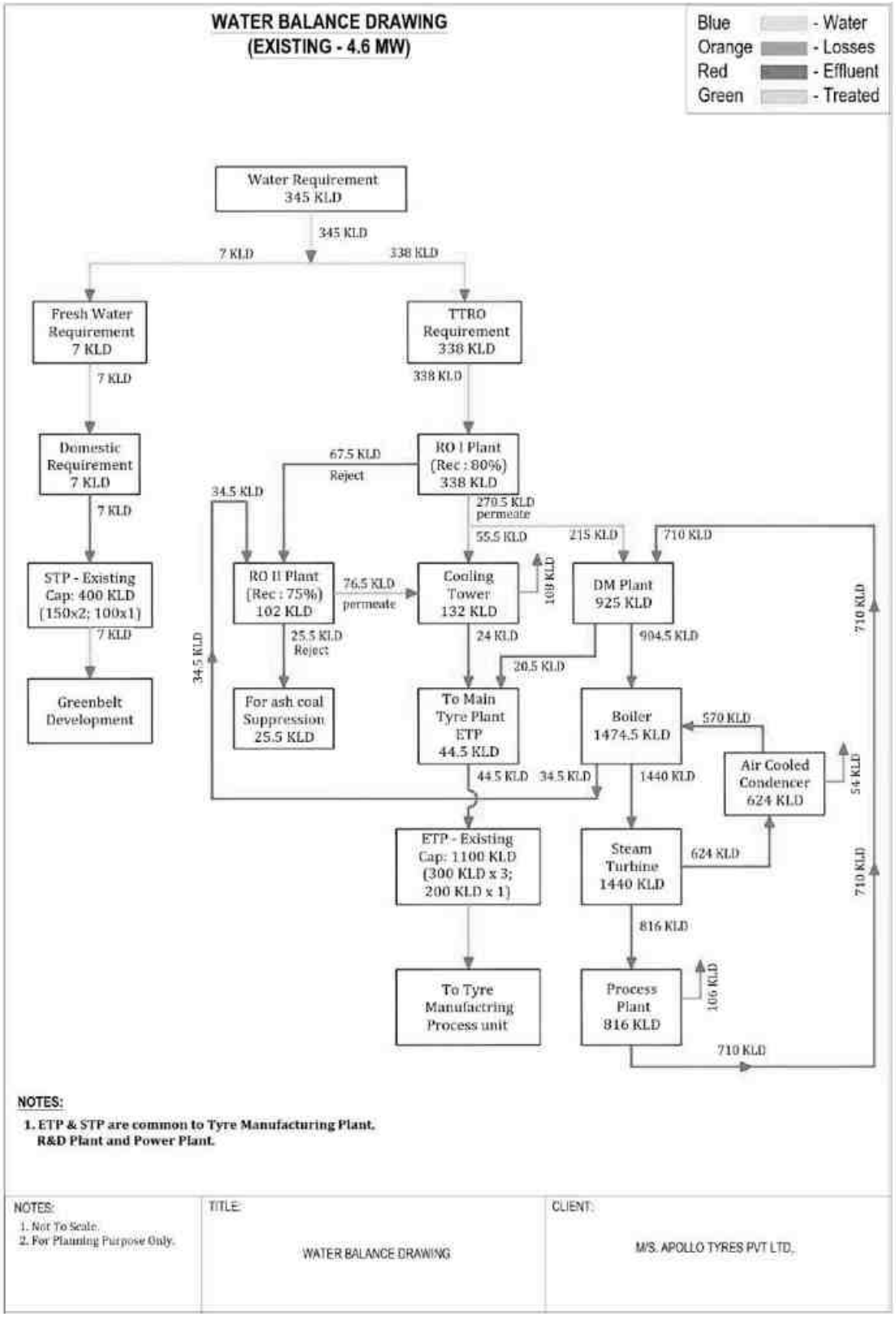


Figure 2-7 Water balance diagram for existing 4.6MW power plant

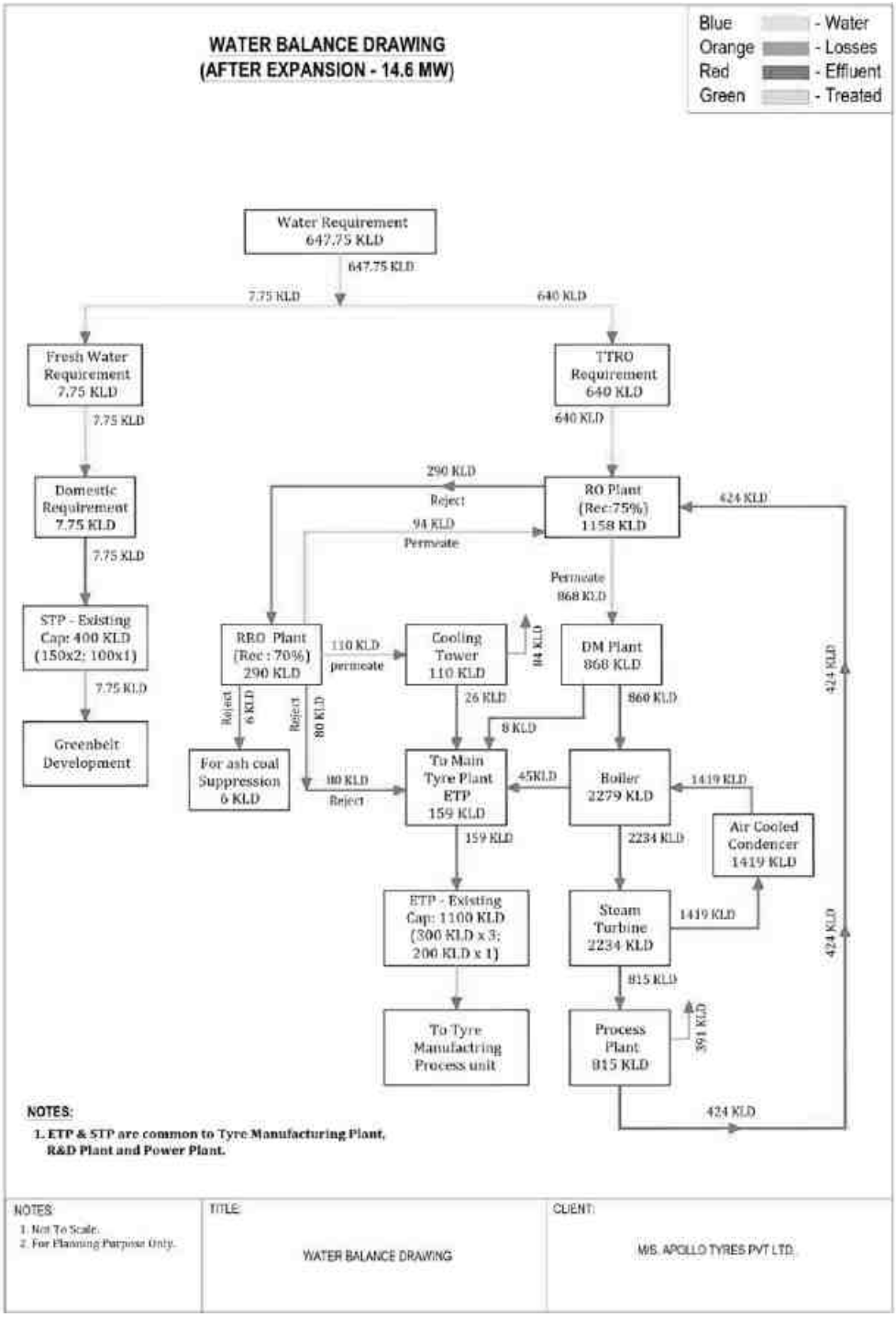


Figure 2-8 Water balance diagram for after expansion of 14.6MW power plant

2.8.2 Project layout, Components of project

The layout of the project site indicating the proposed project site and land document of the project is enclosed as **Annexure – 3** and **Annexure – 5** respectively. The total area and built-up area of the whole plant are 50.72 Ha (125.35 acres) and 27.304 Ha (67.469 acres). The built-up area of the existing project of 1x4.6MW is 0.882 Ha (2.179 acres) and the area of the proposed project of 10 MW

is 0.0357 Ha (0.0882 acres). The land area of 12.51 Ha (30.913 acres) is earmarked as greenbelt development i.e., 24.66% in the site premises.

Additionally, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at Sy. No. 6 to an extent of 16.55 acres (6.70 Ha) which is adjacent to the site. Hence, the additional land allocated by SIPCOT for the development of greenbelt is considered as the proposed greenbelt development for this project. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%. The site photographs including photos of STP, ETP are shown in **Figure 2-9** to **Figure 2-12.**

Figure 2-9 Site Photographs

Figure 2-10 Electrostatic Precipitator

Figure 2-11 Photographs of ETP

Figure 2-12 Photographs of STP

2.8.3 Power requirement

Construction Phase: The power required for the construction phase is 10 kVA. During construction phase, the power will be sourced from the DG set and the fuel requirement for the DG set is 100 liters per day.

Operation Phase:

The existing power requirement is met by the power generated from the 4.6 MW power plant and the same will be followed after expanding the power plant to 14.6 MW. During the operation phase, the power required by the project is mention in the below table;

Table 2-8 Details of Power requirement

S. No	Details	Existing (MW)	Proposed (MW)	After expansion (MW)	Source
1	Power requirement	4.6	10	14.6	Power generated from the power plant

2.8.4 Manpower requirement

Construction phase: During construction phase, 100 nos. of manpower will be employed for the construction activities.

Operation phase: During the operation phase, the total man power required for the project is 50 nos. The detailed manpower requirement is given in the following table:

Table 2-9 Manpower requirement for the project

S. No	Details	Existing (Nos)	Proposed (Nos)	After Expansion (Nos)
1	Manpower	45	5	50

2.8.5 Schematic representations of the feasibility drawings which give information important for EIA purpose

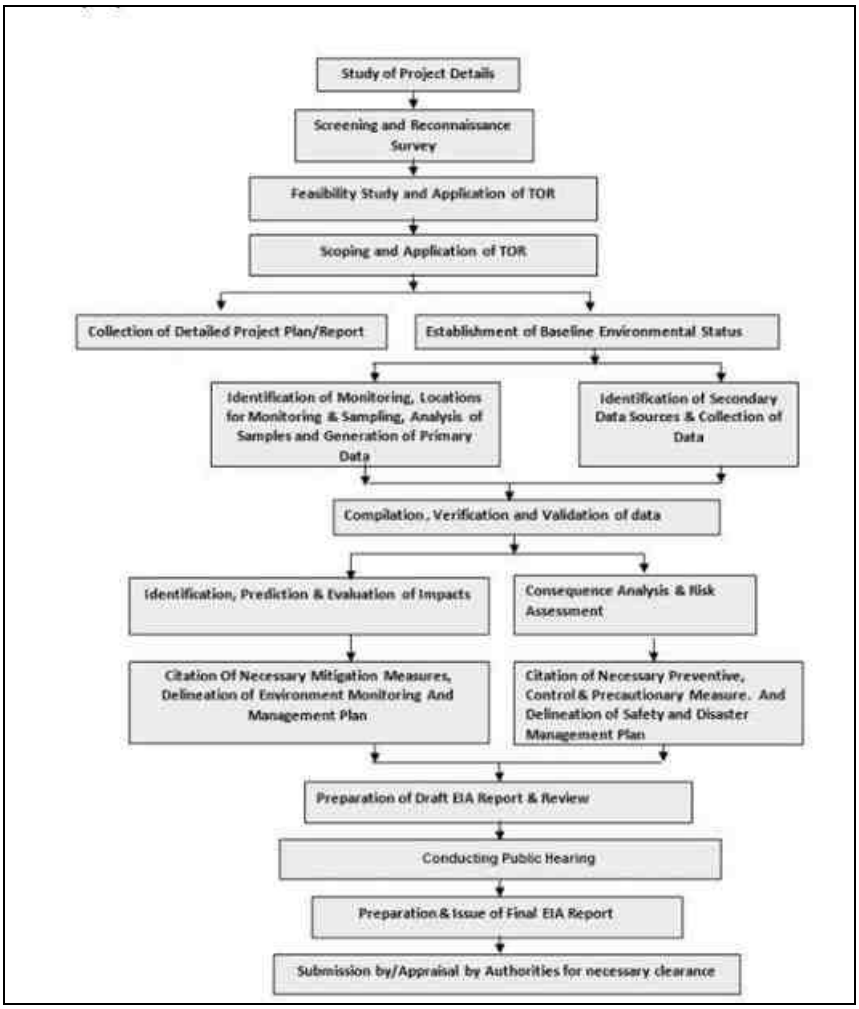


Figure 2-13 EIA Process

2.9 Description of mitigation measures incorporated into the project to meet environmental standards, environmental operating conditions, or other EIA requirements (as required by the scope)

2.9.1 Land Environment

The proposed expansion will be carried out within the existing facility hence there will be no change in land use pattern.

2.9.2 Water Environment

Impacts

- During construction phase, spillage or leakage of construction material can lead to groundwater contamination.
- The total wastewater generated from the existing unit is 146.5 KLD of effluent and 7 KLD of sewage.
- Effluent from the process and fugitive loss of wastewater can accidently contaminate the ground water and surface water.

Mitigation Measures

- The generated effluent of 146.5 KLD is being treated in the existing combined ETP (capacity: 300KLD X 3 & 200KLD & 1) which is common to R&D plant, power plant and main tyre plant. After expansion, 159 KLD of effluent will be treated in the same existing combined ETP facility and will maintain the ZLD process.
- The sewage is being routed to the existing combined STP (capacity: 150KLD X 1, 100KLD X 2) which is common to R&D plant, power plant and main tyre plant.
- After expansion, 7.75 KLD of sewage will be treated in the existing combined STP and the treated water will be used for the greenbelt development, cooling tower makeup and dust suppression process.
- The operational set up will be kept leak proof at all the times to reduce consumption of water
- 70% recycling is being practiced on regular basis to reduce the quantity of freshwater intake and the same will be followed after expansion.
- The treated wastewater after confirming the prescribed norms will be reused for greenbelt development, as required.
- Rain water harvesting program also being implemented for conservation of water.

2.9.3 Air Environment

Impacts

- The main sources of air emission are Boilers, coal crushing, coal loading and unloading, and process.

- The major pollutants of air emissions are particulate matter (PM), sulphur dioxide (SOx), nitrogen dioxide (NOx) and fugitive emissions.

Mitigation Measures

- Electrostatic Precipitator is provided for boilers with adequate stack height of 75m from ground level along with the ash handling system.
- Fugitive emissions from the coal crusher and coal transportation is being prevented using bag filter and enclosed system / belt transfer system respectively. These control measures will be carried out after expansion as well.
- The fly ash generated from the process is being collected in the storage silo and disposed to the authorised brick manufacturer by truck covered in tarpaulin and the same is proposed to follow after expansion.
- Monitoring of emission as per Environmental Monitoring Plan and records will maintain for further review & improvement in EMP as well as Air Pollution Control Activities/ Technologies
- Emission level will be maintained below permissible limits prescribed by concern environmental authority.
- The greenbelt is developed for 24.66% of the total plant area and including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87% which will act as the absorbent of air emissions.
- The record of the monitoring programs & measured quality will be maintained regularly.

2.9.4 Solid and Hazardous Waste Management

2.9.4.1 Solid Waste Management

Construction Phase: During construction phase, 100 nos of employer will be employed for the construction activity. Based on the manpower, the solid waste generation was calculated and tabulated below;

Table 2-10 Solid waste generation and management during construction phase

S. No.	Waste	Quantity (kg/day)	Collection method	Treatment/Disposal method
1	Organic	27	Bins	Sold to Vendors
2	Inorganic wastes	18	Bins	Send to TNPCB authorized recyclers
Total		**45**	--	

Operation phase: during operation phase, 22.50 kg/day of municipal solid waste will be generated after expansion. The generated municipal solid waste is being disposed to TNPCB authorized vendors and recyclers and the same will be followed after expansion also. The details of solid waste generation and disposal method are given in the **Table 2-11**.

Table 2-11 Solid Waste Generation and Management during Operation Phase

S. No.	Waste	Quantity (kg/day)			Collection method	Treatment/Disposal method
		Existing	Proposed	After Expansion		
1	Organic	12.15	1.35	13.50	Bins	Sold to Vendors
2	Inorganic wastes	8.10	0.90	9.00	Bins	Send to TNPCB authorized recyclers
Total		**20.25**	**2.25**	**22.50**	--	

Note: As Per CPCB Guidelines: MSW per capita/day is considered as 0.45 Kg.

2.9.4.2 Hazardous Waste Management

The spent oil is being generated from the turbine in which lubricant oil is utilised. The Hazardous waste is being stored in isolated area above concrete platform under roofed shed. These waste will be segregated & stored and will be disposed off by giving it to the TNPCB authorized dealers/ recyclers/ TSDF within a stipulated period of time.

Hazardous waste materials will be properly disposed as per the Hazardous and other waste (Management Handling and Transboundary Movement) Rules 2016. The type of hazardous waste and the quantity generated are detailed in **Table 2-12.** Hazardous waste authorization letter is **Annexure - 15.**

Table 2-12 Hazardous Waste Generation and Management

S. No.	Schedule No. As per HWM rule, 2016	Hazardous waste type	Quantity			Disposal Method
			Existing	Proposed	After Expansion	
1	5.1	Used/ Spent oil (L/year)	400	200	600	Recover and Reuse – CPCB Authorized recyclers
2	35.3	Chemical sludge (from ETP) (T/Annum)	8.2	14.6	22.8	Common landfill - TSDF
3	35.3	Chemical sludge (from MEE) (T/Annum)	36.85	66.25	103.11	Common landfill - TSDF
4	5.2	Wastes or residues containing oil (T/Annum)	0.15	0.32	0.47	Recover and Reuse – CPCB Authorized recyclers

2.9.4.3 Ash Management

1. Ash Generation

During the coal combustion process of coal, there is a generation of electiricity and steam along with fly and bottom ash. It was observed that around 7.5% of coal is generated as ash from the process. Also, the existing quantity of ash generation is 5.55 MT/month. The generation of ash form the existing and propoed thermal power plant is tabulated in **Table 2-13**.

Table 2-13 Ash generation quantity

S. No	Description	Quantity (MT/day)		
		Existing	Proposed	After expansion
1	Fly ash generation	5.55	15.00	20.55

2. Ash Utilisation & Management

The generated fly ash is being collected from Electrostatic Precipitator using ash handling system. The generation of bottom ash from the process is almost nil (negligible). The ash handling system consisits of 5 no of bed ash cooler and 4 no of Hopper attached to the ESP. The bed ash cooler is divided into two systems and System I comprises of 3 no of bed ash cooler whereas System II has 2 no of bed ash cooler.

The Fly ash is being collected from ESP and stored at different storage silo for each. As the existing facility of ash handling system is sufficient to handle the proposed ash generation, there is no additional control equipment is proposed. Then the stored ash is being safely disposed to the authorised brick manufacturer by truck covered in tarpaulin. Hence, the ash utilisation achieved is 100% in the existing facility and the same will be followed after expansion too.

2.9.5 Noise Environment

Impacts

- Noise generation sources during operation phase are classified into two categories:
    A. Stationary sources due to operation of heavy duty machineries at the project site like Boilers, Coal crusher, Turbine generators, Cooling towers, Process Air Compressor etc.
    B. Mobile sources corresponding to mainly vehicular traffic for staff mobilization, materials, material transportation, etc.
- Noise can be expected to generate by various activities associated with the project during operational phase.
- The impact of noise beyond the site would be negligible during normal operation phase.
- However, the impacts on workers engaged in the plant area would be considerable due to occupational exposure.

Mitigation measures

- Acoustic enclosure is being provided to high noise generating equipment/ machineries/ utilities or such facilities will be housed in closed room to prevent noise propagation in surrounding area.
- Proper maintenance & lubrication of the plant machineries & equipments will be done regularly to reduce the level of noise generation.

- Transport vehicles shall be set in operation only at time convenient with the residents equipped with low noise engine
- Noise generating and vibrating equipments/machineries will be provided with rubber padded foundations.
- Proper maintenance of greenbelt will also help in attenuating noise pollution.

2.9.6 Biological environment

Impacts

There are no identified migratory paths for major and minor wildlife in the project site and the study area. The identified fauna which are observed at the project site and in the study area are local migrants only. Therefore, the proposed project operations are not likely to have any adverse impact on the paths for avid-fauna.

Mitigation Measures

- Since the project is proposed in the existing facility, there is no removal of trees and vegetation is involved. Additionally, the study area does not contain any eco sensitive zone. Hence, there will not be adverse impact on the ecology and biodiversity.
- Awareness will be given to workers about the importance and conservation of terrestrial ecology and biodiversity.

2.10 Assessment of new & untested technology for the risk of technological failure

Since the proposed project is expansion within the existing facility, no new or untested technology is proposed for the project.

CHAPTER – 3

DESCRIPTION OF THE ENVIRONMENT

3. DESCRIPTION OF THE ENVIRONMENT

This chapter depicts the establishment of baseline for valued environmental components, as identified in and around the project, **"Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW"**, located at S.F.No.491, Plot No.B25 SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudur Taluk, Kanchipuram District, Tamil Nadu by M/s. Apollo Tyres. The primary baseline data monitored covered three (3) months i.e., from **January 2023 to March 2023** and secondary data was collected from government and semi-government organizations published data. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) ltd, Chennai, NABL accredited MoEF&CC approved environmental testing laboratory for the following terrestrial environmental.

3.1 Study Area And Period

A 10 Km radial distance with the proposed project site as the epicenter has been identified as the General study area for assessing the baseline environmental status. The core study area is the project area and its immediate surroundings to the tune of 1.0 Km radius from the boundary. Further the Project Impact/Influence Area (PIA) is 10Km from the boundary of the project site which covers parts of Sriperumbudur Taluk, Kanchipuram District, Tamil Nadu. The primary baseline data monitored covered three (3) months i.e., from **January 2023 to March 2023.**

3.2 Description of the Study Area, Components & Methodologies

As described in Chapter 1, the project "**Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW"**, located at S.F.No.491, Plot No. B2-5, SIPCOT Industrial Growth Center, Oragadam Village, Sriperumbudur Taluk, Kanchipuram District, Tamil Nadu by M/s. Apollo Tyres. An overall idea of the study area with reference to the physical conditions are presented for better understanding in the following sections before proceeding into the section on the prevailing environmental conditions of the study area.

- **Meteorology:** Temperature, Relative Humidity, Rainfall, Wind Speed & Direction- **Refer Section- 3.5**
- **Ambient Air Quality:** Particulate matter <10-micron size (PM_{10}), Particulate matter <2.5-micron size ($PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Lead (Pb), Ozone (O_3), Benzene (C_6H_6), Benzo (a) pyrene ($C_{20}H_{12}$), Arsenic (As), Nickel (Ni), Ammonia (NH_3), Mercury (Hg) **Refer Section- 3.6.**
- **Ambient Noise Levels:** Day and Night equivalent noise levels - **Refer Section- 3.7**
- **Water Quality:** Ground Water Quality, Surface Water Quality- **Refer Section- 3.8**

- **Soil Quality- Refer Section- 3.9**
- **Biological Environment - Refer Section- 3.10**
- **Socio Economic Status- Refer Section- 3.11**

The map showing the satellite image of the study area is given in **Figure 3-1** and Topo Map of the study area is given in **Figure 3-2**.

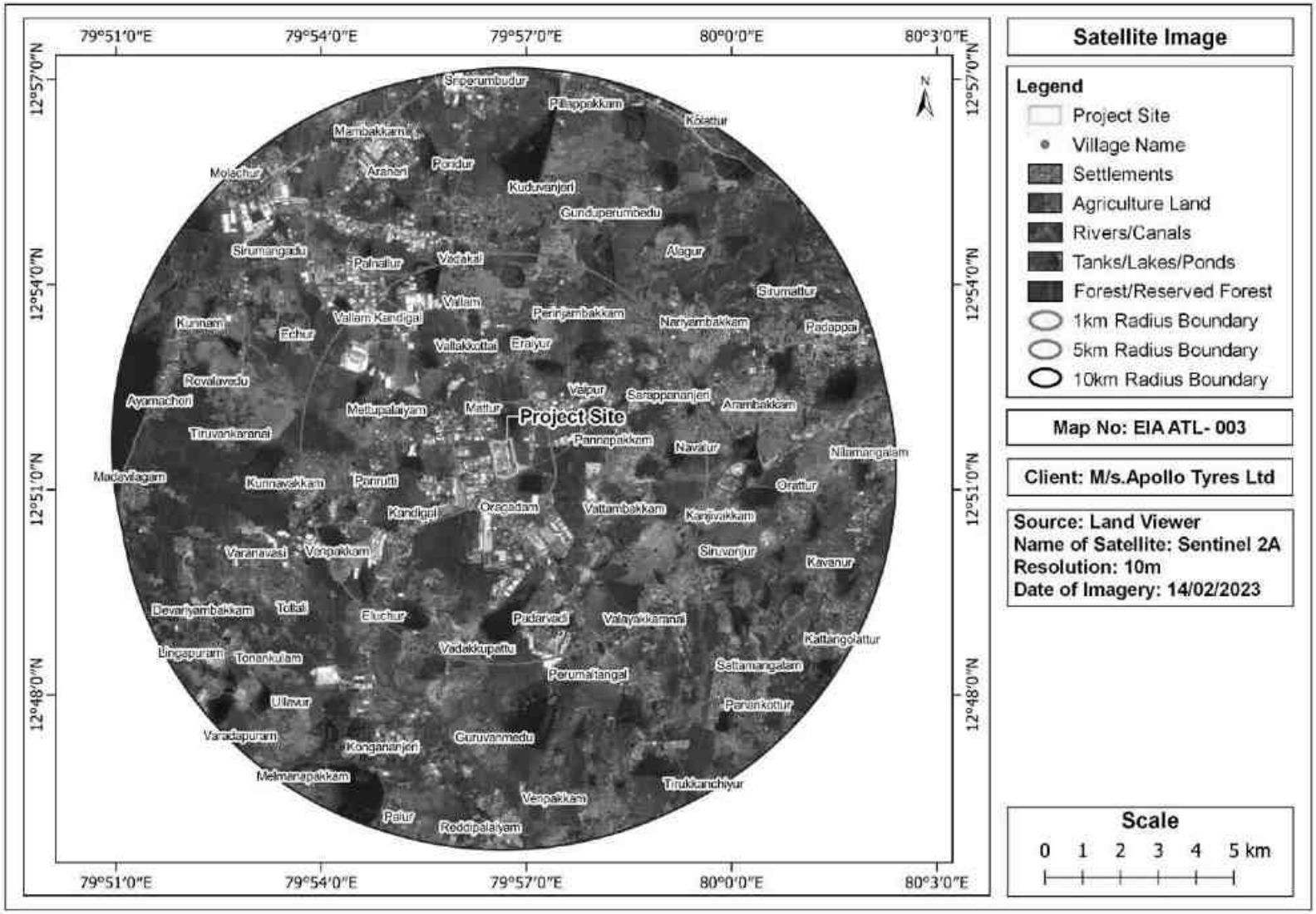


Figure 3-1 Map showing the Satellite Image of the study area of Project

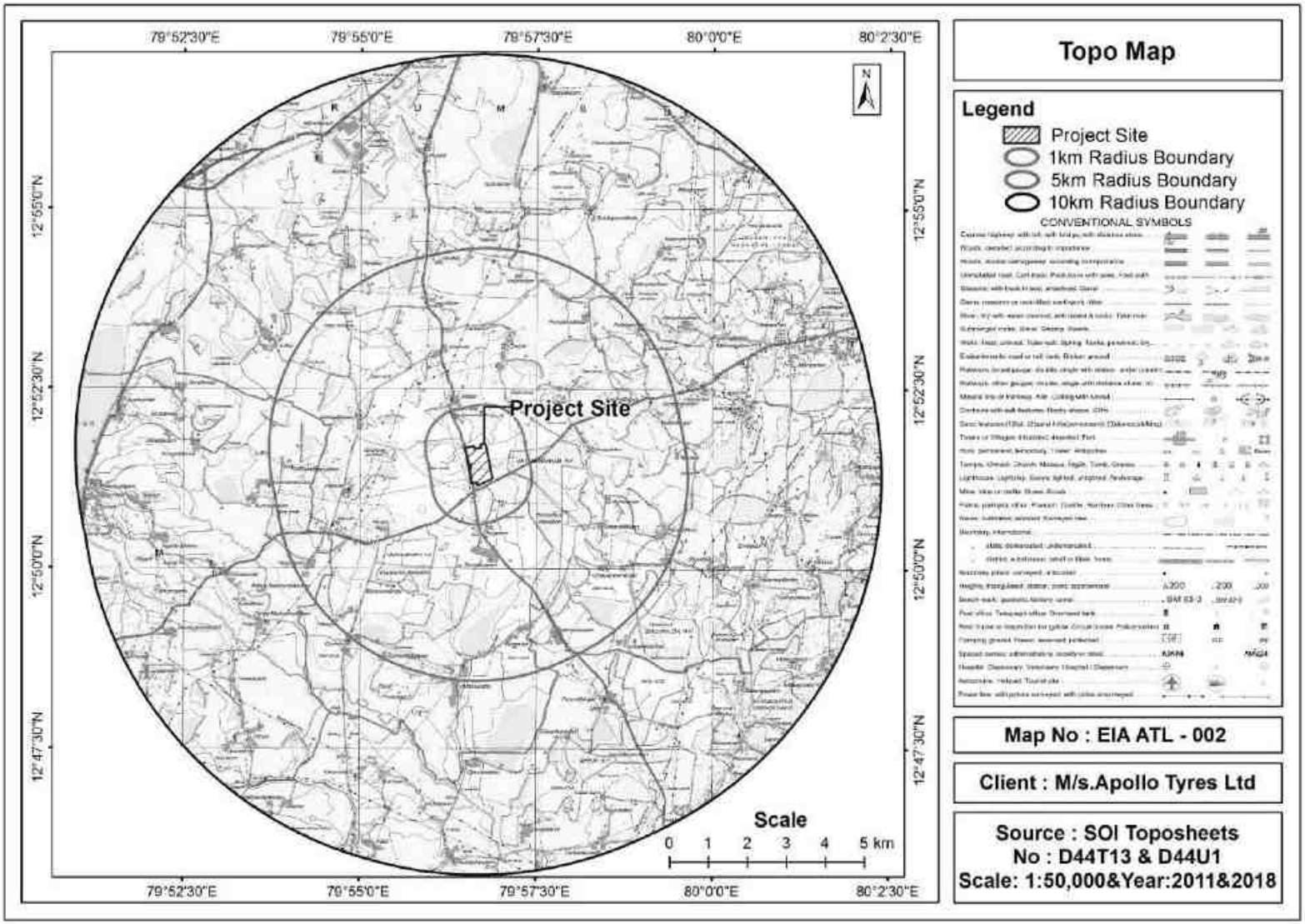


Figure 3-2 Topo Map of the Study Area

3.3 Environmentally/Ecologically Sensitive Areas

This section details with the environmentally sensitive areas present within the project site and surrounding environs. It included national parks, state forest, essential habitats etc. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in **Table 3-1** and **Figure 3-3.**

Table 3-1 Environmentally Sensitive Areas within 15km from Project Boundary

S. No.	Areas	Distance & Direction from project boundary
1	Nearest Airport	**Description** / **Distance (~km)** / **Direction** Chennai International Airport / 25.27 / ENE
2	Nearest Port	**Description** / **Distance (~km)** / **Direction** Chennai Port / 43.43 / ENE
3	Nearest Town and city	**Description** / **Distance (~km)** / **Direction** Town - Sriperumbudur / 9.50 / N City - Chennai / 18 / ENE
4	Nearest State and National Highway	**Description** / **Distance (~km)** / **Direction** SH-57 (Singaperumalkoil - Oragadam - Thiruvallur) / 0.01 / W SH-48 (Chennai-Oragadam-Walajabad) / 0.01 / S NH-48 (Delhi-Chennai) / 8.74 / NNW
5	Nearest Railway Station	**Description** / **Distance (~km)** / **Direction** Nearest Railway st- Kattangulathur RS / 10.05 / ESE
6	Nearby villages	**Villages** / **Distance (~km)** / **Direction** / **Population** Mattur / 0.63 / N / 1,628 Oragadam / 0.95 / S / 819 Vaipur / 2.16 / ENE / 200 Vallakkottai / 2.23 / NNW / 1,000 Vattambakkam / 2.27 / E / 663

7	Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests ,protected areas, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	

S. No	Reserve Forest & Zoological Park	Distance (~km)	Direction
1	Vattambakkam RF	0.42	E
2	Vadakkuppattu RF	1.60	SW
3	Siruvanjur RF	4.74	SE
4	Maganiyam RF	6.11	NE
5	Appur RF	6.67	SSE
6	Kattangolattur RF	7.58	SE
7	Paranur RF	11.68	SSE
8	Gudalur RF	11.88	ESE
9	Tirutteri RF	12.89	SSE
10	Sengunram RF	13.59	SE
11	Nallur RF	14.27	NE
12	Arignar Anna Zoological Park	14.65	E
13	Vandalur RF	14.68	E

S. No	Water Bodies	Distance (~km)	Direction
1	Lake near Oragadam	0.06	S
2	Lake near Mattur	0.12	NE
3	Vadakkupattu Lake	2.57	SSE
4	Lake near Perinjambakkam	2.75	NE
5	Lake near Gunduperumbedu	4.26	NNE
6	Venpakkam Lake	4.28	WSW
7	Lake near Guruvanmedu	5.27	SSE
8	Ninjalmadu R	6.17	SSW
9	Pillappakkam Lake	6.75	N
10	Lake near Kongananjeri	8.59	SSW
11	Tenneri Tank	8.95	W
12	Adyar R	9.47	NE
13	Kambakkal Channel	9.47	NNW
14	Manimangalam Lake	9.95	ENE

15	Sriperumbudur Tank	10.39	N
16	Palar R	10.51	SSW
17	Cheyyar R	13.38	SW

S.No	Monuments	Dist (~km)	Direction
1.	Megalithic cists and cairns Karanaithangal porinjambakkam	3.43	ENE
2.	Megalithic cists and cairns with stone circles Guduperumbedu	4.33	NNE
3.	Megalithic cists and cairns Venpakkam	4.41	W
4.	Megalithic cists and cairns Tattanur	5.57	N
5.	Megalithic cists and cairns with stone circles Echchur	5.76	WNW
6.	Megalithic cists and cairns with stone circles Echchur	5.92	WNW
7.	Megalithic cists and cairns with stone circles Echchur	5.99	WNW
8.	Megalithic cists and cairns Vadakkuppattu	6.19	SSW
9.	Megalithic cists and cairns with stone circles Eluchur	7.6	E
10.	Megalithic cists and cairns Vadakkuppattu	7.75	SSW
11.	Megalithic cists and cairns with stone circles Eluchur	7.94	ENE
12.	Megalithic cists and cairns Kuravanmedu	8.02	SSW
13.	Megalithic cists and cairns Venpakkam	8.26	SSE
14.	Megalithic cists and cairns Maganiyam	9.1	NE
15.	Megalithic cists and cairns Palayasivaram	9.15	SW
16.	Lesser Siva Temple	9.2	W
17.	Megalithic cists and cairns Venpakkam	9.2	S
18.	Megalithic cists and cairns Malaipattu	9.39	NE
19.	Large Siva Temple	9.52	W
20.	Megalithic cists and cairns in virgin state Sastirampakkam	9.78	S
21.	Megalithic cists and cairns with stone circles Venkitapuram	10.43	SSE
22.	Megalithic cists and cairns Palayasivaram	10.51	SW
23.	Megalithic cists and cairns Vadamangalam	10.98	NNW
24.	Megalithic cists and cairns Palayasivaram	11.74	SW
25.	Megalithic cist Vallanjeri	11.74	E
26.	Old Temple with apsidal Gopuram Manimangalam	12.03	ENE
27.	Megalithic cists and cairns intact with stone circles	12.26	SSE

			Settipuniyam		
		28.	Megalithic cists and cairns with stone circles Guduvancheri	12.95	ESE
		29.	Megalithic cists and cairns Nandivaram	12.96	E
		30.	Venkatesaperumal Temple	13.35	SW
		31.	Megalithic cists and cairns Kilampakkam	14.22	E
		32.	Megalithic cists and cairns Paranur	14.43	SSE
		33.	Megalithic cists and cairns with stone circles Ayyanjeri	14.44	E
		34.	Megalithic cists and cairns Sengunram	14.61	SE
		35.	Megalithic cists and cairns Kandalur	14.7	SSE
		36.	Megalithic cists and cairns Virapuram	14.7	SSE
		37.	Megalithic cists circumscribed by stone circles Rajakulipettai	14.82	SSE
8	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Not Applicable			

9	Inland, coastal, marine or underground waters

S. No	Water Bodies	Distance (~km)	Direction
1	Lake near Oragadam	0.06	S
2	Lake near Mattur	0.12	NE
3	Vadakkupattu Lake	2.57	SSE
4	Lake near Perinjambakkam	2.75	NE
5	Lake near Gunduperumbedu	4.26	NNE
6	Venpakkam Lake	4.28	WSW
7	Lake near Guruvanmedu	5.27	SSE
8	Ninjalmadu R	6.17	SSW
9	Pillappakkam Lake	6.75	N
10	Lake near Kongananjeri	8.59	SSW
11	Tenneri Tank	8.95	W
12	Adyar R	9.47	NE
13	Kambakkal Channel	9.47	NNW

			14	Manimangalam Lake	9.95	ENE
			15	Sriperumbudur Tank	10.39	N
			16	Palar R	10.51	SSW
			17	Cheyyar R	13.38	SW
10	State, National boundaries	Nil				

11	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	**Description**	**Distance (~km)**	**Distance**
		SH-57 (Singaperumalkoil - Oragadam - Thiruvallur)	0.01	W
		SH-48 (Chennai-Oragadam-Walajabad)	0.01	S
		NH-48 (Delhi-Chennai)	8.74	NNW

12	Defence installations	Nil

13	Densely populated or built-up area (Nearest Town,City, District)	**Description**	**Distance (~km)**	**Direction**
		Town - Sriperumbudur	9.50	N
		City - Chennai	18	ENE

14	Areas occupied by sensitive man-made land uses (Industries)	**S. No.**	**Industries**	**Dist. (~km)**	**Direction**
		1.	Johnson Lifts & Escalators	adjacent to site	E
		2.	National Poly Plast India Ltd	0.06	W
		3.	Kyungshin Industrial Motherson Pvt Ltd	0.06	W
		4.	National Autoplast	0.14	W
		5.	Magal Engineering Tech Pvt Ltd	0.14	NW
		6.	Auto International India Pvt Ltd	0.18	W
		7.	KGK Jet India Pvt Ltd	0.23	W
		8.	Rice Lake Weighing Systems India Ltd	0.23	W
		9.	NSK Bearing India Pvt Ltd	0.23	NW
		10.	Calsonic Kansei Motherson	0.25	W
		11.	Tide Water Oil	0.26	E
		12.	PreBo Automotive Pvt Ltd	0.28	SW
		13.	Renault Nissan Automotive India Pvt Ltd	0.3	SSW
		14.	Chennai Radha Engineering Works Pvt Ltd	0.31	NNW

			15.	Iberapa India Pvt Ltd	0.32	W	
			16.	Mangal Industries Ltd	0.33	W	
			17.	Besmak Components Pvt Ltd	0.33	SW	
			18.	Sharpline Automation Pvt Ltd	0.34	W	
			19.	Doowon Electronics India Pvt Ltd	0.35	E	
			20.	NHK. F. Krishna Automotive Seating Pvt Ltd	0.4	WSW	
			21.	Seoyon E-HWA Automotive India Pvt Ltd	0.41	W	
			22.	Doowon Automotives Systems India Pvt Ltd	0.43	E	
			23.	Subros Ltd	0.44	W	
			24.	Zetek Castings Pvt Ltd	0.46	NNW	
			25.	Nippon Steel chemical & Materials India Pvt Ltd	0.53	N	
			26.	CTM India Ltd	0.56	W	
			27.	Bosch Electrical Drives India Pvt Ltd	0.6	W	
			28.	Katsushiro Matex Pvt Ltd	0.6	W	
			29.	Sanmina - SCI India Pvt Ltd (DTA unit)	0.62	W	
			30.	Sumika Polymer Compounds India Pvt.Ltd	0.65	WSW	
			31.	Cape Electric Pvt Ltd	0.68	WSW	
			32.	ShinEtsu Polymer India Pvt Ltd	0.7	W	
			33.	Essar Steel India Ltd	0.71	WNW	
			34.	Lohmann Adhesive Tapes India Pvt. Ltd	0.71	W	
			35.	Stanley Engineered Fastening India Pvt Ltd	0.73	W	
			36.	Severn Glocon Valves Pvt Ltd	0.73	SW	
			37.	Industrias Del Recambio India Pvt Ltd	0.81	NW	
			38.	Polymatech Electronics Pvt Ltd	0.81	W	
			39.	Precision Machines & Equipments Unit 3 Pvt Ltd	0.81	WSW	
			40.	Obo Bettermann India Pvt Ltd	0.83	WSW	
			41.	Annai Sakthi Enterprises - Civil Contractor	0.84	W	
			42.	Right Tight Fasteners Pvt Ltd,	0.85	SW	
			43.	DELPHI-TVS Technologies Ltd	0.85	NE	

			44.	Uniproducts India Ltd	0.87	NE	
			45.	Punch Ratna Fasteners Pvt Ltd	0.99	NE	
			46.	Steel Strips Wheels Ltd	1	W	
			47.	Rico Auto Chennai plant	1.06	WNW	
			48.	Eicher Motors Ltd	1.12	SW	
			49.	Danfoss Industries Pvt Ltd	1.16	WSW	
			50.	Sundaram - Clayton Ltd	1.21	NE	
			51.	Daimler India Commercial Vehicles Pvt Ltd	1.23	S	
			52.	Komatsu India Pvt Ltd	1.24	WSW	
			53.	Komos Automotive India Pvt Ltd	1.43	ENE	
			54.	RD Brown Box Packaging	1.5	ENE	
			55.	Sundaram Auto Components Ltd	1.57	NE	
			56.	Amalgamations Valeo Clutch Pvt Ltd	1.64	ENE	
			57.	Nokia Solutions & Networks India Pvt Ltd	1.68	W	
			58.	JCBL Marrel Tippers Pvt Ltd	2.02	ENE	
			59.	Stellar Plastic	2.41	ENE	
			60.	Lear Automotive India Pvt Ltd	2.45	S	
			61.	Tenneco Automotive India Pvt Ltd	2.48	S	
			62.	Unipres India Pvt. Ltd	2.56	S	
			63.	BSA Corporation Ltd.(Mfg. Plant)	2.67	ENE	
			64.	Sandhar Technologies Ltd	2.73	ENE	
			65.	Momentive Performance Material India Pvt Ltd	2.75	ENE	
			66.	Polyplastics Auto Components Pvt Ltd	2.95	S	
			67.	Autoneum Nittoku Sound-Proof Products India Pvt Ltd	2.97	S	
			68.	M M Forgings Ltd-Plant 4	3.02	ENE	
			69.	Flashkart India Pvt Ltd	3.03	N	
			70.	Mindarika Pvt Ltd	3.06	S	
			71.	SSMPL SS Manufacturing Pvt Ltd	3.1	W	
			72.	Kosei Minda Aluminum Company Ltd	3.25	S	

			73.	Aggreko Energy Rental India Pvt Ltd	3.38	ENE	
			74.	Yusen logistics Nissan Warehouse	3.43	WSW	
			75.	Jeongun Chennai Pvt Ltd	3.59	WNW	
			76.	Kasai India Pvt Ltd	3.95	SW	
			77.	Royal Enfield Vallam Vadagal Plant	3.96	NNW	
			78.	TPI Composites India	3.98	WNW	
			79.	Vestas Wind technology India Pvt Ltd	4.07	S	
			80.	Vikram Solar Ltd (FAB 3)	4.37	SW	
			81.	EL Forge Ltd	4.97	SSE	
			82.	Flyjac Logistics Pvt Ltd	5.02	WSW	
			83.	Donaldson India Filter Systems Pvt Ltd	5.1	WSW	
			84.	Nippon Express Warehouse	5.21	WSW	
			85.	KONE Elevator India Pvt Ltd	5.28	WSW	
			86.	MI Steel Processing India Pvt Ltd	5.47	WSW	
			87.	SAN Logistik Park	5.64	WSW	
			88.	Sakura Autoparts India Pvt. Ltd	5.72	NW	
			89.	India Yamaha Motor Pvt Ltd	5.82	NW	
			90.	SMRC Automotive Products India Pvt Ltd	6.09	NW	
			91.	Varroc Polymers Pvt Ltd	6.39	SSW	
			92.	GE T&D India Ltd	6.49	ENE	
			93.	Vassmaan Automotive Pvt Ltd	6.87	ENE	
			94.	Rane Madras Ltd	7.19	WSW	
			95.	Asian Paints Ltd	7.78	NNW	
			96.	Carborundum Universal Ltd	7.84	NNW	
			97.	Saint Gobain Glass India Ltd	8.15	NNW	
			98.	YCH Logistics India Pvt Ltd	8.27	NW	
			99.	Motherson Automotive Technologies and Engineering	8.41	N	
			100.	Samsung India Electronics Pvt Ltd	8.43	NW	
			101.	Amcol Minerals and Materials India Pvt Ltd	8.45	NNW	

			102.	Inox Air Product	8.52	NNW	
			103.	Foxconn Technology India Pvt Ltd	8.54	NW	
			104.	Apex Laboratories Pvt Ltd	8.56	WNW	
			105.	Flex India	8.65	NW	
			106.	Visen Industries Ltd. Chennai	8.67	NNW	
			107.	KwangJin India	8.75	NNW	
			108.	J.K. Fenner India Ltd	8.77	NNW	
			109.	Dell International Services India Pvt Ltd	8.79	NW	
			110.	Interarch Building Products Pvt Ltd	8.97	NNW	
			111.	Faurecia Automotive Seating India Pvt Ltd	9.17	N	
			112.	Wheels India Ltd	9.28	N	
			113.	KM Seats Co Pvt Ltd	9.29	WSW	
			114.	Salcomp manufacturing india Pvt Ltd	9.39	N	
			115.	JTEKT India Ltd	9.51	NNW	
			116.	Prabhu Laser Components	9.54	NNE	
			117.	Jamna Auto Industries Ltd	9.6	NNE	
			118.	Thaai Casting	9.68	NNE	
			119.	CMR Toyotsu Aluminium India Ltd	9.71	N	
			120.	Zsivira Chemie Merk Pvt Ltd	9.83	NNE	
			121.	Surin Automotive Pvt Ltd	9.88	NNE	
			122.	MEI Foundry	9.9	NNE	
			123.	Asian Sealing Products	9.91	N	
			124.	Infac India Pvt Ltd	10.02	ENE	
			125.	Ford India Pvt.Ltd	10.48	SE	
			126.	United Industries Plastic Pvt Ltd	10.73	NNE	
			127.	Mando Automotive India Pvt Ltd	10.74	NNE	
			128.	KONE Elevator India Pvt Ltd	10.77	NNE	
			129.	Hanon Systems Pvt Ltd	10.79	SE	
			130.	BSH Household Appliances Manufacturing Ltd	10.96	NNE	
			131.	Tamil Nadu Steel Tubes	10.97	SE	

			132.	Yorozu JBM Automotive Tamil Nadu Pvt Ltd	11.03	NNE
			133.	Minda Corporation Limited	11.10	NNE
			134.	Blasto Metal Spray Processors	11.13	NNE
			135.	Visteon Electronics India Pvt Ltd	11.15	SE
			136.	Gestamp Automotive Pvt Ltd	11.49	NNE
			137.	THE HINDU	11.51	SE
			138.	UCAL Fuel System Ltd Plant 6	11.75	SE
			139.	Sundaram Industries	11.80	SE
			140.	Mahle Engine Components India Pvt ltd	12.06	SE
			141.	BASF Catalyst India Pvt. Ltd	13.62	SSE
			142.	Wheels India Limited	14.11	NNE
			143.	Sharda Motor Industries Limited	14.39	SSE

15	Areas containing important, high quality or scarce resources, (groundwater resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	

S. No	Reserve & Zoological Park	Distance (~km)	Direction
1	Vattambakkam RF	0.42	E
2	Vadakkuppattu RF	1.60	SW
3	Siruvanjur RF	4.74	SE
4	Maganiyam RF	6.11	NE
5	Appur RF	6.67	SSE
6	Kattangolattur RF	7.58	SE
7	Paranur RF	11.68	SSE
8	Gudalur RF	11.88	ESE
9	Tirutteri RF	12.89	SSE
10	Sengunram RF	13.59	SE
11	Nallur RF	14.27	NE
12	Arignar Anna Zoological Park	14.65	E
13	Vandalur RF	14.68	E

S. No	Water Bodies	Distance (~km)	Direction
1	Lake near Oragadam	0.06	S
2	Lake near Mattur	0.12	NE

			3	Vadakkupattu Lake	2.57	SSE	
			4	Lake near Perinjambakkam	2.75	NE	
			5	Lake near Gunduperumbedu	4.26	NNE	
			6	Venpakkam Lake	4.28	WSW	
			7	Lake near Guruvanmedu	5.27	SSE	
			8	Ninjalmadu R	6.17	SSW	
			9	Pillappakkam Lake	6.75	N	
			10	Lake near Kongananjeri	8.59	SSW	
			11	Tenneri Tank	8.95	W	
			12	Adyar R	9.47	NE	
			13	Kambakkal Channel	9.47	NNW	
			14	Manimangalam Lake	9.95	ENE	
			15	Sriperumbudur Tank	10.39	N	
			16	Palar R	10.51	SSW	
			17	Cheyyar R	13.38	SW	
16	Areas already subjected to pollution or environmental damage (those where existing legal environmental standards are exceeded)	Nil					
17	Areas susceptible to natural hazard which could cause the project to present environmental problems, (earthquakes, subsidence, landslides, erosion or extreme or adverse climatic conditions)	Project site located at seismic zone-III (Moderate Damage Risk Zone)					

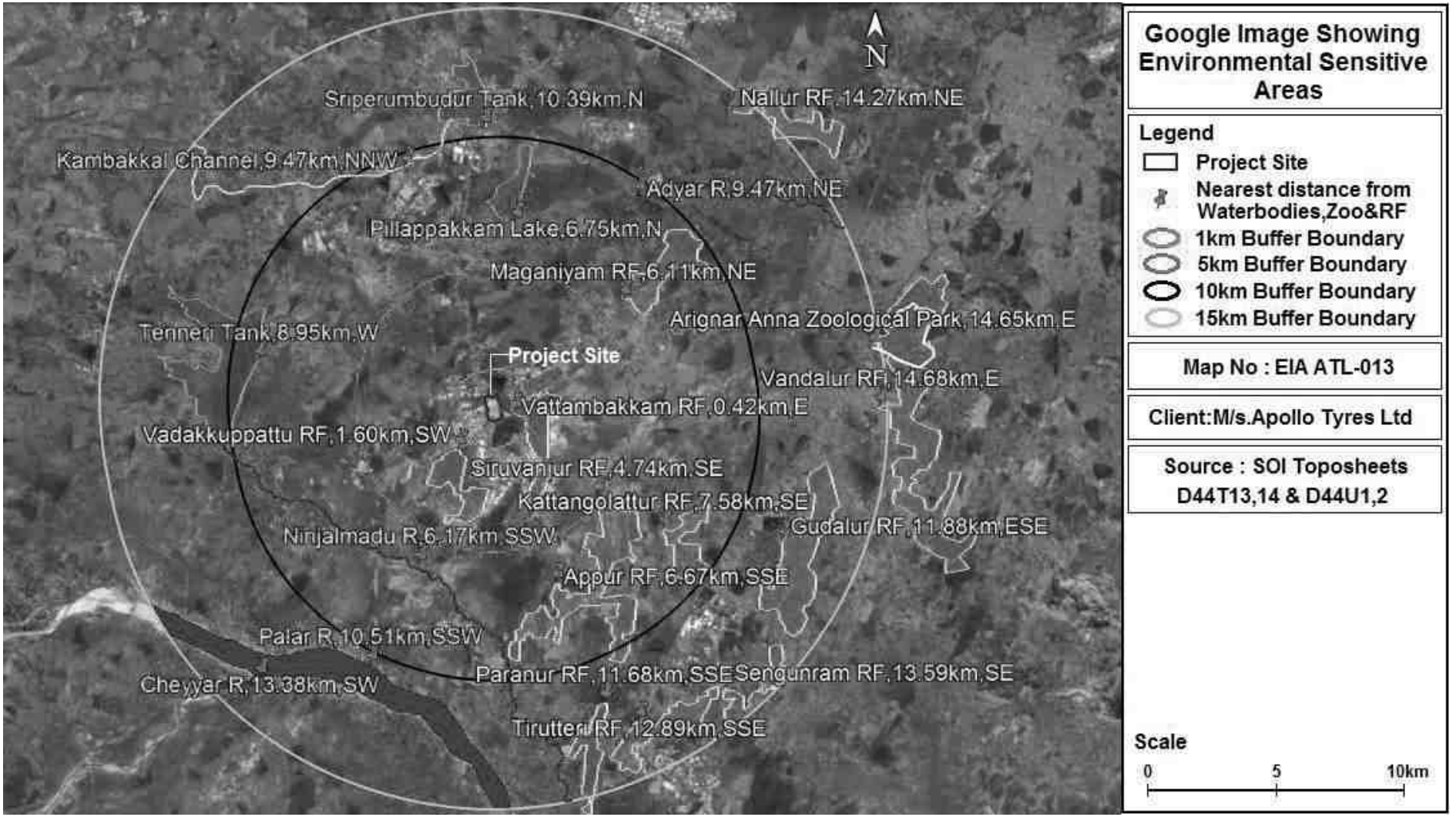


Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary

3.4 Physical Conditions of PIA District

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

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

3.4.1 PIA District Profile

The proposed project area is in Kancheepuram District. This district lies between 11°00'and 12°00' latitudes and between 77°28' and 78°50' longitudes. It has an area of 4483 sq.kms. Kancheepuram district stands 15th place in terms of the largest area. Kancheepuram district is bordering Bay of Bengal in the east, Tiruvannamalai district in the west, Thiruvallur district in the north, Chennai district in the north-east, Vellore district in the North West and Viluppuram district in the south.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, Kancheepuram District", Series-34 Part XII-A)

3.4.2 Climatic Conditions

Kancheepuram district generally experiences hot and humid climatic conditions. The district receives the rain under the influence of both southeast and northeast monsoons. Most of the precipitation occurs in the form of cyclonic storm caused due to the depressions in Bay of Bengal chiefly during northeast monsoon period. The southwest monsoon rainfall is highly erratic and summer rains are negligible. The normal annual rainfall over the district varies from 1105 mm to 1214mm. It is the minimum in the western and north-western parts of the district around Uttiramerur (1105 mm) and it is the maximum around Kovalam (1214.2 mm). High relative humidities between 58 and 84% prevail throughout the year. Relative humidity is maximum in the morning and minimum in the evening. Higher rates of relative humidity are observed between November and January i.e., 83 to 84%. In the months of June, the humidity is lower i.e., around 58%. Average relative humidity in the morning and evening are 74% and 64% respectively. The minimum and maximum temperatures are 20°C & 37°C. The daytime heat is oppressive and the temperature is as high as 43°C.

The district receives the rain under the influence of both Southwest and Northeast monsoons. Most of the precipitation occurs in the form of cyclonic storms caused due to the depressions in Bay of Bengal chiefly during Northeast monsoon period. The southwest monsoon rainfall is highly erratic and

summer rains are negligible. Rainfall data analysis shows that the normal annual rainfall varies from 950mm to 1150mm.

Source: *http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf*

(**Ref**: Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District").

3.4.3 Natural Resources of PIA District

3.4.3.1 Flora & Fauna

The total area under forest in this district is 27226.60 hectares. This works out to 7.2% of the total geographical area of the district. The forest area is scattered throughout the district. Trees of poor height of deciduous type and fuel trees and low scrub jungle are generally found in the reserve forest of the district .The unreserved forest contain some valuable timber grown under Forest Development Schemes. Further, under Afforestation Programmes, sandalwood, babool, bamboo and other useful trees are grown in small areas of the district. Cashew is the only major forest produce in the district. Total yield of cashew in 2010-11 was 5.282 tonnes. *Barringtonia acutangula, Acacia nilotica*, and *Alangium salviflorum* trees and dry evergreen scrub and thorn forests are found in the district.

Monkeys and other common mammals can be spotted. Garganey teals, glossy ibis, grey heron, grey pelican, open-billed stork, painted stork, snake bird, spoonbill, spot bill duck, cormorants, darter, grebes, large egret, little egrets, moorhen, night herons, paddy bird, painted stork, pintails, pond heron, sandpiper, shovellers, terns, white ibis are also found in the district. Manyen dangered species and common animals are found in Vandalur Zoological Garden. Due to rapid industrialisation, increasing conversion of waste land and agricultural land for residential purposes, the forests cover in the district is affected. Flora and fauna of study area is discussed in **Section 3.11**.

***Source**:https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, Kancheepuram District", Series-34 Part XII-A)

3.4.3.2 Forest Resources

The total forest area in the district is 23,586 ha spread in the interior regions of the district. In this 366.675ha are Reserved Land. Much of the natural forests have been converted into man-made forests since the late 1950s. However, chunks of natural forests still exist in Hanumanthaputheri, Maiyur and parts of Kelambakkam R.F. which still support the original vegetation. Kanchipuram district has the singular distinction of having established woodlots in community (Poramboke) lands vested with the panchayat. Way back in 1961, the first ever community plantation- the precursor of the present day social forestry was raised near Sunguvarchatram in panchayat lands. The major forest product, the industrial pulpwood obtained from Eucalyptus plantations, is supplied for paper manufacturing. The

lops and tops left after extracting the pulpwood is sold as fuel wood. Fuel wood is extracted also from the Casuarina plantations. Cashew is the important Non Timber Forest Produce which contributes a major share.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, Kancheepuram District", Series-34 Part XII-A)

3.4.3.3 Irrigation

Palar River along with rain fed tanks, wells and canals are the main sources of irrigation in Kancheepuram district. Total irrigated and unirrigated land area in the district was 95938.5 hectares and17352.5 hectares respectively. **Table 3-2** gives the source wise Net Area Irrigated in 2009-10.

Table 3-2 Net area irrigated in Kancheepuram District (2009-10)

S. No.	Irrigation Source	Area (Ha)
1	Canals	228
2	Tanks	68479
3	Tube wells & Other wells	7286
4	Open wells	30418

Source:*https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, Kancheepuram District", Series-34 Part XII-A)

3.4.3.4 Agricultural Resources

Agriculture is the main occupation of the people with 47% of the population engaged in it. Paddy is the major crop cultivated in the district. Groundnuts, Sugarcane, Gingelly, Cereals and Millets and Pulses are the other crops in Kancheepuram district. Major horticultural crops cultivated in the district are mango, banana, sapota, guava, watermelon, brinjal, ladies finger, chilly, curry leaves, jasmine, tube roses and crysanthamam. An area of 3096 hectares was cultivated with 8701 tonnes of mangoes during 2009-10.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, Kancheepuram District", Series-34 Part XII-A)

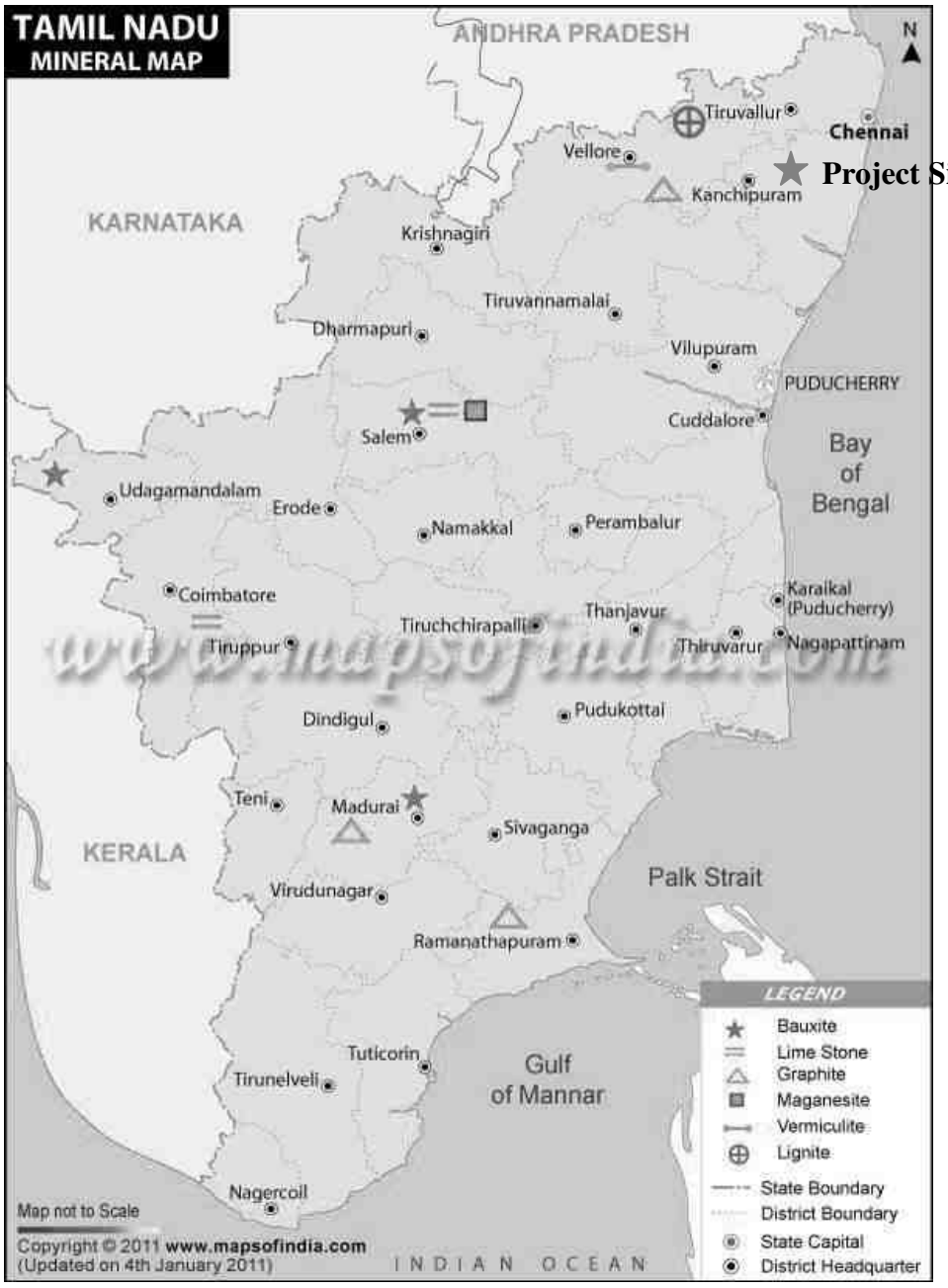
3.4.3.5 Mineral Resources

Mineral wealth in the district is very less. Granite, stone quarry, sand quarry, silica sand and clay are the minerals available in Kancheepuram district. Formation of quartize gravels known as

"Conjeevaram gravels" found in the Northeast and Northwest regions of Kancheepuram district. Grittys and stones of white colour, resembling Cuddalore sandstones also occur in the district. 'Epidot' a very scarce variety of granite is also found in small quantities in the hills at north and north-west of Chengalpattu. The Mineral map of Tamilnadu is shown in **Figure 3-4.**

Source:*https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, Kancheepuram District", Series-34 Part XII-A)



Source: *Maps of India*

Figure 3-4 Mineral Map of Tamil Nadu

3.4.4 Land Use & Land Cover

Total geographic area of Kancheepuram district is 4432.99 Sq. Km. Urban Built up area is 210.87 Sq.km and Rural Built up area is 202.69 Sq.km. Details of land use/land cover statistics for Kancheepuram district were given in Table **Table 3-3** and Land Use map of Kancheepuram is given in **Figure 3-6.** Land Use pattern of Kancheepuram district is given in **Figure 3-5**.

Table 3-3 District land use/land cover statistics (2015-16) for Kancheepuram district

S. No.	Division of Land Use/Land Cover	Area in Sq. km.	Area in acres	Area in Ha.	Area (%)
1	Agriculture, Crop land	2578.67	637202.25	257867	58.17
2	Agriculture, Plantation	135.98	33601.34	13598	3.067
3	Agriculture, Fallow	50.63	12510.93	5063	1.142
4	Barren/unculturable/ Wastelands, Salt Affected land	51.51	12728.38	5151	1.162
5	Barren/unculturable/ Wastelands, Scrub land	140.21	34646.59	14021	3.163
6	Barren/unculturable/ Wastelands, Sandy area	23.15	5720.48	2315	0.522
7	Barren/unculturable/ Wastelands, Gullied/ Ravinous land	1.2	296.53	120	0.027
8	Barren/unculturable/ Wastelands, Barren rocky	2.97	733.90	297	0.067
9	Built-up, Urban	210.87	52107.03	21087	4.757
10	Built-up, Rural	202.69	50085.71	20269	4.572
11	Built-up, Mining	17.07	4218.08	1707	0.385
12	Forest, Evergreen/ Semi evergreen	0.75	185.33	75	0.017
13	Forest, Deciduous	71.71	17719.90	7171	1.618
14	Forest, Forest Plantation	70.89	17517.27	7089	1.599
15	Forest, Scrub Forest	67.19	16602.98	6719	1.516
16	Wetlands/Water Bodies, Coastal Wetland	91.13	22518.68	9113	2.056
17	Wetlands/Water Bodies, River/Stream/canals	109.7	27107.42	10970	2.475
18	Wetlands/Water Bodies, water bodies/ Lakes/ Ponds	606.67	149911.19	60667	13.685
Total		**4432.99**	**1095413.99**	**443299**	**100**

Source: *https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php*

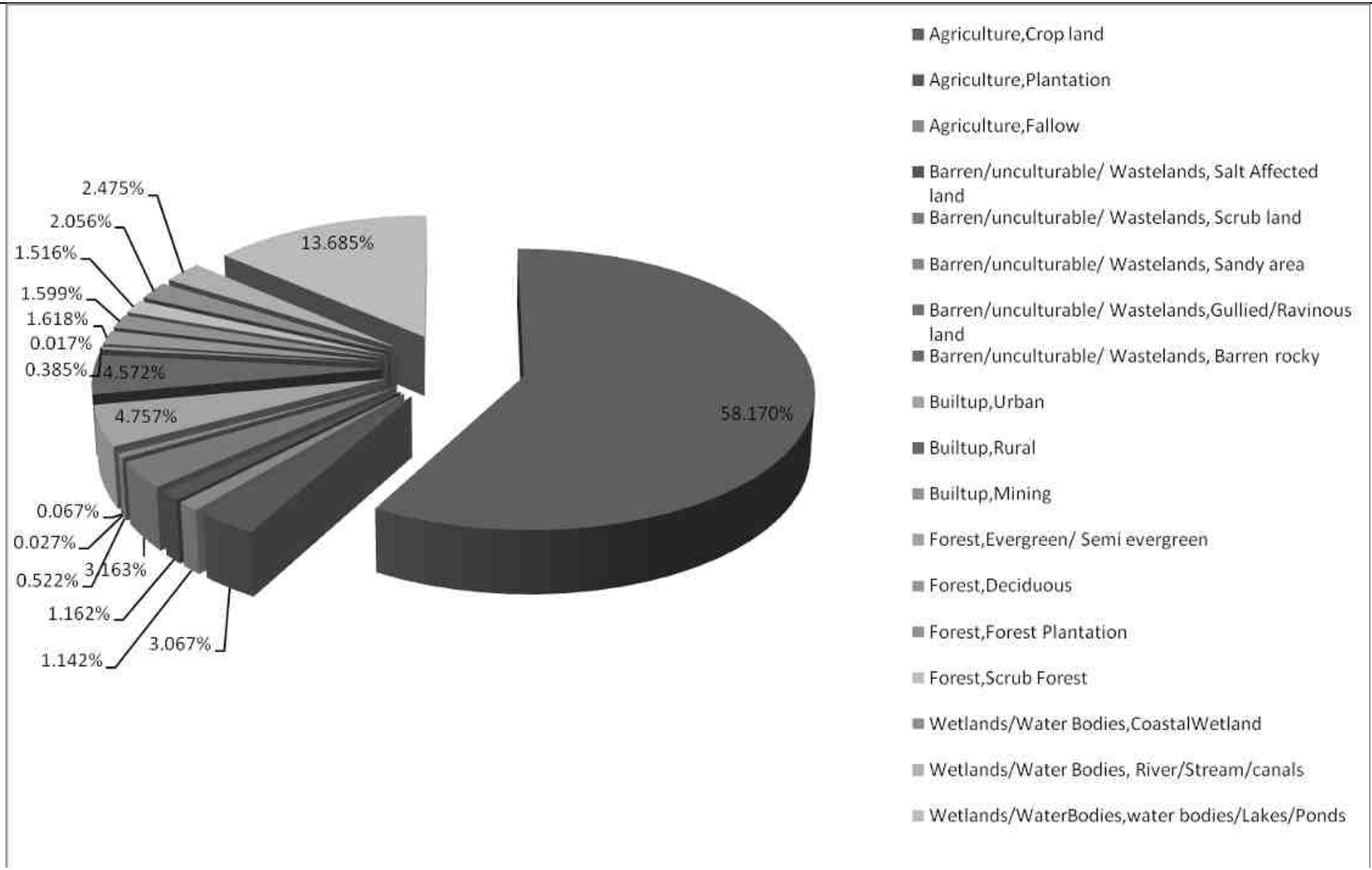


Figure 3-5 Land use/Land cover pattern for Kancheepuram district

Source:[*https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php*](https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php)

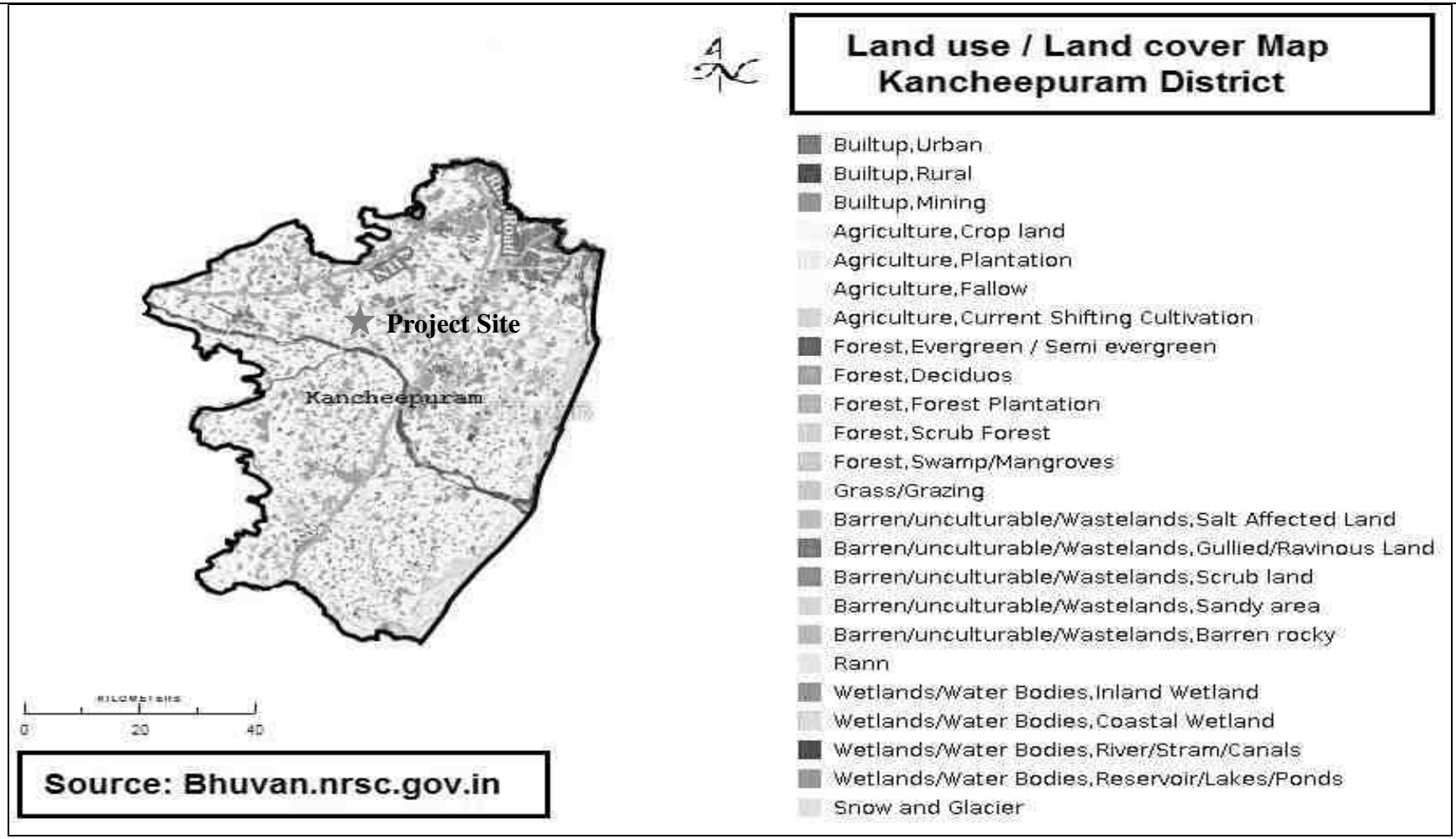


Figure 3-6 Land use/Land cover Map of Kancheepuram district

Source:https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php

3.4.4.1 Land Use Land Cover for the Study Area

The land use pattern of the study area is 345.99 Sq.km given in **Table 3-4** Land use pattern and land use map of the study area is given in **Figure 3-7** and **Figure 3-8** respectively.

Table 3-4 Land use pattern of the Study Area

S.No.	Description	Area (Sq.km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Crop land	143.37	35427.4	14337	41.44
2	Tanks/Lakes/Ponds	53.83	13301.7	5383	15.56
3	Rural	38.59	9535.78	3859	11.15
4	Urban	37.08	9162.65	3708	10.72
5	Fallow	34.77	8591.84	3477	10.05
6	Forest Plantation	10.69	2641.55	1069	3.09
7	Scrub land	9	2223.95	900	2.60
8	Deciduous	7.21	1781.63	721	2.08
9	Mining	3.7	914.289	370	1.07
10	Plantation	3.52	869.81	352	1.02
11	Salt affected land	1.92	474.442	192	0.55
12	Gullied / Ravinous	1.28	316.294	128	0.37
13	River / Stream / Canals	1.03	254.518	103	0.30
Total		**345.99**	**85495.9**	**34599**	**100.00**

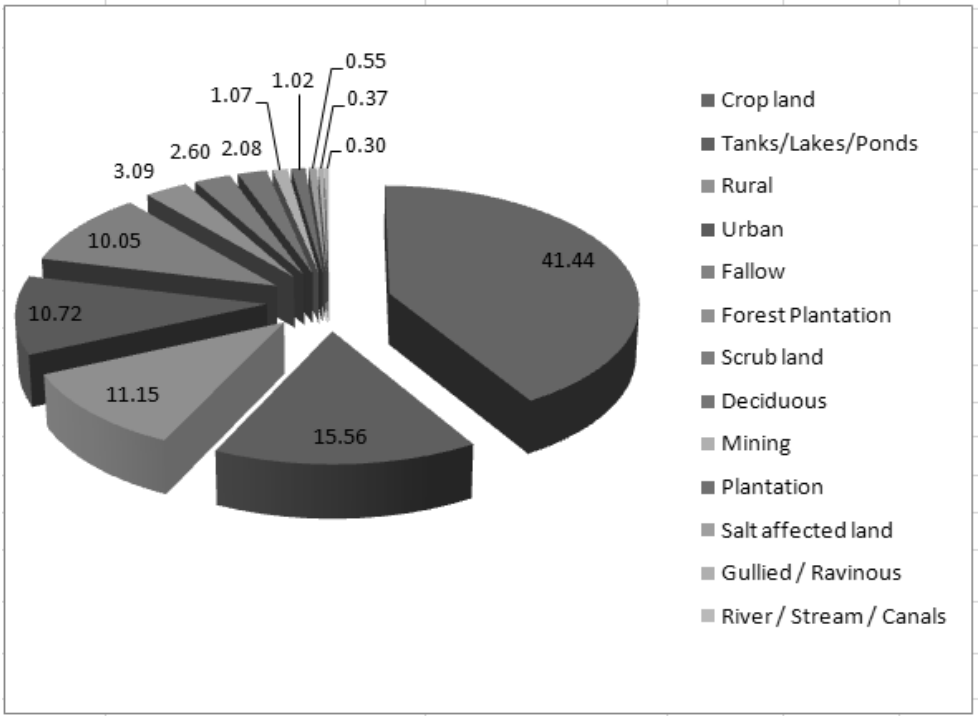


Figure 3-7 Land use pattern of the Study Area

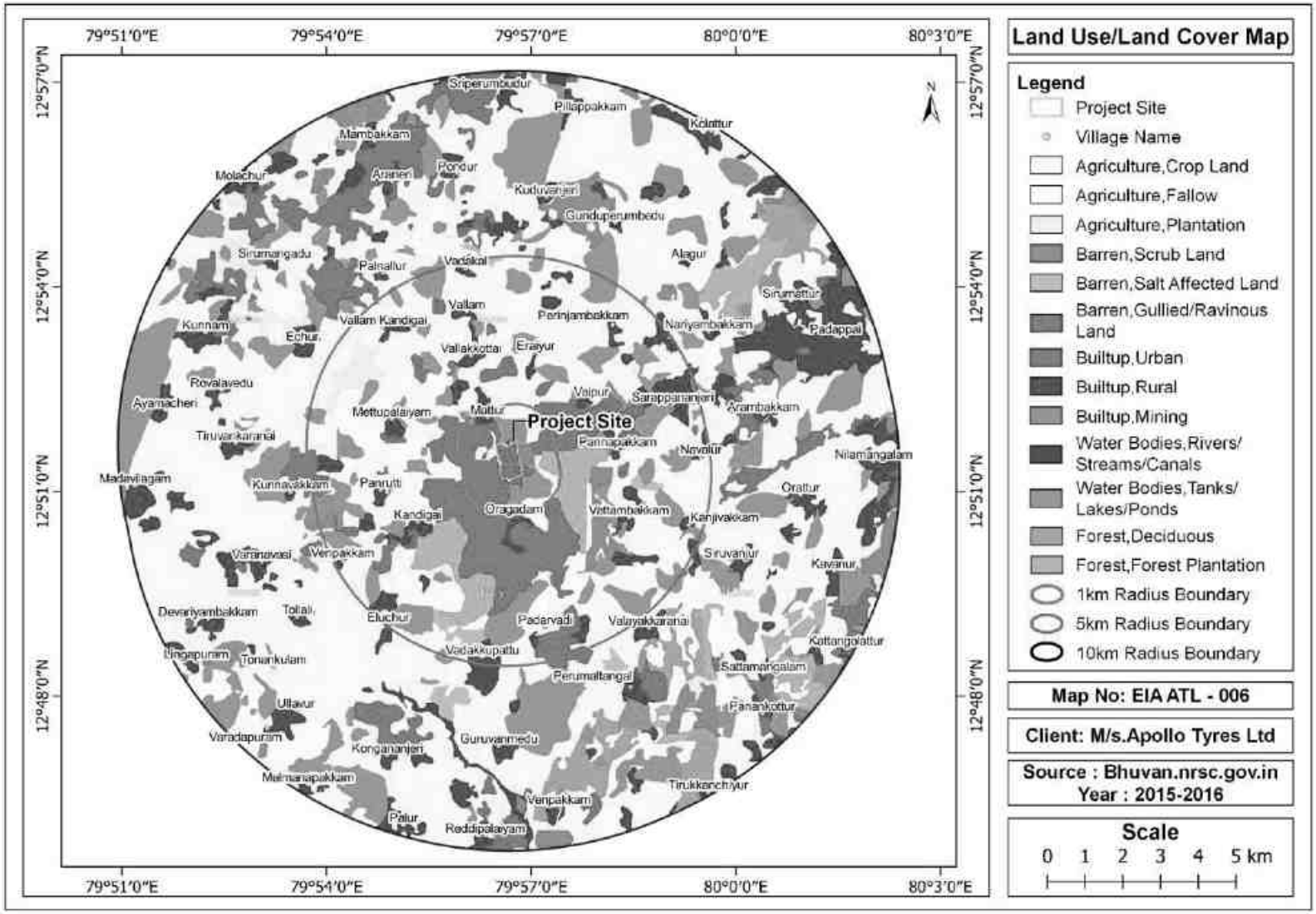


Figure 3-8 Land use map of the Study Area

3.4.5 Topography

The district is flat near the sea. Some parts of the district are undulated and some of them are even hilly. Chengalpattu, Maduranthakam and Cheyyur taluks are low lying land except in its southern portion of Chengalpattu taluk. There are only a few hills of considerable elevation in the district. Besides the small hills in Maduranthakam taluk, a few conical hills or ridges of little elevation are also in the district. St. Thomas Mount, Tiruneermalai and Pallavaram quarry hills are the important landmarks in the district. Most of the hills and hillocks are rocky and no spectacular verdant vegetation is seen on the slopes of the hills of this district. Physical map of Tamilnadu is given as **Figure 3-9** and Topo map of study area is given as **Figure 3-2**. The Contour map of the study area is given in **Figure 3-10**.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf*

*(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, KANCHEEPURAM District", Series-34 Part XII-A)*

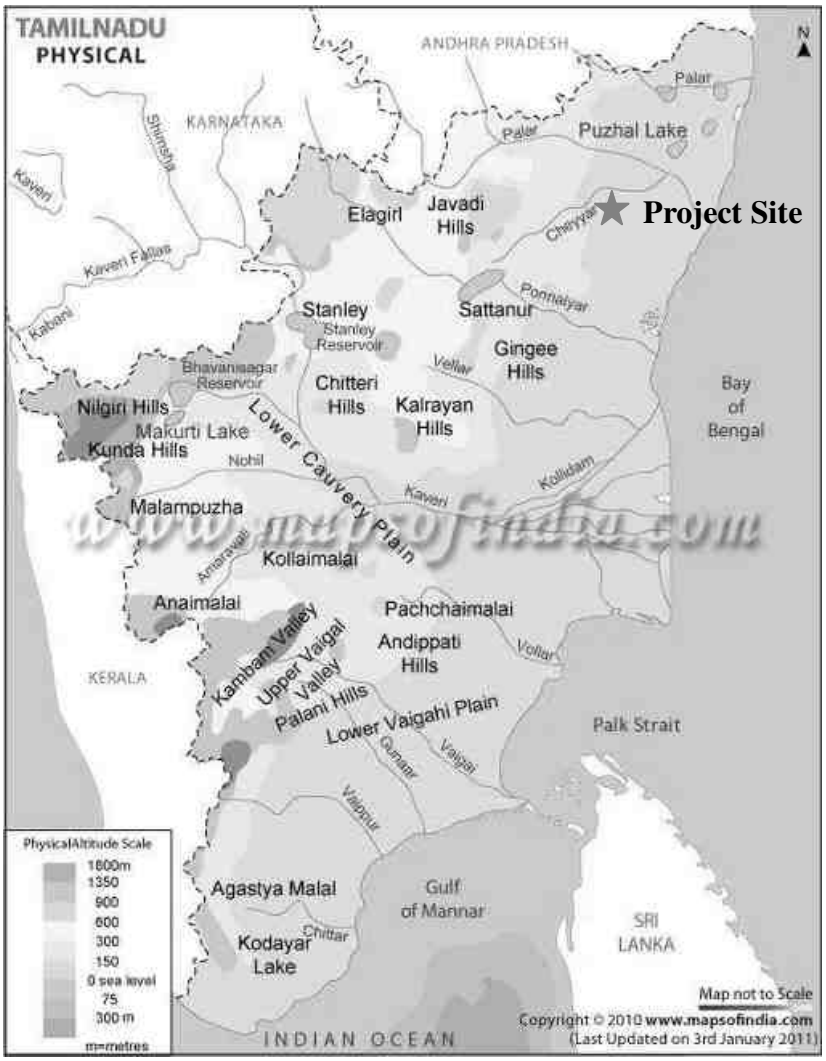


Figure 3-9 Physical Map of Tamilnadu

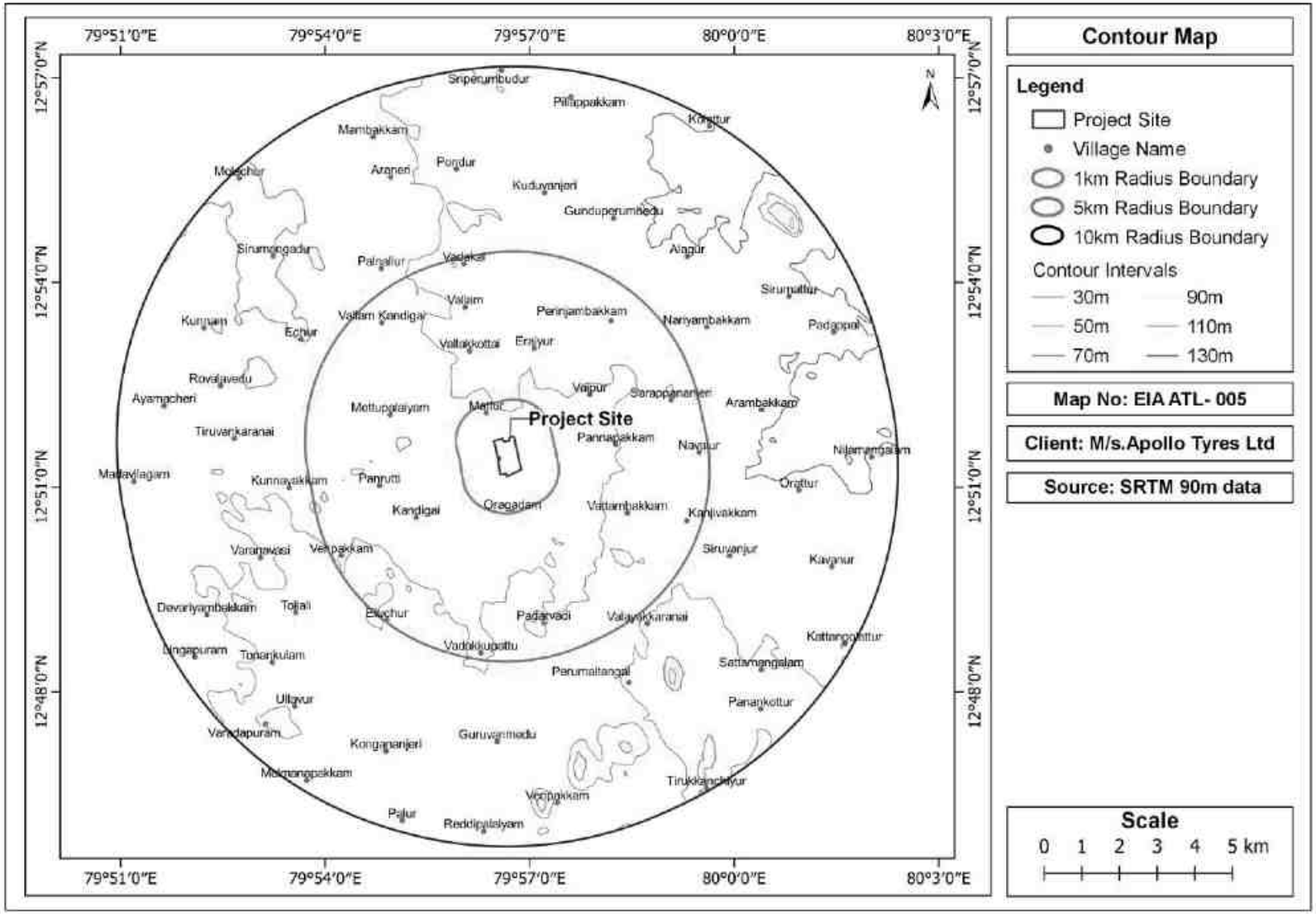


Figure 3-10 Contour map of the Study Area

3.4.6 Geomorphology of PIA District

The prominent geomorphic units identified in the district through interpretation of satellite imagery are Chingleput-Tirukkalukkunram Surface (Erosional), Palar Surface (fluvial) and Mamallapuram (Mahabalipuram) surface (Marina) etc. The elevation of the area ranges from 100 mamsl in the west to a sea level in the east. The major part of the area is characterised by an undulating topography with innumerable depressions, which are used as irrigation tanks. Three beach terraces ranging in elevation between 4 mark the coastal tract and 12m with broad inter terrace depressions. The coastal plain displays a fairly low level or gently rolling surface and only slightly elevated above the local water surfaces on rivers. The straight trend of the coastline is a result of development of a vast alluvial plain. There are a number of sand dunes in the coastal tract. The coastal land forms include estuarine tidal, mud flats or lagoons and salt marsh etc. The Geomorphology Map of the Kancheepuram District is shown in **Figure 3-11**.

Source:https://censusindia.gov.in/nada/index.php/catalog/1102/download/3422/DH_2011_3303_PART_A_DCHB_KANCHEEPURAM.pdf

*(**Ref**: Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011, KANCHEEPURAM District", Series-34 Part XII-A)*

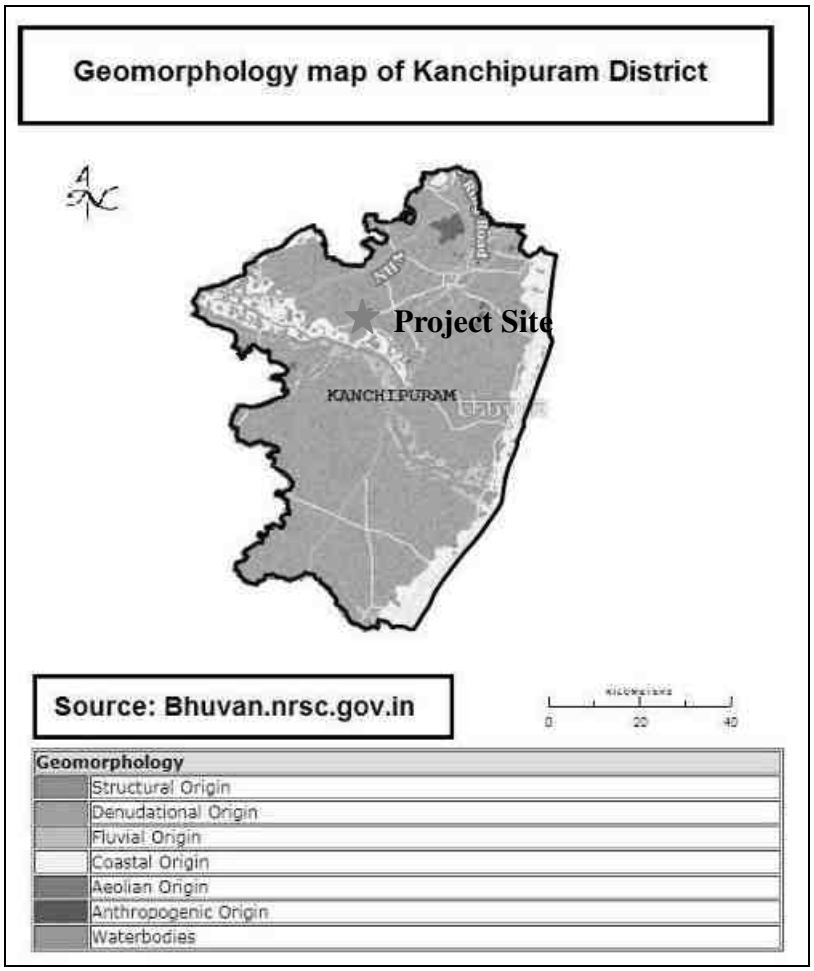


Figure 3-11 Geomorphology Map of Kancheepuram District

3.4.6.1 Geomorphology of the Study Area

Total geographical area of the study area is 345.99 Sq.km. The Geomorphology pattern of the study area is given in **Table 3-5,** Geomorphology pattern of the study area is given in **Figure 3-12.** Geomorphology map of the study area is given in **Figure 3-13.**

Table 3-5 Geomorphology pattern of the study area

S.No.	Description	Area (Sq.km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Denudational Origin - Pediment - Pediplain Complex	267.58	66120.4	26758	77.34
2	Water bodies	54.86	13556.2	5486	15.86
3	Coastal Origin - Older Deltaic Plain	19.88	4912.45	1988	5.75
4	Fluvial Origin - Active Flood Plain	1.89	467.028	189	0.55
5	Denudational Origin-Low Dissected Hills and Valleys	0.87	214.981	87	0.25
6	Structural origin - Low Dissected Hills and Valleys	0.59	145.792	59	0.17
7	Anthropogenic Origin - Anthropogenic Terrain	0.32	79.0736	32	0.09
Total		**345.99**	**85495.9**	**34599**	**100**

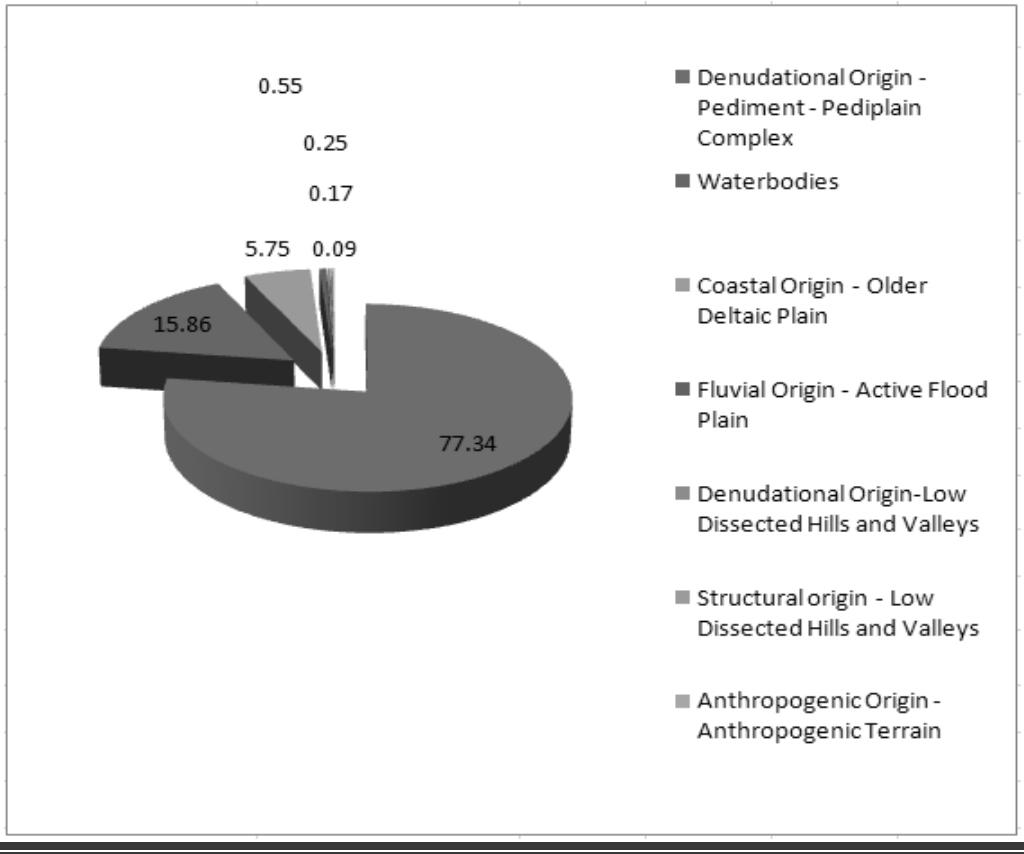


Figure 3-12 Geomorphology pattern of the study area

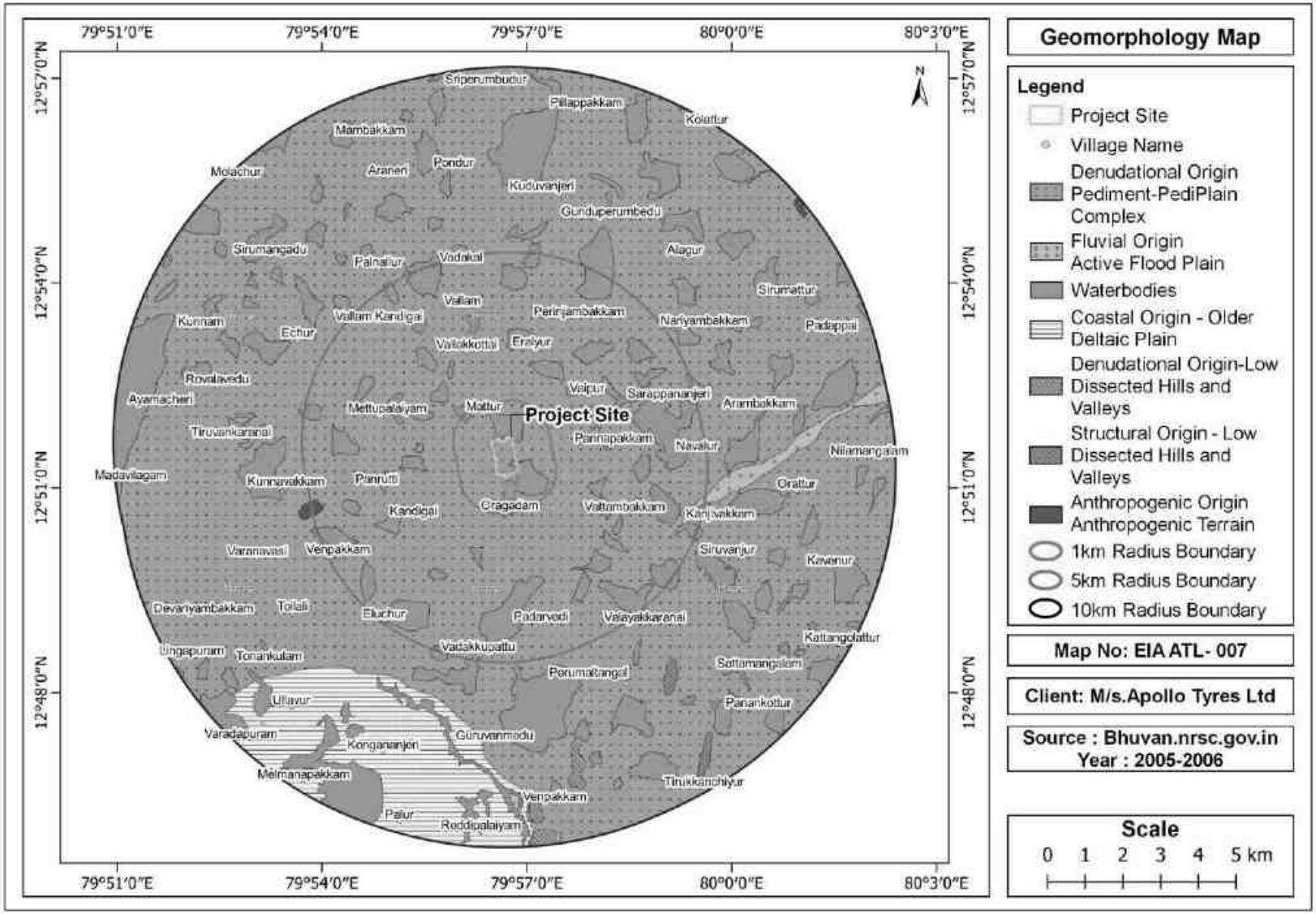


Figure 3-13 Geomorphology Map of the study area

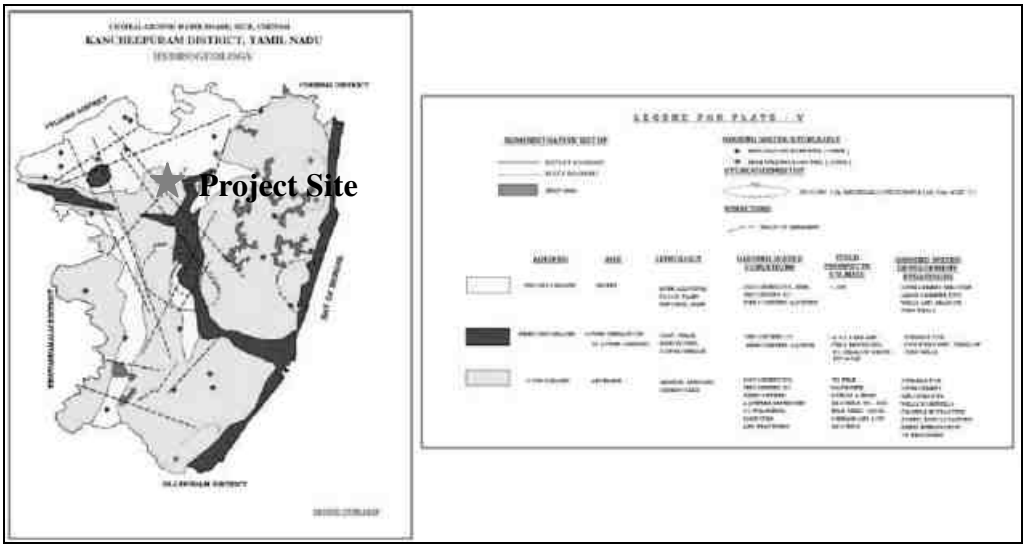
3.4.7 Hydrogeology of PIA District Profile

The district is underlain by both sedimentary and fissured formations. The important aquifer system in the district are constituted by unconsolidated and semi consolidated formations and weathered, fissured and fractured crystalline rocks. Gondwana sandstones and shales and Tertiary mottled clays and sandstones represent the porous, semi-consolidated sediments. Ground water occurs under water table conditions to confined conditions in the inner granular spaces of sandstones, sands and in the bedding planes and thin fractures of shales. The ground water occurs under water table conditions and the depth of the wells ranges from 5 to 10 m bgl. The depth to water level ranged from 2.89 to 4.09 m bgl during May 2006 and 1.05 to 3.40 m.bgl duringJan'2007. The specific capacity of pores formation ranged from 1.00 to80.00 lpm/m/dd.

These unconsolidated formations occur mainly along the banks of Palar and Cheyyar rivers and the sand layers of this alluvium form the potential aquifer. Between Walajabad and Kancheepuram, small diameter dug wells tap the alluvium with depths ranging between 6m and 12m bgl. The yield ranges from 25m to 35 m3/hr. Depth of filter point and dug cum bore wells ranges from 10 – 21 m bgl and yield is around20 m3/hr. The yield of infiltration wells with varying depths of 5 – 12 mbgl is around 35 m3/hr. In areas covered by the laterites, the ground water is developed by means of dug wells in the depth of 4 to 6 m bgl. Along the coast, windblown sand acts as aquifer zones and ground water extraction is by means of shallow dug wells with radial arms. The wells can sustain for3 to 6 hours pumping and yield is around 15m3/hour. The hydrogeology map of Kancheepuram District is given in **Figure 3-14.**

Source: *http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf*

(**Ref:** Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District")



Source: *http://cgwb.gov.in/District_Profile/TamilNadu/KANCHEEPURAM.pdf*

Figure 3-14 Hydrogeology Map of Kancheepuram District

3.4.8 Drainage Pattern in PIA District

Palar River is one of the most important river running through the district. It rise in Karnataka State and flows through Chittoor district of Andhra Pradesh before entering into Kancheepuram district. Cheyyar river and Vegavathi river are the tributories of Palar river which join the Palar river at Tirumukkudal in Kancheepuram taluk. Palar river enters the Bay of Bengal near Sadras (Sadurangappattinam) after flowing in the south-eastern direction. The flow in the river is uncertain. However, the springs beneath the river bed are being used to quench the thirst of the inhabitants of Chengalpattu, Tambaram, Pallavaram, Alandur Municipalities and other places around these towns. The drainage map of the study area is shown in **Figure 3-15**.

Source: *http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf*

(Ref: Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District").

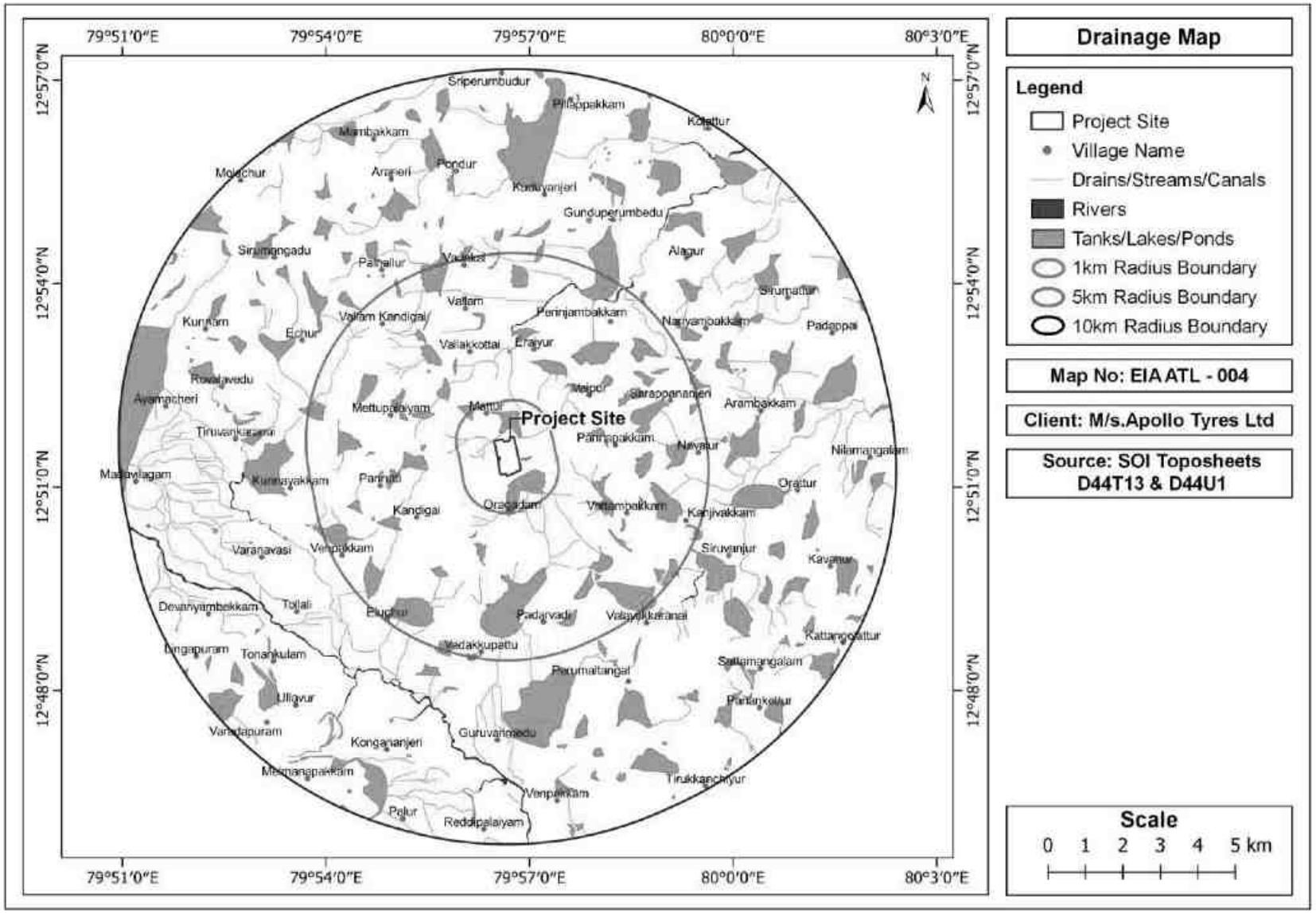

Drainage Map
Legend
Project Site
Village Name
Drains/Streams/Canals
Rivers
Tanks/Lakes/Ponds
1km Radius Boundary
5km Radius Boundary
10km Radius Boundary
Map No: EIA ATL - 004
Client: M/s.Apollo Tyres Ltd
Source: SOI Toposheets D44T13 & D44U1
Scale
0 1 2 3 4 5 km
N
79°51'0"E
79°54'0"E
79°57'0"E
80°0'0"E
80°3'0"E
12°57'0"N
12°54'0"N
12°51'0"N
12°48'0"N
Project Site
Sriperumbudur
Pillappakkam
Kolattur
Mambakkam
Molachur
Arasheri
Pondur
Kanuvanjeri
Gunduperumbedu
Sirumangadu
Pathallur
Alagur
Vallam
Sirumattur
Kuruvam
Echur
Vallam Kandigai
Perinjambakkam
Nariyambakkam
Padappai
Vallakkottai
Erayur
Rowlavedu
Ayyampcheri
Mettupalayam
Melur
Arambakkam
Tiruvankaranai
Panrimpakkam
Nayalur
Nilamangalam
Madhavilagam
Kunnavakkam
Panruti
Oragadam
Vembampakkam
Kanjivakkam
Orattur
Kandigai
Varanavasi
Vembakkam
Siruvanjur
Kavanur
Devanyambakkam
Tollali
Pudarvadi
Vadakkupattu
Kattangolattur
Tonankulam
Perumattangal
Sattamangalam
Ulligur
Pantankollur
Varadapuram
Konganapuri
Guruvanmedu
Mamandhakkam
Tirukkanchiyur
Venpakkam
Polur
Reddipalayam

Figure 3-15 Drainage map of the study area

3.4.9 Geology

The Kanchipuram area is endowed with a complex geological set up with crystalline rocks occurring in the southern part of the area and the northern part of the area the crystalline rocks occur at depths covered by sedimentary formations ranging from Gondwana to Recent. The depth at which the crystalline rocks occur progressively increase towards north. The sedimentary cover sequence is named as Palar basin and the thickness of the sediments is as high as 300 m in the northern part. The eastern part comprises unconsolidated sediments of fluvio-marine and marine origin. The Precambrian crystalline rocks are represented by charnockites and contain several enclaves mafic granulite. Garnetiferous biotite gneisses, leptinites and banded magnetite quartzites are also encountered as linear bands. The laterite and alluvium are related to Quatemary age. The Archaean rocks are represented by Khondalite Group, Charnockite Group and Migmatite complex. Garnet sillimanite gneiss is well exposed in the north eastern part of the district in Pachchamalai hill at Chrompet, Parangimalai and southeast of Pallavaram. In Pachchamalai hill it is essentially a quartz sillimanite rich rock with minor amount of felspar. In Tambaram hill, chamockite and metapellite are intimately interbanded, particularly alongthe hinge zones. Isolated outcrops are also seen on either side of National Highway No.45 near Kadaperi. The major part of the district is occupied by charnockite with enclaves of khondalite, leptynite and BMQ seen around St. Thomas Mount, east of Guduvancheri, Madurantakam, Paler and around Tirukkalukkunram. St. Thomas mount is an extensively studied type area for the chamockite. It is a typical rock with bluish grey quartz, hard and compact, jointed showing recognisable foliation at places. The outcrop stands out prominently as isolated cluster of hills. The area in and around Pallavaram, Tambaram and Pulikaradu contain several bands of pyroxene granulite. The chamockite is traversed by narrow dolerite dykes which stand outprominently as dark low ridges and seen for a few metres.

The lower Gondwana sediments (Talchirs) overlie the Archaean rocks unconformably and are seen to the northeast and south of Paler river preserved in the trough faults and comprise boulder beds, dirty white to light green, greyish yellow fine sandstone, silt stone with clasts of rock fragments and khaki green to greenish grey shales. The Geological map of Tamilnadu is given as **Figure 3-16.**

Source: *http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf*

(**Ref:** Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District")

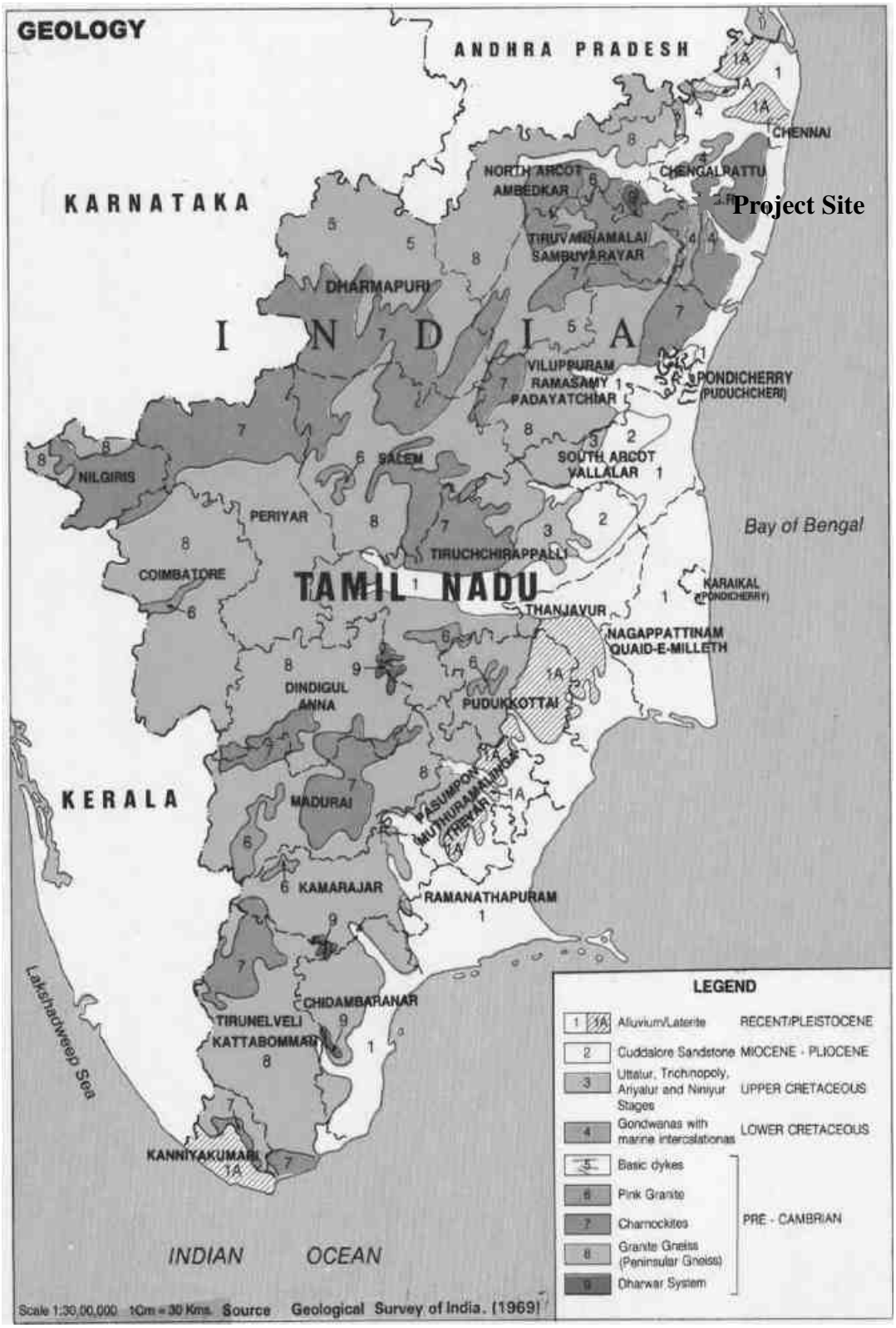


Figure 3-16 Geology Map of Tamilnadu

Source:*Maps of India*

3.4.10 Seismicity

As per Earthquake hazard map of India, The project location/study area falls in Zone III, which is categorized as a Moderate Damage Risk Zone. The Seismicity map of India is shown in **Figure 3-17.**

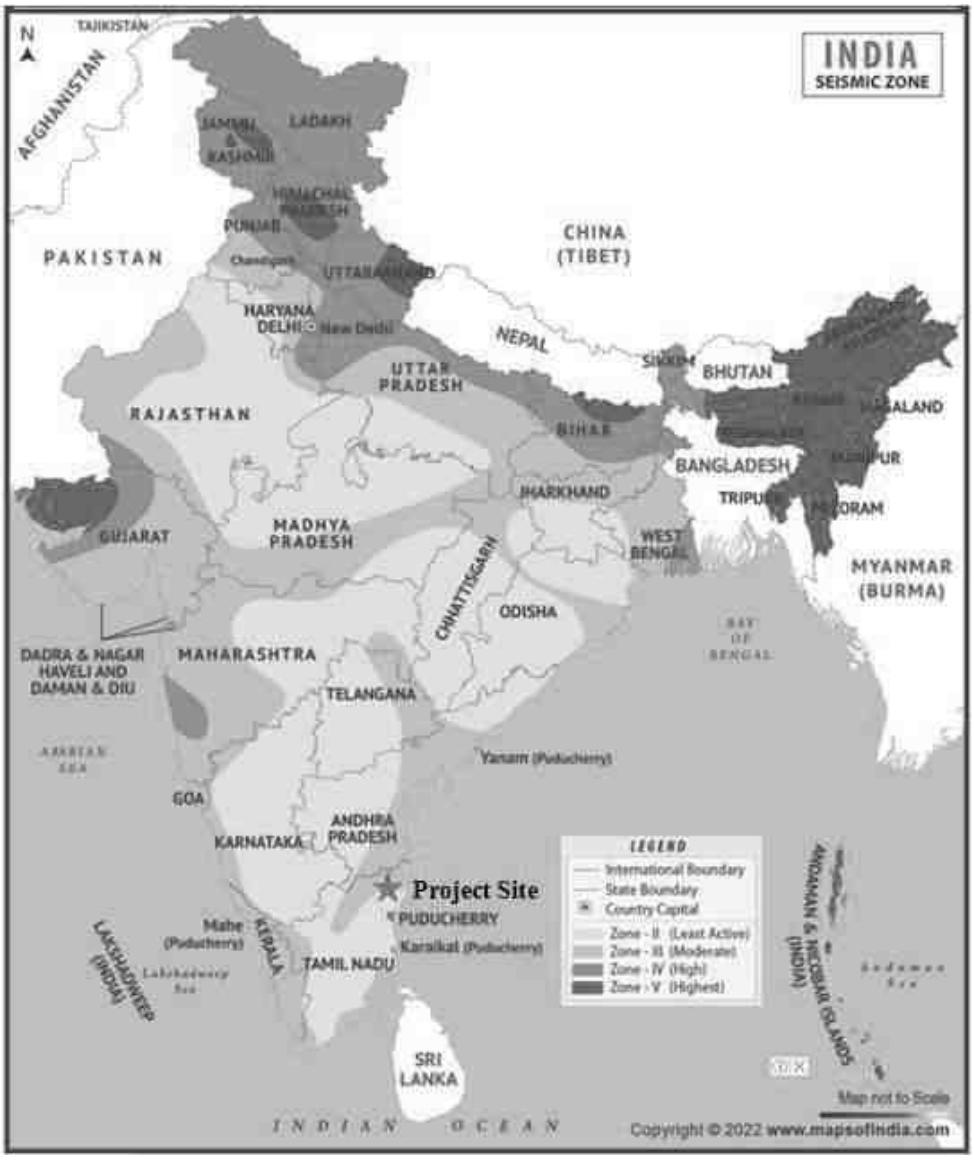


Figure 3-17 Seismicity Map of India

Source:*BMTPC*

3.4.11 Soils in PIA District

Soils have been classified into clayey soil, red sandy or red loamy soil, Red sandy brown clayey soil and alluvial soil. Of the above soils brown clayey soil is the most predominant, covering more than 71% of the areal extent of Kancheepuram district. Alluvial soils are found on the banks of Palar, Cheyyar and other rivers. The river alluvium is transported and is seen in coastal area of this district. Sandy coastal alluvial (arenacious soil) occurs along the seacoast as a narrow belt. Soil map of India is given in **Figure 3-18.**

Source: *http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf*

(Ref: Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District")

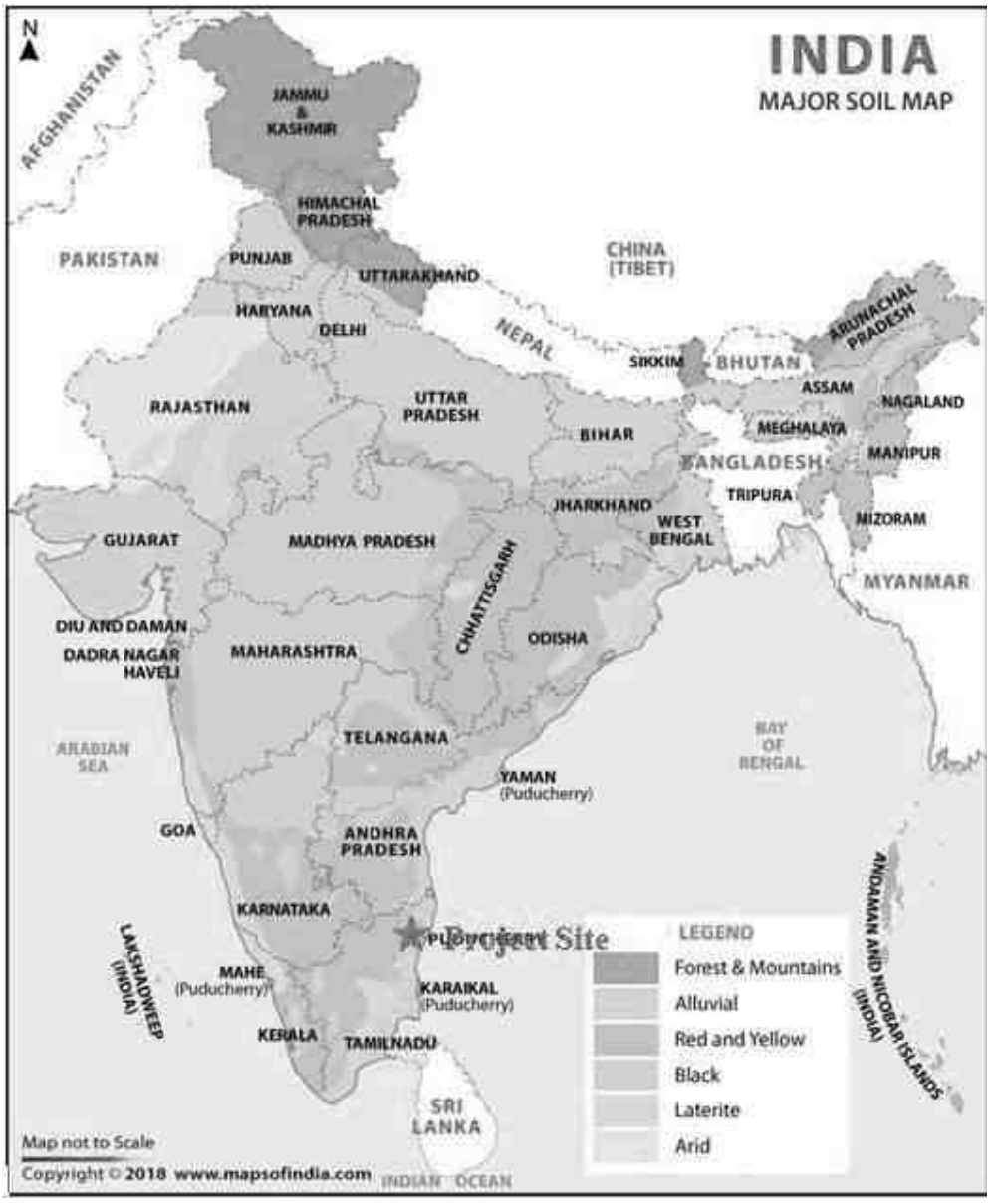


Figure 3-18 Soil map of India

Source:*Maps of India*

3.4.12 Natural Hazards in PIA District

As any other coastal environment, coast of Kancheepuram district also gets affected with regular erosion and accretion. Sea level rise and elevation in sea surface temperature are also seen here as the consequences of global climate change. Natural Hazard Map of India is given in **Figure 3-19.**

Source: *http://tnenvis.nic.in/files/KANCHEEPURAM%20%20.pdf*

Figure 3-19 Natural hazard Map of India

3.5 Establishment of Baseline for Valued Environmental Components

3.5.1 Air Environment

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

3.5.2 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed,

wind direction and temperature. The meteorological data is useful for proper interpretation of the baseline data.

3.5.3 Meteorological Data Collection

Available secondary data pertaining to the meteorological parameters was obtained from the IMD Climatological tables. In addition, baseline meteorological data was generated during the study period **January 2023 to March 2023**. The methodology adopted for monitoring surface observations is as per the standard norms laid down by Bureau of Indian Standards (BIS) i.e. IS:8829 and India Meteorological Department (IMD).

3.5.4 General Meteorological Scenario Based on IMD Data

The nearest India Meteorological Department (IMD) station located to project site is Chennai (Minambakkam). The Climatological data of Chennai (Minambakkam) (13°4' N and 80°15' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30 year period (1991-2020), is presented in the following sections on the meteorological conditions of the region. The monthly variations of the relevant meteorological parameters are reproduced in **Table 3-6.**

Table 3-6 Climatological Summary– Chennai (Minambakkam) (1991-2020)

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (Km/hr)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	29.9	20.9	20.0	1.4	83	64	24.6	22.8	4.8	NW	NE
Feb	31.7	21.8	4.7	0.6	80	62	25.6	23.8	5.7	NW	E
Mar	34.0	23.8	3.4	0.25	76	62	28.4	26.7	7.2	S	SE
Apr	35.9	26.2	17.5	1.0	73	66	31.4	30.5	8.7	S	SE
May	38.3	27.7	49.7	1.8	65	62	30.1	31.2	9.2	SW	SE
Jun	37.5	27.4	75.4	4.5	61	58	27.4	28.9	9.1	W	SE
Jul	35.8	26.4	113.1	6.7	67	59	27.5	28.4	8.1	SW	SE
Aug	34.9	25.7	141.4	8.8	71	64	28.1	29.4	7.5	W	SE
Sep	34.4	25.4	143.9	7.4	75	68	29.3	29.8	6.4	W	SE
Oct	32.6	24.6	278.3	10.6	81	74	30.1	29.7	4.9	W	E
Nov	30.4	23.2	377.3	11.5	83	75	28.5	27.4	4.6	N	NE
Dec	29.4	21.7	183.7	5.7	83	69	25.7	24.1	5.0	N	NE
Max.	**38.3**	**27.7**	**278.3**	**11.5**	**83**	**75**	**32.0**	**33.3**	**9.2**	Annual predominant wind pattern is **SOUTH EAST**	
Min.	**29.9**	**20.9**	**3.4**	**0.6**	**61**	**58**	**24.9**	**23.7**	**4.8**		
Avg/Total	**33.7**	**24.6**	**1408.4**	**60.2**	**75**	**65**	**28.8**	**29.1**	**6.8**		

As per the **Table 3-6,** Climatological data provided observations drawn for the study period are the

following. As per the above IMD Climatological the observations drawn are the following.

- Daily maximum temperature is 38.3ºC and the daily minimum temperature is 20.9.ºC were recorded in the months of June and January respectively.
- Maximum and minimum relative humidity of 83% and 64% were recorded in the months of November and June respectively.
- Maximum and minimum rainfall of 278.3mm and 3.4mm was recorded in the months of October and March respectively.
- Maximum and minimum Mean wind speed is 9.2Km/hr and 4.8 Km/hr was recorded in the months of May and October respectively. According to the above IMD data, Annual predominant wind pattern is from **South East.**

3.5.5 Meteorological Data during Study Period

The meteorological scenario in and around the project site is an essential requirement during study period for proper interpretation of baseline air quality status. Meteorological data was collected during the study period **January 2023 to March 2023** and is presented in **Table 3-7**. The wind rose for the study period is given as **Figure 3-20.**

Table 3-7 Meteorology Data for the Study Period (January 2023 to March 2023)

S. No	Parameter	Observation
1	Temperature	Max. Temperature: 35°C Min. Temperature: 21°C Avg. Temperature: 27.42°C
2	Average Relative Humidity	74.86%
3	Average Wind Speed	2.87m/s
4	Predominant Wind Direction	East

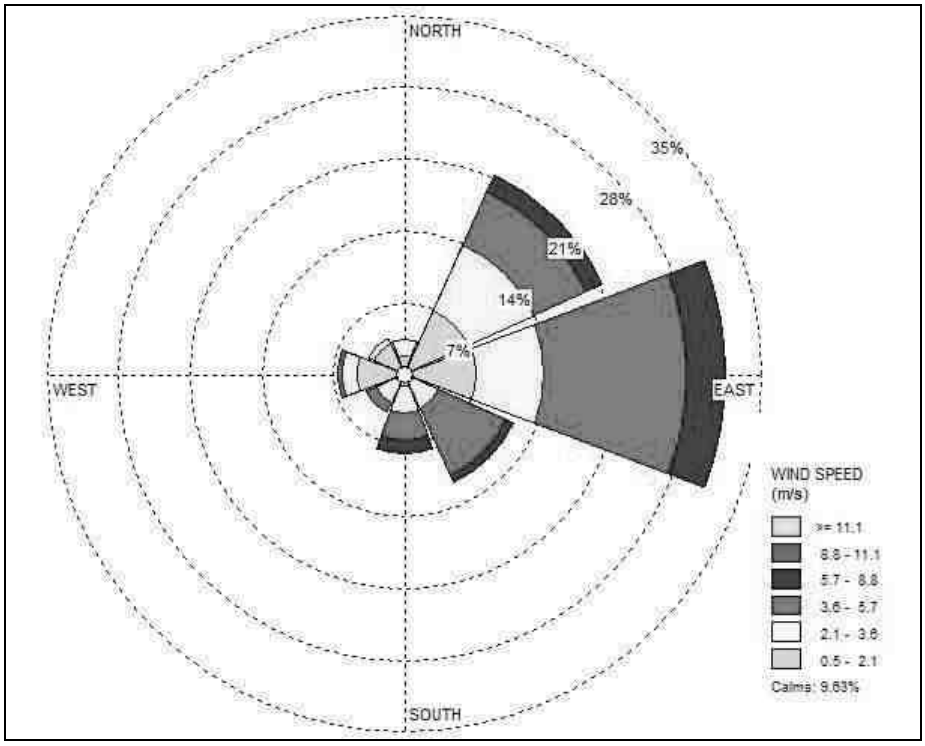


Figure 3-20 Wind Rose during January 2023 to March 2023

3.5.6 Atmospheric Inversion

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

- Average atmospheric temperature: 27.42°C
- Average Relative humidity:74.86%
- Average Wind speed: 2.87m/s

The daily inversion level calculated based on the average temperature and average wind speed at the project site and the maximum inversion height is derived by the graph plotted based on the average temperature and average wind speed. The daily inversion level at the project site varies from 50 to 2579 m during 6 AM to 4 PM, the maximum recorded at 2579 m during March 2023. This is shown in the following **Figure 3-21.**

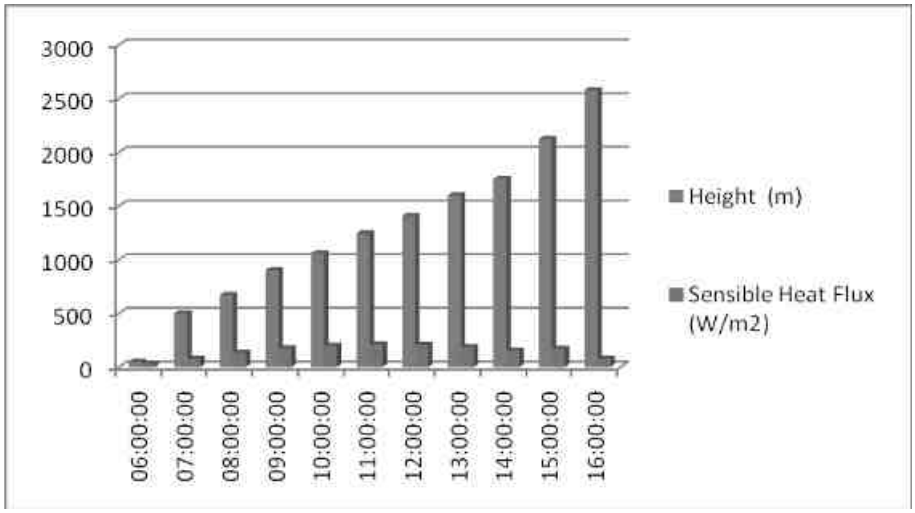


Figure 3-21 Atmospheric inversion level at the project site

3.6 Ambient Air Quality

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

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

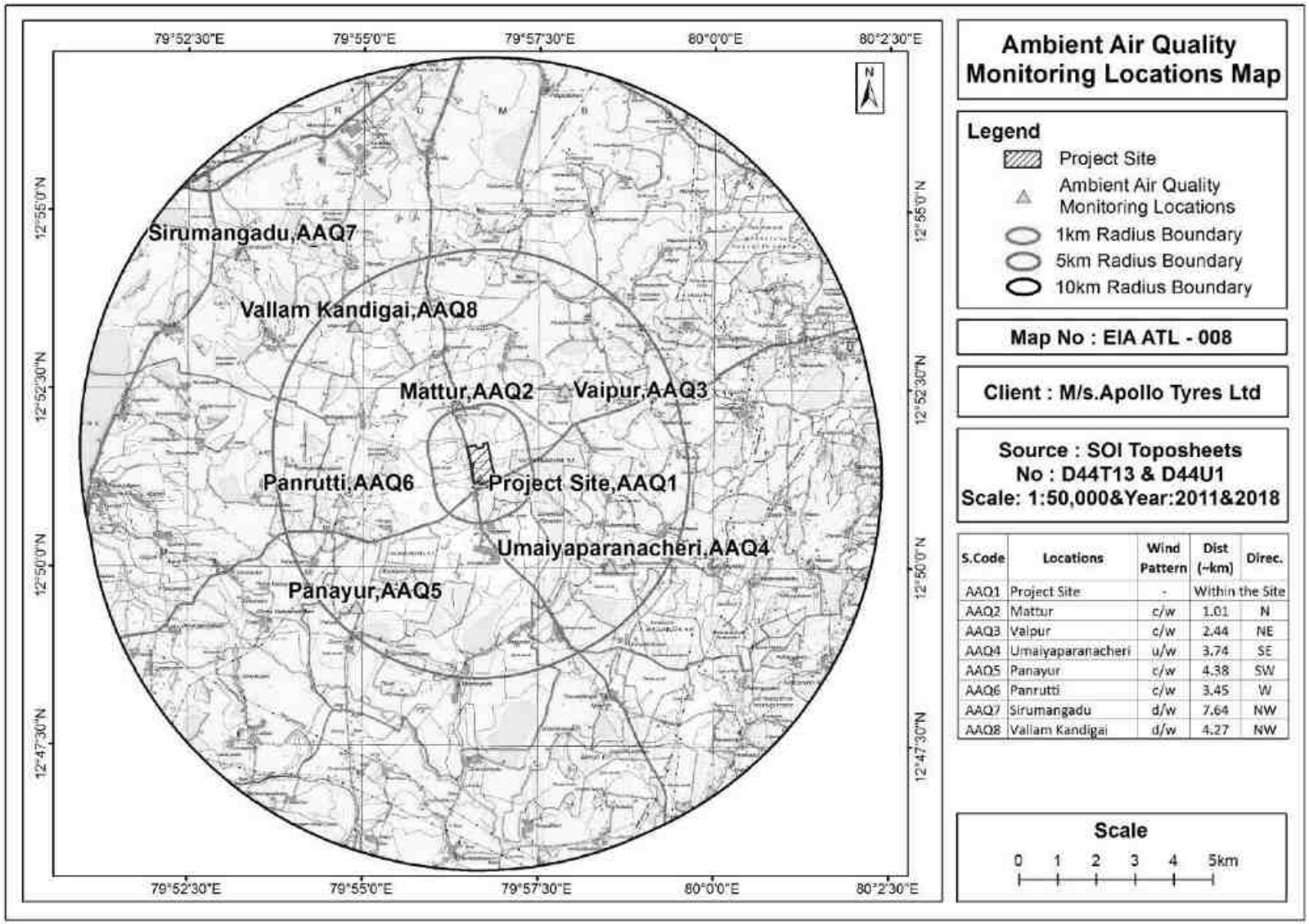
3.6.1 Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, Eight (08) monitoring locations have been identified as per annual wind predominance of Chennai (Minambakkam) from IMD data (1991-2020). The wind predominance during study period (**January 2023 to March 2023**) is from **East**. AAQ monitoring locations are selected based on Annual wind predominance, map showing the AAQ monitoring locations is given in **Figure 3-22** and the details of the locations are given in **Table 3-8**.

Table 3-8 Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Type of Wind	Distance (~Km) from Project boundary	Directions
AAQ1	Project Site	-	Within the Site	
AAQ2	Mattur	c/w	1.01	N
AAQ3	Vaipur	c/w	2.44	NE
AAQ4	Umaiyaparanacheri	u/w	3.74	SE
AAQ5	Panayur	c/w	4.38	SW
AAQ6	Panrutti	c/w	3.45	W
AAQ7	Sirumangadu	d/w	7.64	NW

Station Code	Location	Type of Wind	Distance (~Km) from Project boundary	Directions
AAQ8	Vallam Kandigai	d/w	4.27	NW



S.Code	Locations	Wind Pattern	Dist (~km)	Direc.
AAQ1	Project Site	-	Within the Site	
AAQ2	Mattur	c/w	1.01	N
AAQ3	Vaipur	c/w	2.44	NE
AAQ4	Umaiyaparanacheri	u/w	3.74	SE
AAQ5	Panayur	c/w	4.38	SW
AAQ6	Panrutti	c/w	3.45	W
AAQ7	Sirumangadu	d/w	7.64	NW
AAQ8	Vallam Kandigai	d/w	4.27	NW

Figure 3-22 Map showing the Ambient Air Quality monitoring locations

3.6.2 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during **(January 2023 to March 2023)**. PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO, Pb, O_3, NH_3, C_6H_6, $C_{20}H_{12}$, As, Ni and Mercury were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in **Table 3-9.**

Table 3-9 Analytical Methods for Analysis of Ambient Air Quality Parameters (NAAQ)

S. No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
1	Sulphur Dioxide (SO_2), µg/m^3	IS:5182(Part-2):2001	50 (Annual)	80 (24 Hours)	24 Hours
2	Nitrogen Dioxide (NO_2), µg/m^3	IS: 5182 (Part - 6): 2006	40 (Annual)	80 (24 Hours)	24 Hours
3	Particulate Matter ($PM_{2.5}$), µg/m^3	IS: 5182 (Part - 24): 2019	40 (Annual)	60 (24 hours)	24 Hours
4	Particulate Matter (PM_{10}), µg/m^3	IS:5182 (Part– 23): 2006	60 (Annual)	100 (24 hours)	24 Hours
5	CO, mg/m^3	IS:5182(Part–10):1999	2 (8 hours)	4 (1hour)	8 Hours
6	Pb, µg/m^3	IS:5182(Part–22):2004	0.5 (Annual)	1 (24 hours)	24 Hours
7	O_3, µg/m^3	IS: 5182 (Part – 9): 1974	100 (8hours)	180 (1hour)	8 Hours
8	NH_3, µg/m^3	IS 5182 Part 25:2018	100 (Annual)	400 (24 hours)	8 Hours
9	Benzene, µg/m^3	IS:5182(Part–11):2006	5 (Annual)	5 (Annual)	24 Hours
10	Benzo (a) pyrene, ng/m^3	IS:5182(Part–12):2004	1 (Annual)	1 (Annual)	24 Hours
11	Arsenic, ng/ m^3	HECS/AA/SOP/019, Issue No:01, Issue Date: 16.12.2016:2016	6 (Annual)	6 (Annual)	24 Hours
12	Nickel, ng/ m^3	HECS/AA/SOP/009, Issue No:01, Issue Date: 16.12.2016:2016	20 (Annual)	20 (Annual)	24 Hours
13	Mercury, mg/Nm^3	USEPA Method 8: 2017	-	-	8 Hours

3.6.2.1 Results and Discussions

The variations of the pollutants Particulate matter <10 micron size (PM_{10}), Particulate matter <2.5 micron size ($PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Lead (Pb), Ozone (O_3), Benzene (C_6H_6), Benzo (a) pyrene ($C_{20}H_{12}$), Arsenic (As), Nickel (Ni), Ammonia (NH_3) and Mercury (Hg) are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data (**January 2023 to March 2023)** for the study area is given in **Table 3-10** and trends of measured ambient concentration in the study area were graphically represented in **Figure 3-23.**

Table 3-10 Summary of the average baseline concentrations of pollutants

S. No.	Parameters	Units	Conc.	NAAQ Standards	Locations							
					Project Site	Mattur	Vaipur	Umaiyaparanacheri	Panayur	Panrutti	Sirumangadu	Vallam Kandigai
					A1	A2	A3	A4	A5	A6	A7	A8
1	PM_{10} Conc.	µg/m³	Min.	**100 (24 Hours)**	55.90	53.70	51.23	49.16	47.42	45.93	48.76	55.91
			Max.		79.67	76.53	73.01	70.06	67.58	65.46	69.48	79.68
			Avg.		**67.04**	**64.40**	**61.43**	**58.95**	56.87	55.08	58.47	**67.05**
			98th 'tile		79.21	76.09	72.58	69.65	67.19	65.08	69.08	79.22
2	$PM_{2.5}$ Conc.	µg/m³	Min.	**60 (24 Hours)**	34.98	33.88	30.18	29.45	27.46	26.60	29.21	34.06
			Max.		49.85	48.29	43.02	41.98	39.14	37.91	41.63	48.54
			Avg.		**41.95**	**40.64**	**36.20**	**35.32**	**32.94**	**31.90**	**35.04**	**40.85**
			98th 'tile		49.56	48.01	42.77	41.73	38.91	37.69	41.39	48.26
3	SO_2 Conc.	µg/m³	Min.	**80 (24 Hours)**	9.64	11.21	8.46	9.69	8.89	9.58	8.08	8.90
			Max.		13.73	15.97	12.05	13.82	12.67	13.65	11.52	12.69
			Avg.		**11.56**	**13.44**	**10.15**	**11.63**	**10.67**	**11.49**	**9.70**	**10.68**
			98th 'tile		13.65	15.88	11.98	13.74	12.60	13.57	11.45	12.61
4	NO_2 Conc.	µg/m³	Min.	**80 (24 Hours)**	17.27	16.32	11.58	13.63	12.08	14.37	10.30	12.02
			Max.		24.61	23.25	16.51	19.42	17.22	20.48	14.68	17.12
			Avg.,		**20.71**	**19.57**	**13.89**	**16.35**	**14.49**	**17.24**	**12.36**	**14.41**
			98th 'tile		24.47	23.12	16.41	19.31	17.12	20.36	14.60	17.02
5	Lead (Pb)	µg/m³	Avg.	**1 (24 hour)**	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)
6	Carbon monoxide (CO)	mg/m$_3$	Avg.	**4 (1hour)**	0.62	0.53	0.21	0.27	0.24	0.38	0.58	0.56
7	Ozone O_3	µg/m^3	Avg.	**180 (1hour)**	11.21	11.70	10.52	10.14	10.83	10.75	11.85	12.25
8	Benzene (C_6H_6)	µg/m^3	Avg.	**5 (Annual)**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
9	Benzo (a)	ng/m^3	Avg.	**1**	BLQ	BLQ	BLQ	BLQ (LOQ 1)	BLQ	BLQ	BLQ (LOQ 1)	BLQ

S. No.	Parameters	Units	Conc.	NAAQ Standards	Locations							
					Project Site	Mattur	Vaipur	Umaiyaparanacheri	Panayur	Panrutti	Sirumangadu	Vallam Kandigai
					A1	A2	A3	A4	A5	A6	A7	A8
	Pyrene ($C_{20}H_{12}$ (a))			**(Annual)**	(LOQ 1)	(LOQ 1)	(LOQ 1)		(LOQ 1)	(LOQ 1)		(LOQ 1)
10	Arsenic (As)	ng/ m^3	Avg.	**6 (Annual)**	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)
11	Nickel as Ni	ng/m^3	Avg.	**20 (Annual)**	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)
12	Ammonia (NH_3)	µg/m^3	Avg.	**400 (24 hour)**	7.45	6.58	7.21	6.75	7.23	6.25	7.34	7.85
13	Mercury (Hg)	mg/N m^3	Avg.	**-**	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)

Note: *BLQ (Below Limit Of Quantification), LOQ (Limit of Quantification)*

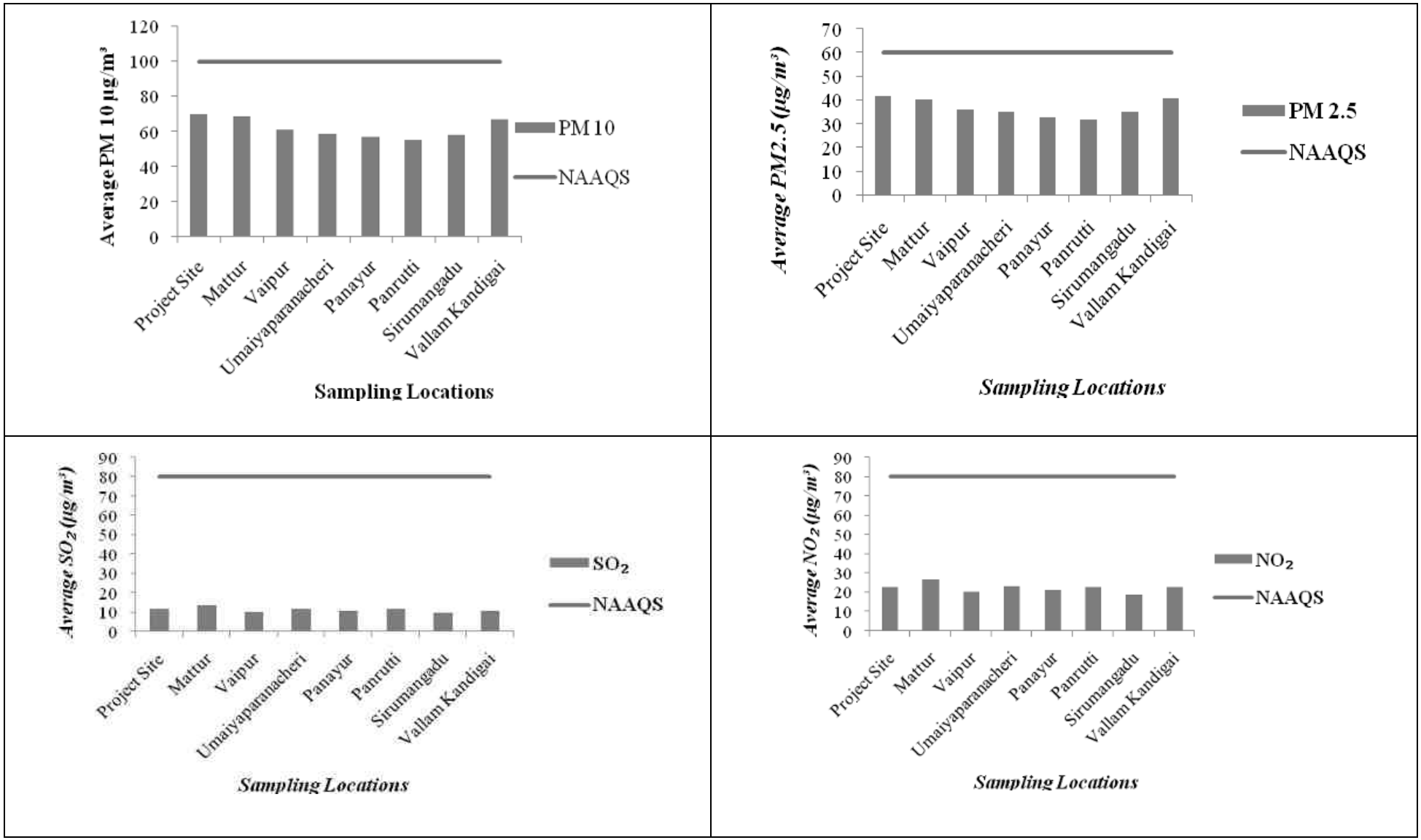


Figure 3-23 Trends of Measured Ambient Concentrations in the Study Area

3.6.2.2 Observations

The ambient air quality has been monitored at 8 locations as per NAAQS, 2009 within the study area. The results obtained are summarised as below:

- The average baseline levels of PM_{10} vary from 55.00 to 69.91 µg/m³.
- The average baseline levels of $PM_{2.5}$ vary from 31.90 µg/m³ to 41.95 µg/m³.
- The average baseline levels of SO_2 vary from 9.70 µg/m³ to 13.44 µg/m³.
- **3.** The average baseline levels of NO_2 vary from 19.18 µg/m³ to 26.88 µg/m³.

3.7 Noise Environment

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

Ambient noise levels have been established by monitoring noise levels at Eight (08) locations in and around 10Km distance from project area during the study period using precision noise level meter. The noise monitoring locations in the study area were selected after giving due consideration to the various land use categories. The land use categories include commercial, residential, rural and sensitive areas. Noise levels were recorded on an hourly basis for one complete day at each location using pre-calibrated noise levels. Map showing noise monitoring locations is **Figure 3-24**.

3.7.1 Results and Discussions

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

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

The day and night equivalent noise levels observed in the study area is given in **Table 3-11**.

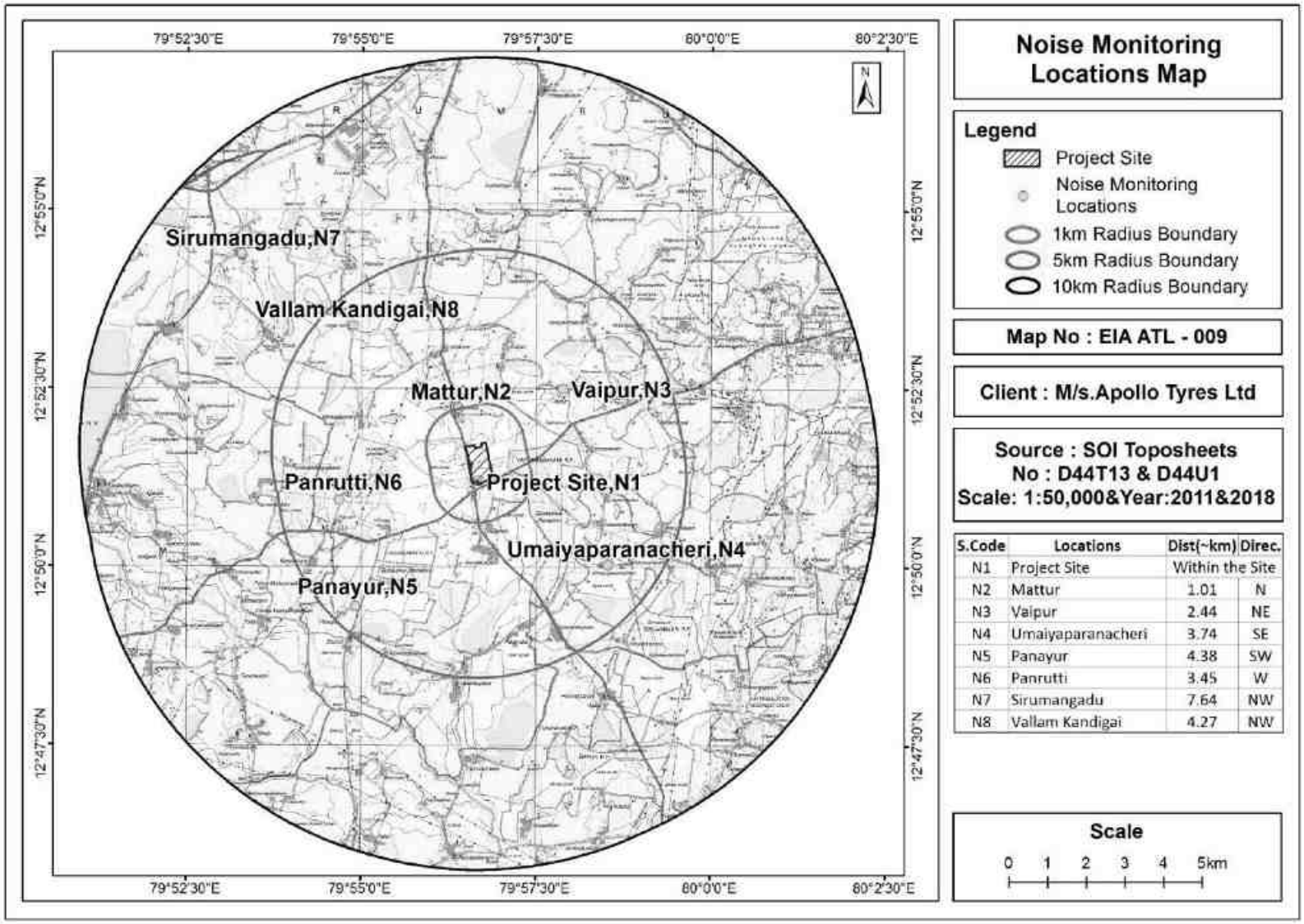
Table 3-11 Day and Night Equivalent Noise Levels

S. No	Location	Location Code	Distance (~Km) from Project boundary	Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1	Project Site	N1	Within Site		68.7	59.5	75	70	Industrial
2	Mattur	N2	1.01	N	54.9	44.8	55	45	Residential
3	Vaipur	N3	2.44	NE	65.4	57.8	75	70	Industrial
4	Umaiyaparanacheri	N4	3.74	SE	54.6	43.2	55	45	Residential
5	Panayur	N5	4.38	SW	67.2	57.6	75	70	Industrial
6	Panrutti	N6	3.45	W	68.8	58.3	75	70	Industrial
7	Sirumangadu	N7	7.64	NW	53.1	44.8	55	45	Residential
8	Vallam Kandigai	N8	4.27	NW	63.8	60.1	75	70	Industrial

3.7.2 Observations

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

- In Industrial area (Project site, vaipur, Panayur, Panrutti, Vallam Kandigai), day time noise level was about 63.8 dB (A) to 68.8 dB (A) and 57.6 dB (A) 60.1 dB (A) during night time, which is within prescribed limit by CPCB for Industrial area (75 dB (A) Day time & 70 dB (A) Night time).
- In Residential area (Mattur, Umaiyaparanacheri, Sirumangadu) day time noise levels varied from 53.1 dB (A) to 54.9 dB (A) and night time noise levels varied from 43.2 dB (A) to 44.8 dB (A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area are within the limit prescribed by CPCB for Residential area (55 dB (A) Day time & 45 dB (A) Night time).



S.Code	Locations	Dist(~km)	Direc.
N1	Project Site	Within the Site	
N2	Mattur	1.01	N
N3	Vaipur	2.44	NE
N4	Umaiyaparanacheri	3.74	SE
N5	Panayur	4.38	SW
N6	Panrutti	3.45	W
N7	Sirumangadu	7.64	NW
N8	Vallam Kandigai	4.27	NW

Figure 3-24 Map showing the noise monitoring locations

3.8 Water Environment

3.8.1 Surface Water Resources

Palar river is one of the most important river running through the district. Other minor rivers in the district are Coovam and Adayar. Adayar river gets the surplus water of Chembarambakkam lake in Sriperumbudur taluk. Besides these, there are few minor streams like Kiliar, Kallar etc in Maduranthakam taluk. Kalavai lake is the second largest lake in the Kancheepuram district after Madhuranthagam lake. Kalavai lake is well known for its perennial nature.

Source: *http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf*

(Ref: Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District").

3.8.1.1 Surface Water Quality Assessment

To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10 Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in **Table 3-12.** Surface water quality results are provided in **Table 3-13.** A map showing the surface water monitoring locations is given as **Figure 3-25**.

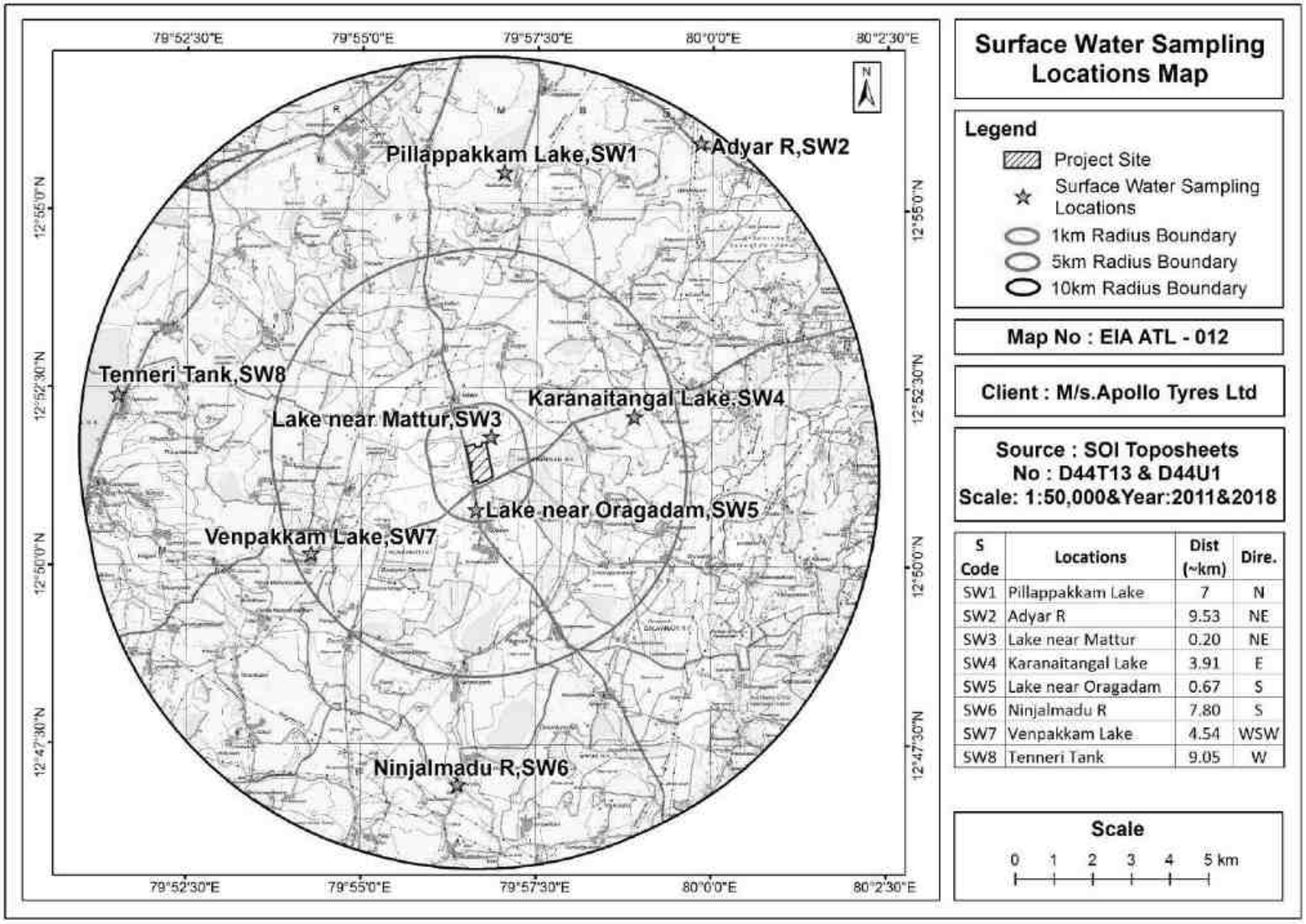
Table 3-12 Test methods used for the analysis of water quality parameters

Sl. No	Parameter Measured	Test Method
1	Turbidity	IS 3025(Part - 10):1984
2	pH	IS:3025 (Part - 11): 1983
3	Electrical Conductivity	IS:3025 (Part - 14): 1983
4	Total Dissolved Solids	IS: 3025:1(Part - 16) 1984
5	Total Suspended Solids	IS 3025 (Part - 17) 1984
6	Total Alkalinity as $CaCO_3$	IS:3025,1 (Part - 23) 1986
7	Total Hardness as $CaCO_3$	IS:3025 (Part - 21) 1983
8	Sodium as Na	IS:3025,5(Part - 45) 1993
9	Potassium as K	IS:3025,5(Part - 45) 1993
10	Calcium as Ca	IS 3025 (Part - 40):1991
11	Magnesium as Mg	IS 3025 (Part - 46) 1994
12	Chloride as cl	IS 3025 (Part - 32):1988
13	Sulphate as SO_4	IS 3025(Part - 24):1986
14	Nitrate as NO_3	ASTM (Part - 31)1978
15	Phosphate as PO_4	IS 3025 (Pt 45) 1993
16	Fluorides as F	IS 3025 (Part - 60):2008
17	Cyanide as Cd	IS 3025 (Part-27):1986
18	Arsenic as As	IS 3025:(Part-37):1988

Sl. No	Parameter Measured	Test Method
19	Cadmium as Cd	IS 3025 (Part - 41)1991
20	Chromium, Total	IS:3025 (Part - 52) 2003
21	Lead as Pb	IS:3025 (Part - 47) 1994
22	Manganese as Mn	IS 3025:(Part - 59):2006
23	Mercury as Hg	IS 3025 (Part48):1994 RA 1999
24	Nickel as Ni	IS 3025:(Part-54):2003
25	Selenium as Se	IS 3025 Part (56)2003
26	Zinc as Zn	IS:3025 (Part - 49) 1994
27	Dissolved Oxygen (DO)	IS:3025 (Part - 38)1989
28	BOD, 3 days @ 27°C as O_2	5210B APHA22nd Edn 2012
29	Chemical Oxygen Demand as O_2	IS:3025 (Part-58)-2006

Table 3-13 Details of Surface water sampling locations

S.No	Location	Location Code	Distance (~km) from Project boundary	Direction
1	Pillappakkam Lake	SW1	7	N
2.	Adyar R	SW2	9.53	NE
3	Lake near Mattur	SW3	0.20	NE
4	Karanaitangal Lake	SW4	3.91	E
5	Lake near Oragadam	SW5	0.67	S
6	Ninjalmadu R	SW6	7.80	S
7	Venpakkam Lake	SW7	4.54	WSW
8	Tenneri Tank	SW8	9.05	W



S Code	Locations	Dist (~km)	Dire.
SW1	Pillappakkam Lake	7	N
SW2	Adyar R	9.53	NE
SW3	Lake near Mattur	0.20	NE
SW4	Karanaitangal Lake	3.91	E
SW5	Lake near Oragadam	0.67	S
SW6	Ninjalmadu R	7.80	S
SW7	Venpakkam Lake	4.54	WSW
SW8	Tenneri Tank	9.05	W

Figure 3-25 Map showing the surface water monitoring locations

Table 3-14 Physicochemical Parameters of Surface water samples from the study area

S. No.	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Pillappakkam Lake	Adyar R	Lake Near Mattur	Karanaitangal Lake	Lake Near Oragadam	Ninjalmadu R	Venpakkam Lake	Tenneri Tank
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
1.	Turbidity	NTU	**1**	18.4	8.2	8	6.2	13	5.1	5.1	21
2.	pH (at 25°C)	--	**6.5-8.5**	7.46	8.16	7.27	7.33	6.75	7.62	8.23	7.42
3.	Electrical Conductivity	µS/cm	**-**	827	763	1223	1015	594	555	740	1416
4.	Total Dissolved Solids	mg/l	**500**	454	427	676	552	322	300	395	787
5.	Total Suspended Solids	mg/l	**-**	40	18	19	18	36	12	16	56
6.	Total Alkalinity as $CaCO_3$	mg/l	**-**	106	102	206	139	89	93	79	212
7.	Total Hardness as $CaCO_3$	mg/l	**300**	189	175	325	220	130	153	190	395
8.	Sodium as Na	mg/l	**-**	77	76	103	106	57	43	59	126
9.	Potassium as K	mg/l	**-**	5	5	7	7	4	3	4	9
10.	Calcium as Ca	mg/l	**-**	45.57	40.68	75.55	51.14	30.22	37.90	44.17	91.82
11.	Magnesium as Mg	mg/l	**-**	18.2	17.9	33.17	22.45	13.27	14.25	19.39	40.31
12.	Chloride as Cl	mg/l	**250**	151.23	140.31	214.65	178.42	96.57	89.52	143.45	263.18
13.	Sulphate as SO_4	mg/l	**400**	64.5	57.7	90.2	74.9	39.6	34.9	49.0	107.1
14.	Nitrate as NO_3	mg/l	**20**	0.26	0.31	0.62	0.43	0.41	0.39	0.49	0.69
15.	Fluorides as F	mg/l	**1.5**	0.19	0.52	0.38	0.31	0.38	0.28	0.26	0.37
16.	Cyanide	mg/l	**0.05**	BLQ (LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
17.	Arsenic	mg/l	**0.05**	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)
18.	Boron as B	mg/l	**-**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
19.	Cadmium as Cd	mg/l	**0.01**	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)

S. No.	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Pillappakkam Lake	Adyar R	Lake Near Mattur	Karanaitangal Lake	Lake Near Oragadam	Ninjalmadu R	Venpakkam Lake	Tenneri Tank
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
20.	Chromium, Total	mg/l	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
21.	Copper as Cu	mg/l	**1.5**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
22.	Lead as Pb	mg/l	**0.1**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
23.	Manganese as Mn	mg/l	**0.5**	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
24.	Mercury	mg/l	**0.001**	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
25.	Nickel as Ni	mg/l	**-**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
26.	Selenium as Se	mg/l	**0.01**	BLQ (LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
27.	Dissolved Oxygen	mg/l	**6**	6.2	5.4	6.4	6.1	5.8	6.1	5.6	5.5
28.	Chemical Oxygen Demand as O_2	mg/l	**-**	16	32	12	16	20	16	28	32
29.	BOD, 3 days @ 27°C as O_2	mg/l	**2**	3	4	2	3	4	2	4	4

Note: *BLQ – Below Limit of Quantification; LOQ – Limit Of Quantification*

3.8.1.2 Results and Discussions

Surface water sample results are discussed below:

- Water sampling results are compared with Surface water standards IS 2296:1992.
- pH in the collected surface water samples varies between 6.75 to 8.23 which is within the limit of IS 2296:1992.
- The Total Dissolved Solids (TDS) value of collected surface water sample ranges from 300 mg/l to 787 mg/l
- The Total hardness value of the collected surface water sample ranges between 130 mg/l to 395 mg/l
- BOD value of surface water varies from 2 mg/l to 4 mg/l
- COD value of surface water varies from 12 mg/l to 32 mg/l

Surface water standards (IS 2296:1992) given in **Table 3-15.**

Table 3-15 Surface water Standards (IS 2296:1992)

S.No	Parameters	Unit	A	B	C	D	E
1	Turbidity	NTU	---	---	---	---	---
2	pH	--	8.5	8.5	8.5	8.5	8.5
3	Conductivity	µS/cm	---	---	---	1000	2250
4	Total Dissolved Solids	mg/l	500	---	1500	---	2100
5	Alkalinity as $CaCO_3$	mg/l	---	---	---	---	---
6	Total Hardness as $CaCo_3$	mg/l	300	---	---	---	---
7	Calcium as Ca	mg/l	---	---	---	---	---
8	Magnesium as Mg.	mg/l	---	---	---	---	---
9	Sodium Na	mg/l	---	---	---	---	---
10	Potassium	mg/l	---	---	---	---	---
11	Chloride as Cl	mg/l	250	---	600	---	600
12	Sulphate as SO4	mg/l	400	---	400	---	1000
13	Phosphate	mg/l	---	---	---	---	---
14	Nitrate as NO_3	mg/l	20	---	50	---	---
15	Fluorides as F	mg/l	1.5	1.5	1.5	---	---
16	Cyanide	mg/l	0.05	0.05	0.05	---	---
17	Arsenic	mg/l	0.05	0.2	0.2	---	---
18	Cadmium	mg/l	0.01	---	0.01	---	---
19	Chromium, Total	mg/l	0.05	0.05	0.05	---	---
20	Copper	mg/l	1.5	---	1.5	---	---
21	Iron	mg/l	0.3	---	50	---	---

S.No	Parameters	Unit	A	B	C	D	E
22	Lead	mg/l	0.1	---	0.1	---	---
23	Zinc	mg/l	15	---	15	---	---
24	Manganese	mg/l	0.5	---	---	---	---
25	Selenium	mg/l	0.01	---	0.05	---	---
26	Mercury	mg/l	0.001	---	---	---	---
27	Dissolved Oxygen	mg/l	6	5	4	4	---
28	COD	mg/l	---	---	---	---	---
29	BOD	mg/l	2	3	3	---	---

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

Class B –Water for outdoor bathing.

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

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

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

3.8.2 Ground Water Resources

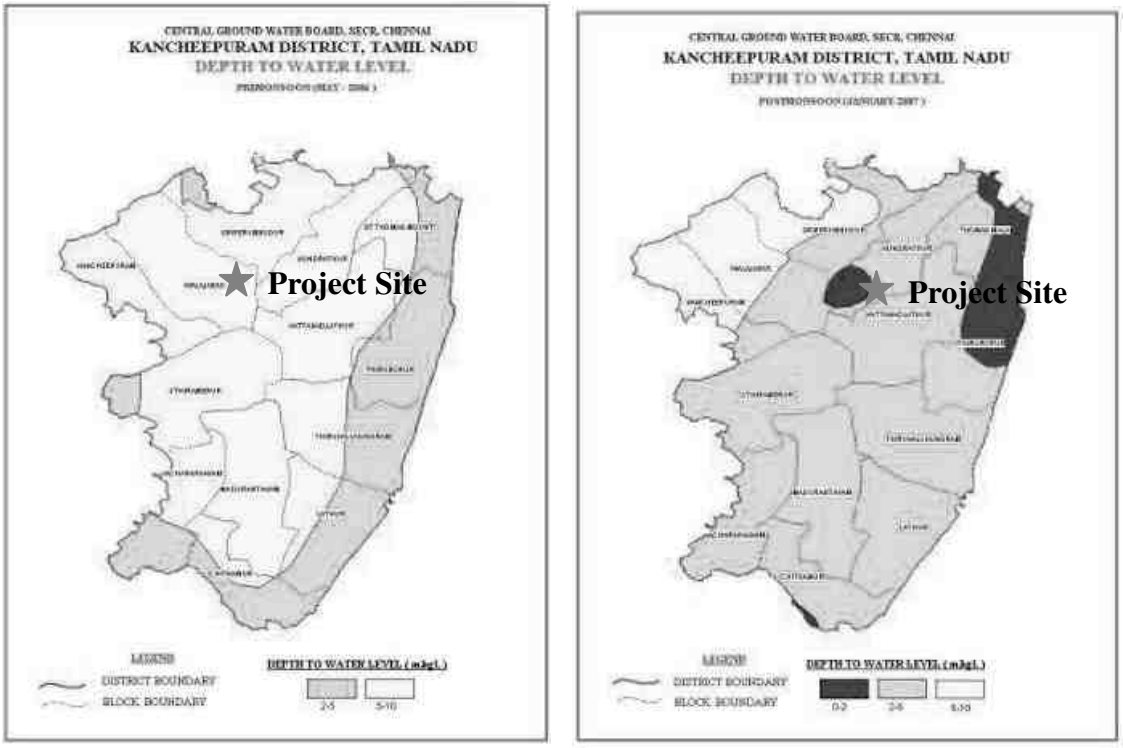
The estimation of ground water resources for the district has shown that two blocks are over exploited and two blocks are under "Critical" category. The shallow alluvial aquifer along Palar and Cheyyar rivers serve as an important source of drinking water between Kancheepuram to Ayyapakkam and Chengleput to Tambaram. The important tanks, which are being used for drinking water purposes are Chembarampakkam tank 88.3 m^3, Madurantakam tank 609.00 m^3, Uttiramerur tank 958.80 m^3, Tenneri tank 1106.70 m^3 Dug wells are the most common ground water abstraction structures used for irrigation. The yield of the dug wells range from 30 to 100 m^3 in weathered crystalline rocks, 25 to 35 m^3/hr in Recent alluvial formations along major drainage courses. Along the coast, windblown sand acts as aquifer zones and ground water extractions is by means of shallow dug wells and they can sustain for 3 to 6 hours pumping and yield is around 15 m^3/hr. The yield of infiltration wells/filter points is around 35 m^3/hr. The dug wells in hard rock terrain tapping the entire weathered residuum are capable of yielding 30-100 m^3/day requiring the installation of 3 - 5 HP pumps for extraction of ground water.

The ground water resources of kancheepuram district are as given in **Table 3-16.** Kancheepuram District Depth of Water Level on Pre Monsoon & post Monsoon is given in **Table 3-16**. The depth of water table level during Pre-monsoon and Post-monsoon is given below;

- Pre- monsoon depth to water level 2.89 – 8.46 m bgl
- Post- monsoon depth to water level 1.05 – 7.53 m bgl

Table 3-16 Groundwater Potential in PIA District

Attribute	Potential /Quantity (Ham)
Net Ground water availability	124461.44
Gross Draft Irrigation	84378.2200
Gross Domestic and Industrial draft	5493.04
Total Draft	89871.26
Allocation for Domestic and Industrial Requirement up to 2029	5812.12
Net ground water availability for irrigation	34271.10



*(**Source:** http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf)*

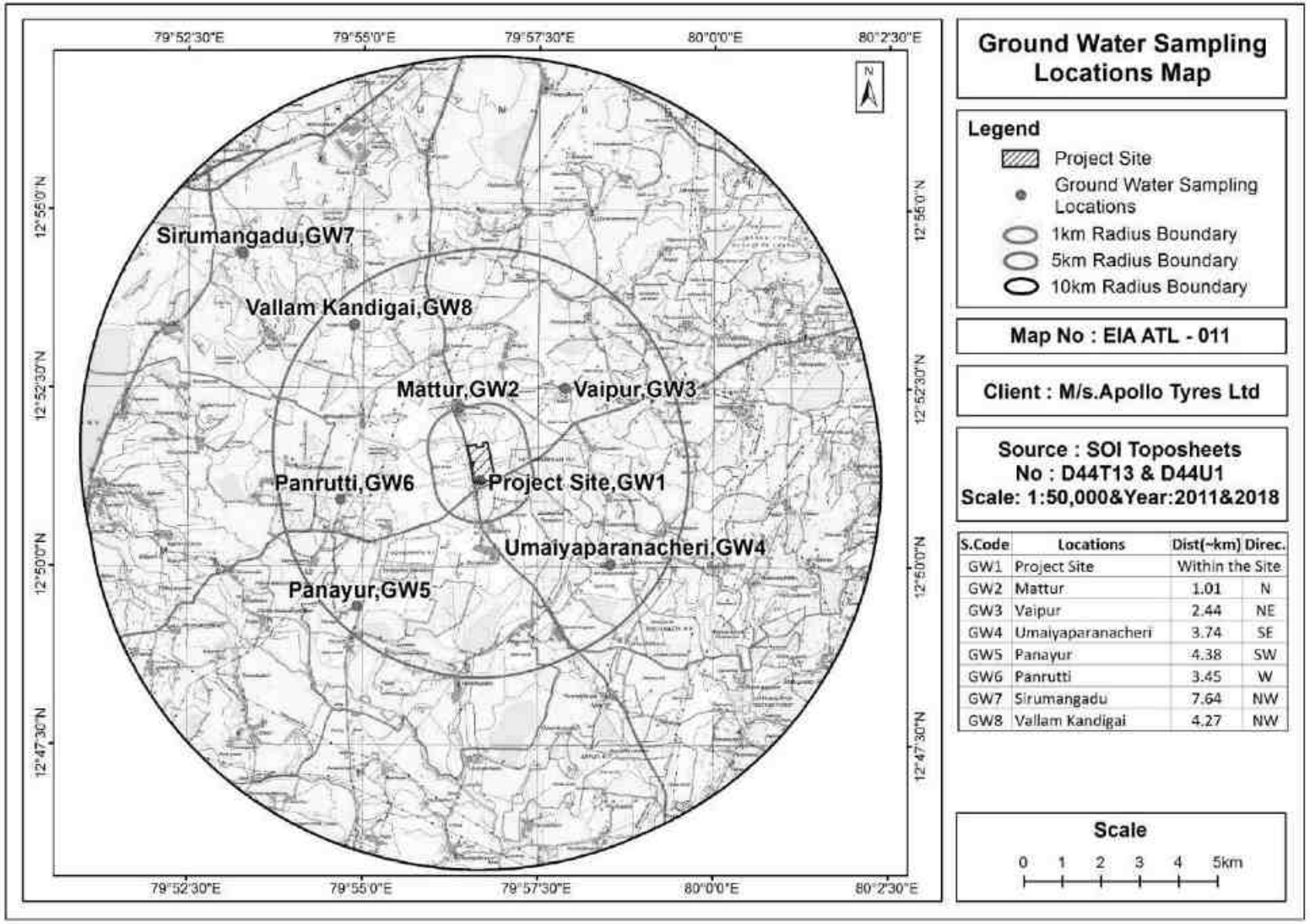
Figure 3-26 Status of ground water utilization- Kancheepuram

3.8.2.1 Ground Water Quality

Total **Eight (08)** ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3-17** and **Table 3-18** respectively. A map showing the groundwater monitoring locations is given in **Figure 3-27.**

Table 3-17 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance (~km) from Project boundary	Directions
GW1	Project Site	Within Site	
GW2	Mattur	1.01	N
GW3	Vaipur	2.44	NE
GW4	Umaiyaparanacheri	3.74	SE
GW5	Panayur	4.38	SW
GW6	Panrutti	3.45	W
GW7	Sirumangadu	7.64	NW
GW8	Vallam Kandigai	4.27	NW



S.Code	Locations	Dist(~km)	Direc.
GW1	Project Site	Within the Site	
GW2	Mattur	1.01	N
GW3	Vaipur	2.44	NE
GW4	Umaiyaparanacheri	3.74	SE
GW5	Panayur	4.38	SW
GW6	Panrutti	3.45	W
GW7	Sirumangadu	7.64	NW
GW8	Vallam Kandigai	4.27	NW

Figure 3-27 Map showing the groundwater monitoring locations

Table 3-18 Ground Water Monitoring Results

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Project Site	Mattur	Vaipur	Umaiyaparanacheri	Panayur	Panrutti	Sirumangadu	Vallam Kandigai
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1	Colour	Hazen	**15**	**5**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ(LOQ 1)
2	Turbidity	NTU	**5**	**1**	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ (LOQ 0.1)	BLQ(LOQ 0.1)
3	pH@25^{0}C	--	**-**	**6.5-8.5**	7.41	7.02	6.81	7.11	6.96	7.01	7.23	6.88
4	Electrical Conductivity	µS/cm	**-**	**-**	597	740	1316	898	618	912	757	1317
5	Total Dissolved Solids	mg/l	**2000**	**500**	328	413	727	488	335	493	405	732
6	Total Suspended Solids		**-**	**-**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ(LOQ 1)
7	Alkalinity as $CaCO_3$	mg/l	**600**	**200**	156	183	238	126	109	230	196	290
8	Total Hardness as $CaCO_3$	mg/l	**600**	**200**	190	237	325	220	170	323	202	395
9	Sodium as Na	mg/l	**-**	**-**	35	55	124	84	45	55	61	104
10	Potassium as K	mg/l	**-**	**-**	2	4	9	6	3	4	5	7
11	Calcium as Ca	mg/l	**200**	**75**	45.57	60.68	75.55	51.14	40.22	77.90	49.17	91.82
12	Magnesium as Mg	mg/l	**100**	**30**	18.2	20.9	33.17	22.45	17.27	31.25	19.39	40.31
13	Chloride as Cl	mg/l	**1000**	**250**	73.52	93.62	219.30	153.33	94.30	115.30	85.63	205.68

14	Sulphate SO_4	mg/l	**400**	**200**	29.4	39.3	88.9	64.4	37.7	45.0	34.0	83.8
15	Nitrate as NO_3	mg/l	**NR**	**45**	2.1	1.89	8.3	3.5	4.11	5.3	5.22	4.2
16	Fluorides as F		**1.5**	**1**	0.54	0.33	0.53	0.32	0.41	0.36	0.52	0.41
17	Cyanide	mg/l	**NR**	**0.05**	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)	BLQ (LOQ 0.01)
18	Arsenic as As	mg/l	**0.05**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
19	Boron as B	mg/l	**1.0**	**0.5**	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)
20	Cadmium as Cd	mg/l	**NR**	**0.003**	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)
21	Chromium as Cr	mg/l	**NR**	**0.05**	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)
22	Copper as Cu	mg/l	**1.5**	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
23	Lead as Pb	mg/l	**NR**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
24	Manganese as Mn	mg/l	**0.3**	**0.1**	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
25	Mercury	mg/l	**NR**	**0.001**	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
26	Nickel as Ni	mg/l	**NR**	**0.02**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
27	Selenium as Se	mg/l	**NR**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
28	Zinc as Zn	mg/l	**15**	**5**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)

*(**Note:** BLQ – Below Limit of Quantification; LOQ – Limit Of Quantification; NR – No Relaxation)*

3.8.2.2 Results and Discussions

A summary of analytical results are presented below:

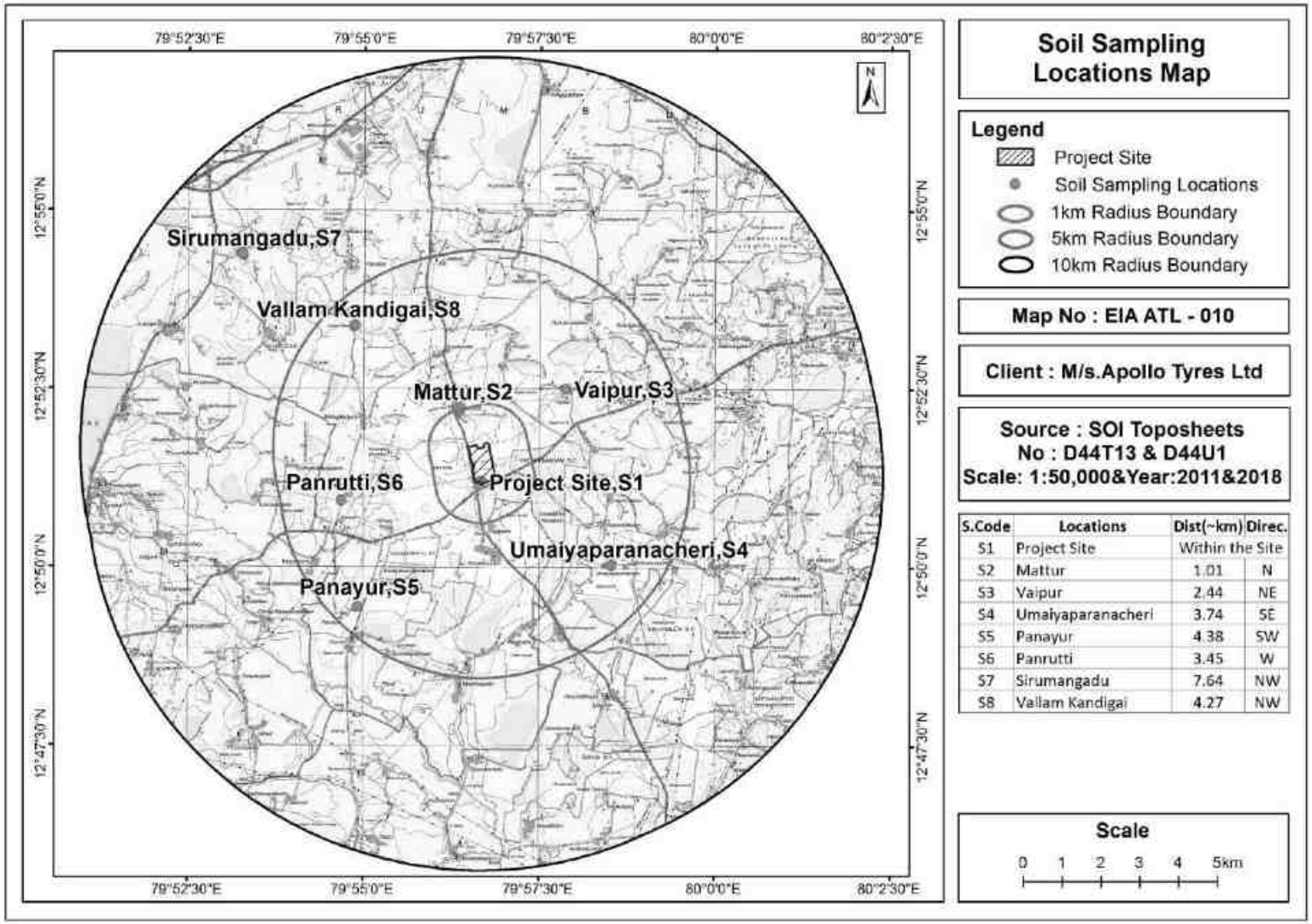
- The ground water results of the study area indicate that the pH range varies between 6.81 and 7.41. It is observed that the pH range is within the permissible limit of IS 10500:2012.
- The Total Dissolved Solids range of the collected ground water sample is varied between 328 mg/l – 732 mg/l.
- The acceptable limit of the chloride content is 250mg/l and permissible limit is 1000 mg/l. The chloride content in the collected ground water samples in the study area ranges between 73.52 mg/l – 219.30 mg/l.
- The acceptable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. the sulphate content in the collected ground water samples in the study area is varied between 29.4 mg/l – 88.9 mg/l. It is observed that all the samples are meeting the acceptable limit of the IS 10500: 2012.
- The Total hardness ranges is between 170 mg/l – 395 mg/l for ground water samples. It is observed that all the samples are within the permissible limit of the IS 10500: 2012.

3.9 Soil as a Resource and Its Quality

The soils of Kancheepuram districts are broadly classified in to four categories viz clayey soil, red sandy or red loamy soil, Red sandy brown clayey soil and Alluvial soil. Of the above soils brown clayey soil is the most predominant, covering more than 71% of the areal extent of Kancheepuram district. Alluvial soils are found on the banks of Palar, Cheyyar and other rivers. The river alluvium is transported and is seen in coastal area of this district. Sandy coastal alluvial (arenacious soil) occurs along the seacoast as a narrow belt. Soil analysis was carried as per IS: 2720 methods. Soil quality monitoring locations & results are given in **Table 3-19** & **Table 3-20.** Map showing the soil monitoring locations is given in **Figure 3-28**.

Table 3-19 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (~km) from the project site	Direction
S1	Project Site	Within Site	
S2	Mattur	1.01	N
S3	Vaipur	2.44	NE
S4	Umaiyaparanacheri	3.74	SE
S5	Panayur	4.38	SW
S6	Panrutti	3.45	W
S7	Sirumangadu	7.64	NW
S8	Vallam Kandigai	4.27	NW



S.Code	Locations	Dist(~km)	Direc.
S1	Project Site	Within the Site	
S2	Mattur	1.01	N
S3	Vaipur	2.44	NE
S4	Umaiyaparanacheri	3.74	SE
S5	Panayur	4.38	SW
S6	Panrutti	3.45	W
S7	Sirumangadu	7.64	NW
S8	Vallam Kandigai	4.27	NW

Figure 3-28 Map showing the soil monitoring locations

Table 3-20 Soil & Sediment Quality Monitoring Results

S.No	Parameters	Units	Project Site	Mattur	Vaipur	Umaiyaparanacheri	Panayur	Panrutti	Sirumangadu	Vallam Kandigai
			S1	S2	S3	S4	S5	S6	S7	S8
1	Soil Texture	-	Sandy clay loam	Sandy clay	Sandy Loam	Sandy clay loam	Sandy clay	Sandy Loam	Sandy Clay	Sandy loam
2	Sand	%	65.4	61.8	59.3	61.5	54.3	62.4	50.6	71.9
3	Silt	%	7.4	2.6	29.9	14.6	4.3	24.1	5.5	12.4
4	Clay	%	27.2	35.6	10.8	23.9	41.4	13.5	43.9	15.7
5	pH	-	6.22	7.12	7.22	6.99	7.02	7.24	6.93	7.12
6	Electrical conductivity	µS/cm	365	95	325	176	106	138	148	159
7	Organic Carbon	%	0.41	0.38	0.61	0.46	0.27	0.31	0.25	0.31
8	Organic matter	%	0.65	0.60	0.96	0.73	0.43	0.49	0.40	0.49
9	Nitrogen as N	mg/kg	112.80	104.40	113.20	142.60	93.10	94.90	84.30	96.50
10	Phosphorus	mg/kg	12.10	11.20	12.10	15.30	10.00	10.20	9.00	9.50
11	Potassium	mg/kg	60.40	55.90	60.60	76.40	49.90	50.80	45.20	48.30
12	Boron	mg/kg	BLQ(LOQ 0. 1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
13	Cadmium	mg/kg	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
14	Water Holding Capacity	%	15.80	16.00	18.20	15.60	19.20	19.40	15.80	15.20
15	Porosity	-	0.42	0.43	0.43	0.42	0.43	0.43	0.42	0.42

Note: *BLQ: Below Limit of Quantification; LOQ: Limit Of Quantification*

3.9.1 Results and Discussions

Summary of analytical results

- The pH of the soil samples ranged from 6.22 to 7.24 Indicating that the soils are slightly acidic to moderately alkaline in nature.
- Conductivity of the soil samples ranged from 95 µmhos/cm to 365 µmhos/cm.
- Nitrogen content in the collected soil samples ranged from 84.30 mg/kg to 142.60 mg/kg.
- Phosphorous content ranged from 9.00 mg/kg to 15.30 mg/kg.
- Potassium content ranges from 45.20 mg/kg to 76.40 mg/kg.

3.10 Biological Environment

An ecological study of the ecosystem is essential to understand the impact of industrialization and urbanization on existing flora and fauna of the study area. Studies on various aspects of ecosystem play an important role in identifying sensitive issues for under taking appropriate action to mitigate the impact, if any. The biological study was under taken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measures for maintaining its health. Secondary information was collected to study the flora & fauna in 10 km radius. Some of the information was gathered from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora and fauna of that region. All the available information was recorded about the wild plants and cultivated crop plants.

During secondary information, following aspects were considered for ecological studies:

- ❖ Assessment of present status of flora and fauna;
- ❖ Identification of rare and endangered species of plants and animals (if any);
- ❖ Identification of ecologically sensitive areas within the study area;
- ❖ Assessment of migratory route of wildlife (if any); and
- ❖ Assessment of Aquatic Ecology with specific reference to aquatic birds and plankton resources.

i. Methodology

Terrestrial investigations for flora and fauna records were collected by secondary information like research article, periodicals, floras and forest checklist.

ii. Floral Study

- ❖ Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature.

- Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.

iii. Faunal Study

- Secondary information collected from published government data etc.
- List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.
- Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN.

3.10.1 Flora

It was observed that the flora, which includes herbs, shrubs and trees, were sparsely distributed within study area. List of flora reported/observed in the study area is given in **Table 3-21.**

Table 3-21 List of flora reported/observed in the study area

S.No	Scientifice name	Family	Habit	Tamil Name	IUCN status
1	*Abutilon indicum*	Malvaceae	Shrub	Thuthi	
2	*Acalypha indica*	Euphorbiaceae	Herb	Kuppaimeni	
3	*Acanthospermum hispidum*	Asteraceae	Herb	Kombu mull	
4	*Aerva persica*	Amaranthaceae	Shrub	Perumpulai	
5	*Aristida setacea*	Poaceae	Herb	-	
6	*Atriplex repens*	Chenopodiaceae	Herb	-	
7	*Azadirachta indica*	Meliaceae	Tree	Veppamaram	
8	*Boerhavia diffusa*	Nyctaginaceae	Herb	Mukurattai	
9	*Borassus flabellifer*	Arecaceae	Tree	Panai maram	-
10	*Bulbostylis barbata*	Cyperaceae	Herb	-	-
11	*Calotropis gigantea*	Asclepiadaceae	Shrub	Erukku	-
12	*Canavalia cathartica*	Fabaceae	Climber		-
13	*Canavalia rosea*	Fabaceae	Climber		-
14	*Cassia italica*	Caesalpiniaceae	Herb	Nilavahai	-
15	*Casuarina litorea*	Casuarinaceae	Tree	Chavuku	-
16	*Catharanthus roseus*	Apocynaceae	Herb	Nithyakalyani	-
17	*Cenchrus ciliaris*	Poaceae	Herb	Kolukattaipul	-
18	*Citrullus colocynthis*	Cucurbitaceae	Herb	Peykkumatti	-
19	*Cocos nucifera*	Arecaceae	Tree	Thennai maram	-
20	*Croton bonplandianus*	Euphorbiaceae	Herb	Mannannai chedi	-
21	*Datura metel*	Solanaceae	Herb	Oomathai	-
22	*Euphorbia hirta*	Euphorbiaceae	Herb	Amampatchaiarisi	-
23	*Euphorbia tortilis*	Euphorbiaceae	Shrub	Tirukukalli	-
24	*Fimbristylis cymosa*	Cyperaceae	Herb	-	-
25	*Gisekia pharnaceoides*	Aizoaceae	Herb	Manalkeerai	-

26	*Gomphrena serrata*	Amaranthaceae	Herb	-	-
27	*Hibiscus tiliaceus*	Malvaceae	Tree	Neerparuthi	Least Concern
28	*Launaea intybacea*	Asteraceae	Herb	-	-
29	*Launaea sarmentosa*	Asteraceae	Herb	-	-
30	*Leucas aspera*	Lamiaceae	Herb	Thumbai	-
31	*Lopholepis orithocephala*	Poaceae	Herb		-
32	*Opuntia stricta*	Cactaceae	Shrub	Sappathikalli	Least Concern
33	*Panicum repens*	Poaceae	Herb	-	-
34	*Passiflora foetida*	Passifloraceae	Climber	Sirupunaikali	-
35	*Pedalium murex*	Pedaliaceae	Herb	Perunerunji	-
36	*Percularia daemia*	Asclepiadaceae	Climber		-
37	*Phyla nodiflora*	Verbenacee	Herb	Koduppai	Least Concern
38	*Prosopis juliflora*	Mimosaceae	Tree	Veelikkaruvai	-
39	*Pycreus polystachyos*	Poaceae	Herb		Least Concern
40	*Sida cordifolia*	Malvacece	Herb	Nilathuthi	-
41	*Spinifex littoreus*	Poaceae	Herb	Ravanan meesai	-
42	*Tephrosia purpurea*	Fabaceae	Shrub	Kolingi	-
43	*Thespesia populnea*	Malvaceae	Tree	Poovarasu	Least Concern
44	*Tribulus terrestris*	Zygophyllaceae	Herb	Nerinji	-
45	*Vernonia cinerea*	Asteraceae	Herb	Mukuttipundu	-
46	*Zoysia matrella*	Poaceae	Herb		-

(LC-Least Concern, DD-Data deficient, CR-Critically Endangered, VU-Vulnerable, NA-Not yet assessed, EN- Endangered, NT-Near Threatened, EW- Extinct in the Wild)

Source: Gamble, J.S. and C.E.C. Fischer. 1915-1935. Flora of Presidency of Madras, Adlard and Son, London. pp. 1-3.

3.10.2 Fauna

This area hosts common animals like Domestic cat, Domestic Cows, Buffaloes, and Goat etc. are found amongst mammals and common snakes, and lizards like garden lizards are commonly found amongst reptiles. List of fauna reported/observed in the study area is given in **Table 3-22.** There is no National park/Wild life Sanctuary within10 km radius of the study area. But there are reserve forests present there is no rare/endangered species within study area of 10 km radius.

Table 3-22 List of fauna reported/observed in the study area

S. No.	Scientific name	Common name	Family	IUCN / WPA
Mammals				
1	*Bandicota bengalensis*	Lesser Bandicoot Rat	Hystricidae	LC/ IV
2	*Bandicota indica*	Greater Bandicoot Rat	Hystricidae	LC/ IV
3	*Funambulus palmarum*	Three-striped Palm Squirrel	Sciuridae	LC/ IV
4	*Rattus rattus*	House Rat	Hystricidae	LC/ IV

Reptiles				
1	*Calotes versicolor*	Indian Garden Lizard	Agamidae	LC /IV
2	*Eutropis carinata*	Keeled / Common Grass Skink	Scincidae	LC /IV
3	*Eutropis macularia*	Bornze Grass Skink	Scincidae	LC /IV
4	*Hemidactylus brooki*	Brooke's House Gecko	Geckonidae	LC /IV
5	*Hemidactylus flaviviridis*	House Gecko	Geckonidae	LC /IV
6	*Hemidactylus frenatus*	Asian House Gecko	Geckonidae	LC /IV
Amphibians				
1	*Bufo scaber*	Furguson's Toad	Bufonidae	LC / IV
2	*Clinotarsus curtipes*	Bi-colored Frog	Dicroglossidae	LC / IV
3	*Duttaphrynus melanostictus*	Common Indian Toad	Bufonidae	LC / IV
4	*Euphlyctis cyanophylyctis*	Skittering Frog	Dicroglossidae	LC / IV
5	*Euphlyctis hexadactylus*	Indian green Frog	Dicroglossidae	LC / IV
6	*Hoplobatrachus crassus*	Jerdon's Bull Frog	Dicroglossidae	LC / IV
7	*Hoplobatrachus tigerinu*	Indian bull Frog	Dicroglossidae	LC / IV
8	*Indirana brachytarsus*	Short-legged Leaping frog	Ranixalidae	LC / IV
Birds				
1	*Acridotheres tristis*	Common Myna	Sturnidae	LC / IV
2	*Acritillas indica*	Yellowbrowed Bulbul	Pycnonotidae	LC / IV
3	*Anthus trivialis*	Tree Pipit	Motacillidae	LC / IV
4	*Apus affinis*	Little Swift	Apodidae	LC / IV
5	*Chrysomma sinense*	Yelloweyed Babbler	Timaliidae	LC / IV
6	*Cinnyris asiaticus*	Purple Sunbird	Nectariniidae	LC / IV
7	*Coracias benghalensis*	Indian Roller	Coraciidae	LC / IV
8	*Coracina macei*	Large Cuckoo shrike	Campephagidae	LC / IV
9	*Corvus splendens*	House Crow	Corvidae	LC /V
10	*Cuculus micropterus*	Indian Cuckoo	Cuculidae	LC / IV
11	*Cyornis tickelliae*	Tickell's Blue Flycatcher	Muscicapidae	LC / IV
12	*Cypsiurus balasiensis*	Asian Palm Swift	Apodidae	LC / IV
13	*Dendrocitta vagabunda*	Rufous Treepie	Corvidae	LC / IV
14	*Dendrocopos mahrattensis*	Yellowcrowned Woodpecker	Picidae	LC / IV
15	*Dicrurus macrocercus*	Black Drongo	Cuculidae	LC / IV
16	*Haliastur indus*	*Brahminy Kite*	*Accipitridae*	*LC /IV*
17	*Iduna aedon*	Thickbilled Warbler	Sylviidae	LC / IV
18	*Irena puella*	Asian Fairybluebird	Irenidae	LC / IV
19	*Lonchura malacca*	Tricoloured Munia	Estrildidae	LC / IV
20	*Luscinia svecica*	Blue throat	Muscicapidae	LC / IV
21	*Megalaima zeylanica*	Brownheaded Barbet	Megalaimidae	LC / IV
22	*Merops orientalis*	Green Bee-eater	Meropidae	LC / IV
23	*Milvus migrans*	Black Kite	Accipitridae	LC /IV
24	*Motacilla cinerea*	Grey Wagtail	Muscicapidae	LC / IV
25	*Muscicapa dauurica*	Asian Brown Flycatcher	Muscicapidae	LC / IV

26	*Nyctyornis athertoni*	Bluebearded Bee-eater	Meropidae	LC / IV
27	*Orthotomus sutorius*	Common Tailorbird	Sylviidae	LC / IV
28	*Parus aplonotus*	Indian Yellow Tit	Paridae	LC / IV
29	*Passer domesticus*	House Sparrow	Passeridae	LC / IV
30	*Pellorneum ruficeps*	Puffthroated Babbler	Timaliidae	LC / IV
31	*Phylloscopus trochiloides*	Greenish Warbler	Sylviidae	LC / IV
32	*Picumnus innominatus*	Speckled Piculet	Picidae	LC / IV
33	*Ploceus manyar*	Streaked Weaver	Ploceidae	LC / IV
34	*Ploceus philippinus*	Baya Weaver	Ploceidae	LC / IV
35	*Pomatorhinus horsfieldii*	Indian ScimitarBabbler	Timaliidae	LC / IV
36	*Prinia hodgsonii*	Greybreasted Prinia	Cisticolidae	LC / IV
37	*Saxicola caprata*	Pied Bushchat	Muscicapidae	LC / IV
38	*Saxicoloides fulicatus*	Indian Robin	Muscicapidae	LC / IV
39	*Spilopelia chinensis*	Spotted Dove	Columbidae	LC / IV
40	*Tephrodornis pondicerianus*	Common Woodshrike	Tephrodornithidae	LC / IV
41	*Terpsiphone paradisi*	Asian ParadiseFlycatcher	Monarchidae	LC / IV
42	*Turdoides striata*	Jungle Babbler	Timaliidae	LC / IV
43	*Zoothera citrina*	Orange headed Thrush	Turdidae	LC / IV
Butterflies				
1	Nymphalidae	Danaus chrysippus	Plain Tiger	NA
2	Nymphalidae	Danaus genutia	Striped Tiger	NA
3	Nymphalidae	Ariadne merione	Common Caster	NA
4	Nymphalidae	Neptis hylas	Common Sailor	NA
5	Nymphalidae	Phalanta phalantha	Common Leopard	NA
6	Nymphalidae	Melanitis leda	Common Evening Brown	NA
7	Nymphalidae	Mycalesis perseus	Common Bush Brown	NA
8	Nymphalidae	Ypthima asterope	Common Three Ring	NA
9	Nymphalidae	Euthala nais	Baronet	NA
10	Nymphalidae	Argynnis hyperbius	Indian Fritillary	NA
11	Nymphalidae	Byblia ilithya	Joker	NA
12	Pieridae	Colotis danae	Crimson Tip	NA
13	Pieridae	Colotis etrida	Small Orange Tip	NA
14	Pieridae	Eurema hecabe	Common Grass Yellow	NA
15	Pieridae	Catopsillia pomona	Common Emigrant	NA
16	Pieridae	Cepora nerissa	Common Gull	NA
17	Pieridae	Leptosia nina	Psyche	NA
18	Lycaenidae	Castalius rosimon	Common Pierrot	NA
19	Lycaenidae	Arhopala centaurus	Large Obakblue	NA
20	Lycaenidae	Euchrysops cnejus	Gram Blue	NA
21	Lycaenidae	Jamides celeno	Common Cerulin	NA

22	Lycaenidae	Freyeria trochylus	Grass Jewel	NA
23	Papilionidae	Papilio polytes	Common Mormon	NA
24	Papilionidae	Papilio demoleus	Lime Butterflies	NA
25	Hesperiidae	Borbo cinnara	Rice Swift	NA

(LC-Least Concern, DD-Data deficient, CR-Critically Endangered, VU-Vulnerable, NE-Not Evaluated, NA-Not assessed, EN- Endangered, NT-Near Threatened, EW- Extinct in the Wild).

Source:

1. List of Birds: Ali, S. (2002). The Book of Indian Birds (13th Revised Edition). Oxford University Press, New Delhi, 326pp.
2. List of Butterflies: Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, 2008, 497.
3. List of Mammals: Kamalakannan, M. & P.O.Nameer (2019). A checklist of mammals of Tamil Nadu, India. Journal of Threatened Taxa 11(8): 13992–14009; https://doi.org/10.11609/jott.4705.11.8.13992–14009.
4. List of Reptiles: Aengals, R., Sathish Kumar, V.M., Palot, M.J. & Ganesh, S.R. (2018). A Checklist of Reptiles of India. 35 pp. Version 3.0. Online publication is available at www.zsi.gov.in (Last update: May 2018)

3.10.3 Impact on Biological Environment

The project site is found in non-forest area. Therefore, management plan is not required. The proposed project will not have any impact of terrestrial ecology of the area. Project area can be developed with greenbelt by planting native species to maintain the good environment.

i. Impact on Flora

Plantation will be developed in the undevelopment area as per plantation programme. These activities will help to improve the floral cover of the area. The greenery and plantation development will eventually attract micro fauna, birds etc in the area. Assistance will be taken from local forest department in selection of species of plants so that green coverage may improve fast. The varieties would include those plants, which are suitable to the area. The following plant species will be planted according to CPCB guidelines: *Acacia nilotica, Azadirachta indica, Albizza lebbek, Butea monosperma, Cassia fistula, Delbergia sisso, Delonix regia, Ficus benghalensis, Prosopis cineraria, Tectona grandis, Wrightia tinctoria* etc.

Following Plants will be planted on the periphery of Apollo site area & along the approachable road;

S.No	Botanical name	Common Name	Key future of Tree
1	*Albizia lebbeck*	Vagai	A middle-sized deciduous tree with a spreading crown.

2	*Azadicrta Indica*	Vembu	It is adapted to various climate zones.
3	*Dalbergia latifolia*	Eeitti	It is common on deep loams or clays containing lime.
4	*Ficus benghalensis*	Allamaram	Nesting and food purpose for wildlife
5	*Ficus relegiosa*	Arasamaram	It is tolerant to various climate zones.
6	*Madhuca longifolia*	Illupai	A large deciduous shapely, long lived tree
7	*Pongamia pinnata*	Pungaimaram	Dust reduce
8	*Pterocarpus marsupium*	Vengai	--
9	*Syzygiumcumini*	Naval	It is tolerant to temprature resistant.
10	*Termanilia arjuna*	Maruthu	It is reducing soil erosion

ii. Impact on Fauna

The project area is non forest land. As such, there will be little adverse impact of the plant unit activity on fauna around the plant unit area. A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals.

iii. Impact on Wildlife

There is no National Park, Wildlife Sanctuary, Biosphere Reserve, Wildlife corridors and Tiger/Elephant Reserve.

3.11 Socio Economic Profile of the Project Influenced Area

As per the 2011 Census, the total population of Kancheepuram district was 3,998,252 and it was them 2nd most populous out of the 32 districts in Tamil Nadu. The population density of Kancheepuram as 910 persons per sq.km and it was the 4th most densely populated district in Tamil Nadu. The rate of urbanization in the district has been very swift and quite haphazard. The 2011 Census states that, the Kancheepuram district has 63.49% urban population and 36.51 % rural population. As per the 2011 Census, the population increased by 39.0 per cent. In the 2001 Census, Kancheepuram district recorded an increase of 19.15 per cent to its population compared to 1991. The sex ratio of the district is good at 986 women to 1000 men and much above the national average (940) and slightly below the state average (996). Child Sex Ratio (CSR) as per 2011 Census was 959 compared to 961 of 2001 Census. In 2011, children under 0-6 formed 10.79 percent of Kancheepuram district compared to 11.72 percent in 2001.

The literacy rates of the Kancheepuram district have risen considerably since the last decade. As per the 2001 and 2011Census reports Kancheepuram district literacy rates are respectively 76.85% (Tamil Nadu 73%)and 84.5% (Tamil Nadu 80.09%), which are consistently higher in comparison with the state literacy rates for respective years. Both the male and female average literacy rates have shown an increase of about 10 % each.

According to the 2011 Census, 63.49% constituted the urban population of Kancheepuram district and 36.51 %, the rural population. The total population of Kancheepuram district was 39,98,252 in 2011,

registering a growth of 39.0 per cent over 2001. There was an increase in the sex ratio in the district from 975 in 2001 to 986 in 2011 in which is, however, still lower than the state sex ratio of 996 women per men (Census 2011).

Source: *http://www.spc.tn.gov.in/DHDR/Kancheepuram.pdf*

3.11.1 Socio Economic Aspects

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

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

Table 3-23 shows some important Social Indicators of Kancheepuram District in Tamilnadu.

Table 3-23 Social Indicators of Kancheepuram District

S.No	Social Indicators	Kancheepuram District
1	Decadal variation %	38.95
2	Urban population %	63.49
3	Sex ratio	986
4	0-6 age group %	10.79
5	Population density (Persons per square Km)	892
6	Scheduled caste population %	23.71
7	Scheduled tribe population %	1.03
8	Literacy rate %	84.49
9	Work Participation rate %	41.86
10	Main Workers %	81.69
11	Marginal Workers %	18.31
12	Cultivators %	5.34
13	Agricultural labourers %	16.28
14	Workers in household industries %	3.27
15	Other workers %	75.11

Source:

http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3303_PART_A_DCHB_KANCHEEPURAM.pdf

i) Population and Household Size

In 2011 census, the total population of Kancheepuram district was 3998252. Of this, rural population was 1459916 and urban population was 2538336. In 2001, these were 2877468, 1342502 and 1534966 respectively. Alandur taluk has returned with the highest population of 642237 and the lowest population was recorded in Uthiramerur taluk with the population of 148133. Among the taluks in Rural population, Chengalpattu taluk tops with the population of 264378. Tambaram taluk has recorded the lowest rural population of 27396. Comparing the population of Urban area, Alandur taluk ranks first with the population of 642237. Uthiramerur taluk has recorded the lowest urban population of 25194.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3303_PART_A_DCHB_KANCHEEPURAM.pdf*

ii) Sex Ratio

The sex ratio is defined as number of females to 1000 males. The sex ratio of the district was recorded as 986, lower than the State level of 996 during Census 2011 census. Child sex ratio of the district was recorded as 959.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3303_PART_A_DCHB_KANCHEEPURAM.pdf*

iii) Scheduled Castes and Scheduled Tribes

There are 23.71% Scheduled Caste (SC) and 1.03% Scheduled Tribe (ST) of total population in Kancheepuram district. In the case of ST population, it forms a very small proportion at both the state and district levels.

Source: *https://www.censusindia.co.in/district/kancheepuram-district-tamil-nadu-604*

iv) Education & Literacy

In Census, a person aged 7 and above is considered literate, if he or she can read and write with understanding in any language. The literacy rate in the kancheepuram district has increased in 2011 census compared to 2001 census. In 2011 census, Kancheepuram district has returned 84.5% as literate population; males with 89.9% and females with 79%.The total literacy in 2001 was 76.9%; males at 84.7%and females at 68.8%. The education infrastructures in the Kancheepuram District is tabulated in **Table 3-24.**

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3303_PART_A_DCHB_KANCHEEPURAM.pdf*

Table 3-24 Education Infrastructures in the Kancheepuram District

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
Primary	868	503	809	373
Primary + Upper Primary	346	105	308	68
P + UP+ Secondary + Higher Secondary	49	186	39	113
UP only	1	2	1	0
UP + Secondary + Higher Secondary	126	41	100	16
P + UP + Secondary	35	118	28	82
UP + Secondary	120	41	110	26

*(**Source:** District Information Systems on Education (DISE report card 2016-17))*

v) Health Facilities

Primary Health Centers (PHCs) and Health Sub-centers (HSCs) are providing the preventive, curative and rehabilitative health care services to the rural people. The district has good number of public health systems accessible and affordable apart from the private health facilities. The Health Facilities given in **Table 3-25.**

Table 3-25 Medical Facilities available in Kancheepuram District

		Facilities As on 16th October 2019									
		Total Facility					Active Facilities				
Name of the District	Type of Facility	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]
Kancheepuram	SC	364	364	0	0	364	364	364	0	0	364
	PHC	71	71	0	20	51	64	64	0	20	44
	CHC	15	14	1	1	14	14	13	1	1	13
	SDH	12	12	0	7	5	11	11	0	7	4
	DH	1	1	0	0	1	1	1	0	0	1
	Total	463	462	1	28	435	454	453	1	28	426

*(**Source:** National Health Mission, as on October 16, 2019)*

*(**Note:** SC – Sub Center; PHC – Primary Health Center; CHC – Community Health Center; SDH – Sub District Hospital; DH – District Hospital)*

vi) Employment and Livelihood

In Kancheepuram district, 1673814 were engaged in work activities which accounts for 41.86% of total population of the district. 81.69 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 18.31 % were involved in Marginal activity providing livelihood for less than 6 months. Of 1673814 workers, 89343 were cultivators (owner or co-owner)

while 272514 were Agricultural labours, 54732 were involved in Household Industry works and 1257225 were involved in other works.

vii) Industrial Scenario

Kancheepuram over the last decade has fast moved from an agriculture-based economy to an industrial and tertiary sector economy. Apart from this, the district has adequate soil testing, fertilizer testing and pesticide testing laboratories. Currently, by way of value addition, private dairy processing units like Seva Dairy in Acharapakkam, Hatsun, Heritage and Ananya Dairy in Kancheepuram function successfully in the district. These efforts could be further strengthened. The west coastal areas of Thiruporur, Lathur and Chithamour blocks are ideal for shrimp and prawn culture. Fisheries and animal husbandry are the key sectors to strengthen the agricultural economy of the district. In terms of industrial development, Kancheepuram is a vibrant and a vital district. The District Industries Centre (DIC) functions at Kancheepuram and several schemes and industry friendly policies are implemented. All the facilities like Chennai international airport, excellent rail and road facilities, a seaport, telecommunications and power linkages and easy marketability of products are easily available to any enterprise.

3.11.2 Social Economic Profile of the Study Area

The project area comes under the Sriperumbudur taluk of Kancheepuram District of Tamilnadu. **Table 3-26** provides the details on population profile within study area. **Table 3-30** show the socio-economic indicator within the study area.

Table 3-26 Population profile within study area

S. No	Name	No of Households	Total Population Person	Total Population Male	Total Population Female	Population in the age group 0-6 Person	Scheduled Castes population Person	Scheduled Tribes population Person
0-5 km								
Kancheepuram District-Kancheepuram Taluk								
1.	Thiruvenkaranai	432	1668	831	837	186	647	49
2.	Kunnavakkam	334	1397	698	699	177	622	5
3.	Vembakkam	254	974	481	493	127	609	33
Kancheepuram District-Chengalpattu Taluk								
4.	Senthamangalam	141	620	368	252	61	295	28
Kancheepuram District-Sriperumbudur Taluk								
5.	Karunakaracheri	83	323	146	177	21	1	0
6.	Valathancheri	3	8	4	4	0	0	0
7.	Perinjambakkam	95	379	184	195	41	342	0
8.	Vaipoor	384	1803	1019	784	173	1139	0
9.	Vallam	709	2837	1506	1331	291	1545	33
10.	Mettupalayam	271	1068	557	511	143	813	0
11.	Panrutti	423	1946	1088	858	197	703	4
12.	Mathur	392	1628	817	811	174	1022	0
13.	Serapanacheri	236	976	514	462	78	673	45
14.	Karanaithangal	43	182	93	89	24	97	0
15.	Navalur	147	524	254	270	57	8	65
16.	Vattambakkam	151	663	329	334	63	427	37
17.	Oragadam	213	819	410	409	96	375	2
18.	Sennakuppam	227	965	482	483	94	929	5

S. No	Name	No of Households	Total Population Person	Total Population Male	Total Population Female	Population in the age group 0-6 Person	Scheduled Castes population Person	Scheduled Tribes population Person
19.	Panaiyyur	156	650	328	322	80	436	0
20.	Ezhichur	343	1373	658	715	152	937	0
21.	Padervadi	25	77	39	38	16	12	0
22.	Valayakaranai	170	689	344	345	89	151	0
23.	Umayalparamancheri	178	696	357	339	74	232	33
24.	Kanchivakkam	145	644	339	305	82	575	0
5-10 km								
Kancheepuram District-Kancheepuram Taluk								
25.	Suramenikuppam	123	439	213	226	66	118	0
26.	Ayimicheri	287	1121	541	580	120	976	0
27.	Kovalavedu	166	748	371	377	75	208	0
28.	Navettikulam	38	140	62	78	19	0	44
29.	Agaram	413	1724	824	900	158	906	0
30.	Manjamedu	131	462	221	241	52	417	17
31.	Thenneri	541	2101	1022	1079	246	1591	21
32.	Madavilagam	122	470	237	233	34	11	22
33.	Sirupagal	83	307	152	155	24	70	0
34.	Oddanthangal	44	323	179	144	44	81	7
35.	Kattavakkam	269	1063	523	540	103	824	38
36.	Alavur	137	557	267	290	52	467	24
37.	Varanavasi	193	797	408	389	94	491	22
38.	Chinnamadurapakkam	80	318	172	146	24	304	0
39.	Ambakkam	269	1017	522	495	139	732	31

S. No	Name	No of Households	Total Population Person	Total Population Male	Total Population Female	Population in the age group 0-6 Person	Scheduled Castes population Person	Scheduled Tribes population Person
40.	Kosapattu	68	236	102	134	34	218	0
41.	Devariyambakkam	232	875	426	449	102	138	0
42.	Thonankulam	123	435	216	219	52	287	24
Kancheepuram District-Chengalpattu Taluk								
43.	Appur	301	1244	603	641	137	699	15
44.	Kolathur	306	1279	636	643	136	557	98
45.	Dasarikunnathur	58	225	113	112	32	0	54
46.	Guruvanmedu	199	841	429	412	86	359	46
47.	Palur	1660	6964	3466	3498	833	4504	285
48.	Villiambakkam	347	1344	673	671	122	4	34
49.	Vembakkam	253	1099	560	539	117	529	45
50.	Venkatapuram	528	2137	1053	1084	252	1676	64
Kancheepuram District-Sriperumbudur Taluk								
51.	Vadamangalam	310	1222	603	619	148	579	0
52.	Pillaipakkam	446	1741	871	870	167	400	0
53.	Vengadu	249	1011	491	520	109	381	0
54.	Somangalam	1088	4376	2199	2177	526	864	1
55.	Pazhanthandalam	1189	4777	2378	2399	565	1946	297
56.	Sethupattu	266	1027	498	529	135	82	50
57.	Karunakaracheri	83	323	146	177	21	1	0
58.	Kolathur	283	1136	572	564	112	360	217
59.	Navalur	208	767	384	383	93	314	0
60.	Oddankaranai	71	323	155	168	36	273	0

S. No	Name	No of Households	Total Population Person	Total Population Male	Total Population Female	Population in the age group 0-6 Person	Scheduled Castes population Person	Scheduled Tribes population Person
61.	Kaduvancheri	122	484	253	231	58	305	0
62.	Pondur	569	2347	1163	1184	241	1085	9
63.	Irungulam	5	494	329	165	9	36	61
64.	Mambakkam	607	2501	1284	1217	276	684	5
65.	Thirumangalam	966	4012	1996	2016	440	799	93
66.	Santhavelur	1190	4817	2367	2450	606	815	0
67.	Sirumangadu	264	1011	497	514	97	281	0
68.	Araneri	188	748	394	354	98	291	0
69.	Vadekkal	941	3939	2004	1935	391	1985	52
70.	Gunduperumbedu	254	1020	505	515	123	746	16
71.	Nallamperumbedu	17	68	31	37	14	7	0
72.	Alagoor	68	302	149	153	41	0	0
73.	Mahanyam	455	1860	921	939	217	757	5
74.	Vellarai	109	426	205	221	48	353	0
75.	Malaipattu	297	1078	551	527	123	292	0
76.	Manimangalam	1974	8198	4117	4081	806	2982	143
77.	Karasangal	943	3858	1912	1946	443	740	198
78.	Thundalkalani	185	781	382	399	73	180	22
79.	Sirumathur	250	1034	531	503	135	681	0
80.	Salamangalam	633	2547	1285	1262	321	441	2
81.	Nariyambakkam	152	566	291	275	75	0	0
82.	Kavalkazhani	10	40	21	19	1	30	0
83.	Echoor	650	2698	1360	1338	258	753	23

S. No	Name	No of Households	Total Population Person	Total Population Male	Total Population Female	Population in the age group 0-6 Person	Scheduled Castes population Person	Scheduled Tribes population Person
84.	Kunnam	521	2037	1001	1036	249	579	33
85.	Pappankuli	192	766	379	387	115	107	4
86.	Venjuvancheri	166	649	328	321	61	353	0
87.	Arambakkam	308	1242	628	614	159	377	26
88.	Ammanumbakkam	19	85	45	40	19	33	0
89.	Korukkanthangal	141	503	247	256	39	219	12
90.	Adhanur	1925	7663	3852	3811	773	1528	180
91.	Neelamangalam	376	1575	823	752	163	51	0
92.	Orathur	411	1744	864	880	215	916	16
93.	Nattarasampattu	164	717	363	354	101	485	43
94.	Siruvanjur	145	604	293	311	55	519	0
95.	Vadamelpakkam	141	591	295	296	55	120	0
96.	Erivakkam	32	145	74	71	13	117	0
97.	Keelakalani	18	81	44	37	6	22	0
98.	Kavanur	373	1586	781	805	181	936	7
99.	Kattupakkam	71	271	137	134	28	105	0
100.	Molachur (CT)	2206	8887	4641	4246	1060	1860	93
Total		34777	141853	71477	70376	15747	56527	2838

*(**Source:** Census 2011)*

viii) Employment and Livelihood

Economic vibrancy in area is shown by the type and nature of the occupation available in the area. Of the total working population, the majority is the main workers i.e. they have steady job more than six months per annum. It is due to the industrialization in the area. The job opportunity is due to the development of Industrial and Service sectors. **Table 3-27** shows the classification of workers within the study area.

Table 3-27 Classification of workers within study area

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
0-5 km												
Kancheepuram District-Kancheepuram Taluk												
1.	Thiruvenkaranai	105	96	9	29	2	25	1	0	0	42	6
2.	Kunnavakkam	4	3	1	0	0	1	0	0	0	2	1
3.	Vembakkam	259	165	94	18	12	45	29	11	5	91	48
Kancheepuram District-Chengalpattu Taluk												
4.	Senthamangalam	909	702	207	11	1	263	14	5	2	423	190
Kancheepuram District-Sriperumbudur Taluk												
5.	Karunakaracheri	1310	1267	43	128	0	341	1	22	0	776	42
6.	Valathancheri	503	391	112	46	2	26	12	9	1	310	97
7.	Perinjambakkam	745	670	75	15	13	52	8	5	5	598	49
8.	Vaipoor	837	625	212	31	11	21	10	8	2	565	189
9.	Vallam	284	268	16	64	2	26	1	3	2	175	11
10.	Mettupalayam	58	57	1	6	0	0	0	0	0	51	1
11.	Panrutti	179	56	123	4	3	7	22	0	0	45	98
12.	Mathur	294	181	113	3	1	60	76	0	1	118	35
13.	Serapanacheri	356	331	25	7	0	6	7	2	1	316	17
14.	Karanaithangal	370	340	30	7	0	18	5	0	0	315	25
15.	Navalur	293	280	13	34	3	26	1	0	0	220	9
16.	Vattambakkam	607	537	70	33	1	204	8	5	2	295	59
17.	Oragadam	28	28	0	0	0	0	0	0	0	28	0
18.	Sennakuppam	297	208	89	14	22	2	25	5	4	187	38
19.	Panaiyyur	342	203	139	71	45	16	26	7	37	109	31
20.	Ezhichur	356	46	310	11	7	3	125	3	8	29	170

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
21.	Padervadi	294	289	5	6	1	2	1	0	6	275	3
22.	Valayakaranai	1000	516	484	138	6	107	257	79	178	192	43
23.	Umayalparamancheri	749	296	453	66	12	141	126	24	9	65	306
24.	Kanchivakkam	501	308	193	19	5	47	145	2	19	240	24
5-10 km												
Kancheepuram District-Kancheepuram Taluk												
25.	Suramenikuppam	220	201	19	29	2	107	13	38	0	27	4
26.	Ayimicheri	517	490	27	11	0	267	11	8	2	204	14
27.	Kovalavedu	283	108	175	4	39	2	83	3	11	99	42
28.	Navettikulam	52	52	0	20	0	0	0	0	0	32	0
29.	Agaram	837	599	238	46	3	332	142	18	3	203	90
30.	Manjamedu	234	233	1	0	0	124	0	1	0	108	1
31.	Thenneri	919	792	127	142	17	168	35	8	8	474	67
32.	Madavilagam	192	130	62	11	19	4	20	12	9	103	14
33.	Sirupagal	125	85	40	1	0	65	17	4	7	15	16
34.	Oddanthangal	58	55	3	0	0	29	0	0	0	26	3
35.	Kattavakkam	472	466	6	16	1	252	3	2	0	196	2
36.	Alavur	185	101	84	1	32	3	25	3	4	94	23
37.	Varanavasi	396	334	62	41	1	113	18	2	5	178	38
38.	Chinnamadurapakkam	187	187	0	3	0	103	0	2	0	79	0
39.	Ambakkam	419	182	237	3	4	2	151	4	2	173	80
40.	Kosapattu	117	100	17	7	0	49	17	0	0	44	0
41.	Devariyambakkam	435	428	7	82	1	202	3	9	0	135	3
42.	Thonankulam	241	241	0	4	0	166	0	2	0	69	0
Kancheepuram District-Chengalpattu Taluk												

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
43.	Appur	582	458	124	117	11	50	75	14	5	277	33
44.	Kolathur	546	495	51	15	5	313	19	8	1	159	26
45.	Dasarikunnathur	119	109	10	0	0	14	1	0	0	95	9
46.	Guruvanmedu	321	299	22	26	7	208	4	19	2	46	9
47.	Palur	3387	2297	1090	96	13	737	474	35	421	1429	182
48.	Villiambakkam	697	405	292	57	11	140	215	2	3	206	63
49.	Vembakkam	584	442	142	47	2	51	90	25	6	319	44
50.	Venkatapuram	875	532	343	19	7	36	34	12	22	465	280
Kancheepuram District-Sriperumbudur Taluk												
51.	Vadamangalam	600	144	456	17	28	18	207	18	116	91	105
52.	Pillaipakkam	1101	162	939	16	114	67	15	16	173	63	637
53.	Vengadu	628	176	452	21	8	10	313	6	2	139	129
54.	Somangalam	1728	1512	216	87	12	189	74	42	12	1194	118
55.	Pazhanthandalam	1666	1431	235	64	3	286	12	29	3	1052	217
56.	Sethupattu	470	199	271	58	4	38	81	6	5	97	181
57.	Karunakaracheri	105	96	9	29	2	25	1	0	0	42	6
58.	Kolathur	523	240	283	6	40	48	124	4	9	182	110
59.	Navalur	344	67	277	11	57	6	9	1	4	49	207
60.	Oddankaranai	162	83	79	6	5	41	15	5	5	31	54
61.	Kaduvancheri	219	202	17	13	0	66	4	1	0	122	13
62.	Pondur	1134	655	479	34	12	144	19	25	5	452	443
63.	Irungulam	17	16	1	0	0	0	0	0	0	16	1
64.	Mambakkam	1144	813	331	50	20	53	208	26	4	684	99
65.	Thirumangalam	1731	1562	169	73	8	40	7	191	20	1258	134
66.	Santhavelur	1959	1682	277	136	19	326	71	212	7	1008	180

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
67.	Sirumangadu	600	288	312	28	11	51	169	65	47	144	85
68.	Araneri	326	313	13	7	0	4	0	7	0	295	13
69.	Vadekkal	1870	1697	173	36	1	602	26	26	6	1033	140
70.	Gunduperumbedu	505	268	237	46	3	41	200	1	16	180	18
71.	Nallamperumbedu	28	21	7	18	0	0	0	0	1	3	6
72.	Alagoor	149	130	19	103	1	4	6	2	0	21	12
73.	Mahanyam	648	611	37	91	0	194	3	5	0	321	34
74.	Vellarai	212	142	70	4	1	0	67	0	1	138	1
75.	Malaipattu	525	396	129	30	12	41	18	6	14	319	85
76.	Manimangalam	3313	2237	1076	287	53	288	211	55	73	1607	739
77.	Karasangal	1394	1328	66	118	5	185	4	11	4	1014	53
78.	Thundalkalani	327	315	12	7	1	8	0	4	0	296	11
79.	Sirumathur	439	438	1	36	0	44	1	4	0	354	0
80.	Salamangalam	1203	1075	128	89	5	86	28	128	12	772	83
81.	Nariyambakkam	245	241	4	30	0	15	1	0	0	196	3
82.	Kavalkazhani	20	10	10	2	0	0	1	1	2	7	7
83.	Echoor	1464	1120	344	88	15	402	24	164	37	466	268
84.	Kunnam	803	615	188	55	3	259	144	49	3	252	38
85.	Pappankuli	324	286	38	23	2	115	31	19	0	129	5
86.	Venjuvancheri	240	240	0	10	0	6	0	2	0	222	0
87.	Arambakkam	558	29	529	1	10	0	112	0	4	28	403
88.	Ammanumbakkam	40	1	39	0	0	0	0	0	0	1	39
89.	Korukkanthangal	247	202	45	19	4	71	2	0	0	112	39
90.	Adhanur	3066	2537	529	77	20	101	20	64	30	2295	459
91.	Neelamangalam	588	437	151	52	29	25	24	27	6	333	92

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
92.	Orathur	909	294	615	41	141	120	150	11	10	122	314
93.	Nattarasampattu	281	16	265	0	11	0	87	0	15	16	152
94.	Siruvanjur	256	201	55	5	0	26	32	5	2	165	21
95.	Vadamelpakkam	290	279	11	37	0	77	0	1	0	164	11
96.	Erivakkam	56	56	0	5	0	21	0	0	0	30	0
97.	Keelakalani	41	41	0	5	0	11	0	0	0	25	0
98.	Kavanur	682	679	3	28	0	103	1	11	0	537	2
99.	Kattupakkam	133	117	16	15	2	5	1	4	0	93	13
100.	Molachur (CT)	4004	3044	960	33	2	43	120	125	196	2843	642
Total		**62997**	**46428**	**16569**	**3606**	**988**	**9281**	**4993**	**1800**	**1637**	**31735**	**8957**

*(**Source:** Census 2011)*

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

ix) Educational infrastructure within study area

The district has good primary and secondary education infrastructure in urban and rural areas. The people around the study area have well connected to educational infrastructures. **Table 3-28** shows the literates population.

Table 3-28 Details of Literacy population in the study area

S. No	Name	Total Population Person	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
0-5 km								
Kancheepuram District-Kancheepuram Taluk								
1.	Thiruvenkaranai	1668	949	537	412	719	294	425
2.	Kunnavakkam	1397	724	415	309	673	283	390
3.	Vembakkam	974	536	310	226	438	171	267
Kancheepuram District-Chengalpattu Taluk								
4.	Senthamangalam	620	390	269	121	230	99	131
Kancheepuram District-Sriperumbudur Taluk								
5.	Karunakaracheri	323	213	113	100	110	33	77
6.	Valathancheri	8	7	4	3	1	0	1
7.	Perinjambakkam	379	257	141	116	122	43	79
8.	Vaipoor	1803	1290	804	486	513	215	298
9.	Vallam	2837	1983	1149	834	854	357	497
10.	Mettupalayam	1068	670	374	296	398	183	215
11.	Panrutti	1946	1428	876	552	518	212	306
12.	Mathur	1628	1166	627	539	462	190	272
13.	Serapanacheri	976	687	380	307	289	134	155
14.	Karanaithangal	182	148	83	65	34	10	24
15.	Navalur	524	358	197	161	166	57	109

S. No	Name	Total Population Person	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
16.	Vattambakkam	663	438	241	197	225	88	137
17.	Oragadam	819	544	296	248	275	114	161
18.	Sennakuppam	965	703	391	312	262	91	171
19.	Panaiyyur	650	440	246	194	210	82	128
20.	Ezhichur	1373	886	457	429	487	201	286
21.	Padervadi	77	61	33	28	16	6	10
22.	Valayakaranai	689	383	213	170	306	131	175
23.	Umayalparamancheri	696	471	271	200	225	86	139
24.	Kanchivakkam	644	406	241	165	238	98	140
5-10 km								
Kancheepuram District-Kancheepuram Taluk								
25.	Suramenikuppam	439	209	118	91	230	95	135
26.	Ayimicheri	1121	628	347	281	493	194	299
27.	Kovalavedu	748	561	315	246	187	56	131
28.	Navettikulam	140	70	35	35	70	27	43
29.	Agaram	1724	984	552	432	740	272	468
30.	Manjamedu	462	299	161	138	163	60	103
31.	Thenneri	2101	1272	687	585	829	335	494
32.	Madavilagam	470	380	201	179	90	36	54
33.	Sirupagal	307	249	138	111	58	14	44
34.	Oddanthangal	323	236	146	90	87	33	54
35.	Kattavakkam	1063	657	361	296	406	162	244
36.	Alavur	557	378	204	174	179	63	116

S. No	Name	Total Population Person	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
37.	Varanavasi	797	481	264	217	316	144	172
38.	Chinnamadurapakkam	318	213	122	91	105	50	55
39.	Ambakkam	1017	568	313	255	449	209	240
40.	Kosapattu	236	127	64	63	109	38	71
41.	Devariyambakkam	875	571	329	242	304	97	207
42.	Thonankulam	435	270	149	121	165	67	98
Kancheepuram District-Chengalpattu Taluk								
43.	Appur	1244	860	458	402	384	145	239
44.	Kolathur	1279	994	515	479	285	121	164
45.	Dasarikunnathur	225	97	53	44	128	60	68
46.	Guruvanmedu	841	582	344	238	259	85	174
47.	Palur	6964	4637	2496	2141	2327	970	1357
48.	Villiambakkam	1344	879	511	368	465	162	303
49.	Vembakkam	1099	703	411	292	396	149	247
50.	Venkatapuram	2137	1341	726	615	796	327	469
Kancheepuram District-Sriperumbudur Taluk								
51.	Vadamangalam	1222	806	422	384	416	181	235
52.	Pillaipakkam	1741	1106	630	476	635	241	394
53.	Vengadu	1011	654	363	291	357	128	229
54.	Somangalam	4376	3047	1670	1377	1329	529	800
55.	Pazhanthandalam	4777	3450	1853	1597	1327	525	802
56.	Sethupattu	1027	651	355	296	376	143	233
57.	Karunakaracheri	323	213	113	100	110	33	77

S. No	Name	Total Population Person	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
58.	Kolathur	1136	853	452	401	283	120	163
59.	Navalur	767	482	258	224	285	126	159
60.	Oddankaranai	323	204	106	98	119	49	70
61.	Kaduvancheri	484	336	189	147	148	64	84
62.	Pondur	2347	1631	867	764	716	296	420
63.	Irungulam	494	478	314	164	16	15	1
64.	Mambakkam	2501	1620	958	662	881	326	555
65.	Thirumangalam	4012	2406	1334	1072	1606	662	944
66.	Santhavelur	4817	3285	1771	1514	1532	596	936
67.	Sirumangadu	1011	620	366	254	391	131	260
68.	Araneri	748	531	305	226	217	89	128
69.	Vadekkal	3939	2477	1421	1056	1462	583	879
70.	Gunduperumbedu	1020	722	389	333	298	116	182
71.	Nallamperumbedu	68	52	25	27	16	6	10
72.	Alagoor	302	247	127	120	55	22	33
73.	Mahanyam	1860	1207	664	543	653	257	396
74.	Vellarai	426	259	137	122	167	68	99
75.	Malaipattu	1078	796	444	352	282	107	175
76.	Manimangalam	8198	5837	3190	2647	2361	927	1434
77.	Karasangal	3858	2683	1440	1243	1175	472	703
78.	Thundalkalani	781	577	308	269	204	74	130
79.	Sirumathur	1034	699	396	303	335	135	200
80.	Salamangalam	2547	1832	1003	829	715	282	433

S. No	Name	Total Population Person	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
81.	Nariyambakkam	566	392	232	160	174	59	115
82.	Kavalkazhani	40	35	18	17	5	3	2
83.	Echoor	2698	1744	994	750	954	366	588
84.	Kunnam	2037	1356	757	599	681	244	437
85.	Pappankuli	766	427	254	173	339	125	214
86.	Venjuvancheri	649	484	262	222	165	66	99
87.	Arambakkam	1242	843	456	387	399	172	227
88.	Ammanumbakkam	85	52	27	25	33	18	15
89.	Korukkanthangal	503	414	212	202	89	35	54
90.	Adhanur	7663	6285	3272	3013	1378	580	798
91.	Neelamangalam	1575	1272	702	570	303	121	182
92.	Orathur	1744	1043	558	485	701	306	395
93.	Nattarasampattu	717	421	242	179	296	121	175
94.	Siruvanjur	604	423	233	190	181	60	121
95.	Vadamelpakkam	591	364	213	151	227	82	145
96.	Erivakkam	145	80	41	39	65	33	32
97.	Keelakalani	81	54	35	19	27	9	18
98.	Kavanur	1586	1074	595	479	512	186	326
99.	Kattupakkam	271	226	123	103	45	14	31
100.	Molachur (CT)	8887	6474	3646	2828	2413	995	1418
Total		**141853**	**96608**	**53430**	**43178**	**45245**	**18047**	**27198**

*(**Source:** Census 2011)*

x) Dwelling within study area

Due to industrialization in nearby area and various Government Schemes, the standard of dwelling place has improved.

xi) Health facilities within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There was no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The local transport facilities and the communication facilities are the main reasons to get immediate medical attention. The emergency medical service facility "108" is very familiar and being used by the people in this area. The incidents of institutional delivery are high due to awareness, education, economic development, proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced. The list of medical facility available in the study area is tabulated in **Table 3-29**.

Table 3-29 List of Medical facilities available in the study area

S.No	Type	Study area
1	Community health centre	0
2	Primary health centre	3
3	Primary health sub-centre	24
4	Maternity and Child Welfare Centre	7
5	TB hospital/Clinic	3
6	Hospital Allopathic	0
7	Hospital Alternative Medicine	1
8	Dispensary	3
9	Veterinary hospital	10
10	Mobile health clinic	0
11	Family Welfare Centre	3
12	Non Government Medical facilities Out Patient	4

*(**Source:** Census 2011)*

xii) Summary

The Socioeconomic profile of the study area shows that the majority of people in the study area work in non-agricultural sector, however in rural area majority of the people in the rural area depends on agricultural sector. They have good educational infrastructures and the people in the study area are well connected to the educational infrastructures. The average literacy rate of the study area is 68.10%. The people in the study area are well connected to Government primary health centres and Primary health sub-centresshows the summary of socio-economic indicators within the study area is tabulated in **Table 3-30.**

Table 3-30 Summary of Socioeconomic indicators within the study area

S. No	Particulars	Study Area	Unit
1	Number of villages and Town in the Study Area	100	Nos.
2	Total Households	34777	Nos.
3	Total Population	141853	Nos.
4	Children Population (0-6 Years Old)	15747	Nos.
5	SC Population	56527	Nos.
6	ST Population	2838	Nos.
7	Total Working Population	62997	Nos.
8	Main Workers	46428	Nos.
9	Marginal Workers	16569	Nos.
10	Cultivators	4594	Nos.
11	Agricultural Labourers	14274	Nos.
12	Household Industries	3437	Nos.
13	Other Workers	40692	Nos.
14	Literates population	96608	Nos.

*(**Source:** Census 2011)*

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4. ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 Details of investigated environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project

4.1.1 Impact Identification & Evaluation

In this chapter the environmental impacts associated with the proposed project are identified, characterized, and evaluated systematically. The impacts will be distinctly direct and indirect, positive and negative, reversible and irreversible. The prediction of impacts on various environmental parameters during pre-operational, operational, and post-operational activities assists in effective identification of mitigation measures to minimize the adverse impacts on environmental quality.

Once identified anticipated impacts are analyzed and evaluated based on available information, the method used for evaluating the overall importance of impacts is based on four fundamental criteria:

- Nature (positive or negative, and direct or indirect);
- Duration (temporary or permanent);
- Area extent (regional, local, or isolated); and
- Intensity (low, moderate, or high).

These criteria enable the determination of the overall importance or significance (low, moderate, or strong negative/positive) of each impact identified. Even if a particular evaluation is merely based on a value judgment rather than quantitative data that is not available, the methodology enables the establishment of acceptable levels and defines necessary mitigation and monitoring measures to minimize or eliminate.

The environmental impacts associated due to proposed project are classified into two phases and the possible impacts are assessed.

1. Impacts during construction phase
2. Impacts during operational phase

4.1.2 Impacts During Construction Phase

Activities during construction phase include site clearance, site formation, building works, infrastructure provision, and any other infrastructure activities.

4.1.2.1 Impact on Air Quality

The potential source of air quality impact arising from the establishment/construction of the proposed project is fugitive dust generation. The dust, measurable as Total Suspended Particulate Matter

(TSPM) and Respirable Suspended Particulate Matter (RSPM), would be generated as a result of construction activities.

The potential dust sources associated with the construction activities are loading and unloading of the materials, vehicular movement over unpaved roads, and wind erosion, etc. The possible construction activities that contribute to the environmental impacts broadly given below:

- Dust generation due to the movement of vehicles on unpaved roads
- Emission of pollutants from vehicular exhaust
- Unloading of raw materials and removal of unwanted waste material from site

The impact of the above activities would be temporary and will be confined within the project boundary.

Mitigation Measures

The impact of above mentioned activities would be temporary and will be restricted to the construction phase. The impact is generally confined to the project area and is expected to be negligible outside the plant boundaries. However, following mitigative measure will be taken to limit the environmental impact during construction phase:

- Regular water sprinkling will be done to avoid the dust entering into the atmosphere. During windy days, the frequency of water sprinkling will be increased.
- Temporary tin sheets of sufficient height will be erected around the project site as a barrier for dust control.
- Plantation of trees around the project boundary will be maintained.
- All the vehicles carrying raw materials will be covered with tarpaulin/plastic sheet.

4.1.2.2 Impact on Water Quality

The proposed project involves various construction activities and the impact on water quality associated with each of these construction activities are described below:

i) Site formation

The preparation of land required for the subsequent development activities generates a significant amount of construction waste. The site formation may produce large quantities of run-off with high suspended solids in the absence of appropriate mitigation measures. This potential problem will be intensified during rainy season.

ii) Construction of buildings

In rainy season, due to the construction of various civil structures, the site runoff results change in water quality in the receiving water bodies.

iii) Domestic wastewater

Domestic wastewater generated from temporary toilets used by the work.

Mitigation Measures

- Construction material will be stored at adequate distance from the water storage in order to prevent any chances of accidental leakage or spillage which could pollute the water storage
- Wherever required impervious lining will be provided to storage premises to avoid accidental mixing or mixing due to fugitive losses
- For runoff water guidance runoff routes will be provided and managed properly so the runoff could be collected and treated before release if serious contamination is observed.
- Spillage or leakage of construction material can lead to groundwater contamination and hence care shall be taken to minimise the chances of the Spillage or leakage of construction material.
- Construction materials like Ready Mix Concrete will be used to prevent impacts on water environment.

4.1.2.3 Impact on Noise Levels

The major activities, which produce periodic noise, during construction phase, are as follows:

- Foundation works
- Fabrication of structures
- Plant erection
- Operation of construction equipment
- Movement of vehicles

Mitigation Measures

The impact on noise environment can be made insignificant by adopting the following mitigative measures:

- Noise generating equipment will be used during day time.
- Where ever possible the noise generating equipment will be kept away from the human habitations.
- All the vehicles entering into the project will be informed to maintain speed limits, and not to blow horns unless it is required.
- The workers involved in operating major noise generating equipments will be provided with personal protective equipment like ear plugs/ear muffs etc.

4.1.2.4 Impact on Land Use

The proposed expansion will be carried out within the existing facility hence there will be no change in land use pattern.

4.1.2.5 Impact on Biological Environment

There are no identified migratory paths for major and minor wildlife in the project site and the study area. The identified fauna which are observed at the project site and in the study area are local migrants only. Therefore, the proposed project operations are not likely to have any adverse impact on the paths for avid-fauna.

4.1.2.6 Impact on Demography and Socio-Economics

The impact due to the proposed project on demography and socio economic conditions of the study area would be as follows.

- Employment opportunities for construction labourers, skilled and unskilled workers, etc
- Rapid growth of service sector will result in increase of incomes in the area
- More work to civil construction and transportation companies

4.1.3 Impacts During Operational Phase

The major areas identified to assess the environmental impact due to the proposed project are discussed as follows;

- Land Environment
- Air Quality
- Noise quality
- Water Resources and Water Quality
- Soil Quality, landscape and land use
- Ecology/Biodiversity
- Socio-economics

4.1.3.1 Impact on Land Environment

Since the proposed expansion will be carried out within the existing premises, and the site is located in Notified Industrial Complex, there will not be any change in land use pattern of the surrounding area.

4.1.3.2 Impact on Air Environment

Base line data reveals that ambient air quality in the study area for the Parameters PM_{10}, SO_2 & NO_x, are well within the permissible Limits as prescribed by the National Ambient Air Quality Standards (NAAQS) for Industrial Area, Residential, Rural & Other areas. The major air pollutant from the proposed activity is PM_{10}, SO_2 and NO_x emissions.

4.1.3.2.1 Meteorological Data

The meteorological data for a month, i.e. from 01/01/2023 to 31/03/2023 was considered for the study. Data included for AERMET were daily wind speed, wind direction, temperature, relative humidity, air

pressure, precipitation, and solar radiation recorded during the period. AERMET reformats meteorological data so that it can be used as input for AERMOD model. Meteorology considered for modelling is shown below.

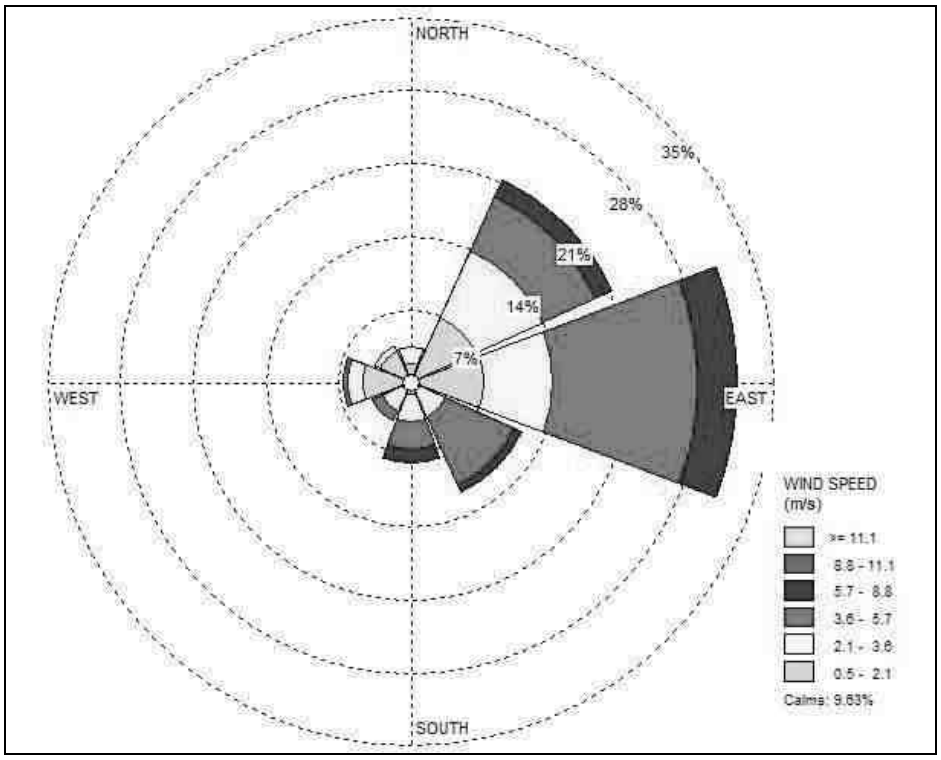


Figure 4-1 Wind rose diagram of Meteorological data considered for Modelling (Jan to March 2023)

AERMET Process

For the 3 phase AERMET processing of the meteorological data, specifications of the land use in the area are required to determine the terrain roughness for modelling. The land use was characterized for in and around the site. The surface characteristics for the site and surroundings were selected and used to calculate the Albedo, Bowen ratio and surface roughness parameters.

AERMOD Process

AERMOD Software Version 8.0.5 was used for air dispersion modelling and is applicable to a wide range of buoyant or neutrally buoyant emissions up to a range of 50 km. In addition to more straight forward cases, AERMOD is also suitable for complex terrain and urban dispersion scenarios.

AERMOD is a steady-state plume model. In the stable boundary layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (pdf). This behavior of the

concentration distributions in the CBL was demonstrated by Willis and Deardorff (1981) and Briggs (1993). Additionally, in the CBL, AERMOD treats "plume lofting," whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL AERMOD treats the enhancement of lateral dispersion resulting from plume meander.

The emissions from proposed stacks are estimated and used for the air dispersion modeling as shown in **Table 4-1** proposed emissions, respectively**.** Maximum incremental values for utility emissions of PM, SO_2 and NO_x have been represented as pictorial concentration contours in **Figure 4-2**, **Figure 4-3** and **Figure 4-4** and tabulated the concentration values in **Table 4-2**, **Table 4-3** and **Table 4-4**. Similarly, Maximum incremental values for line source of PM & NO_x and cumulative emissions of PM, SO_2 and NO_x is shown in **Figure 4-5**, **Figure 4-6** & **Figure 4-7** and **Figure 4-8** & **Figure 4-9** repectively. The concentration values for the same were tabulated in **Table 4-7**, **Table 4-8**, **Table 4-11**, **Table 4-12** and **Table 4-13**.

4.1.3.2.2 Emissions

Table 4-1 Emission from the proposed project Utility Stack Emission

S. No	Source	Fuel Type	Additional Fuel Quantity (TPD)	Stack Details						Emission(g/s)		
				No. of stacks	Height (m)	Dia (m)	Temp (°C)	Exit velocity (m/s)	Flow rate (Nm^3/hr)	PM	SO_2	NO_X
1	35TPH Boiler	Coal	131.25	1	65	2.5	130	8	94,861	0.1148	8.8867	6.8359
2	60TPH Boiler	Coal	168.75	1	75	2.5	129	7.64	90,818	0.1477	11.4258	8.7891
Total										**0.2625**	**20.3125**	**15.6250**

Note:

1. The existing boiler will be used for the increased quantity of fuel.

2. ESP is connected to the boiler (to control PM control only).

Source:

1. *Emission reference: AP-42: Compilation of Air Emissions Factors (USEPA)*

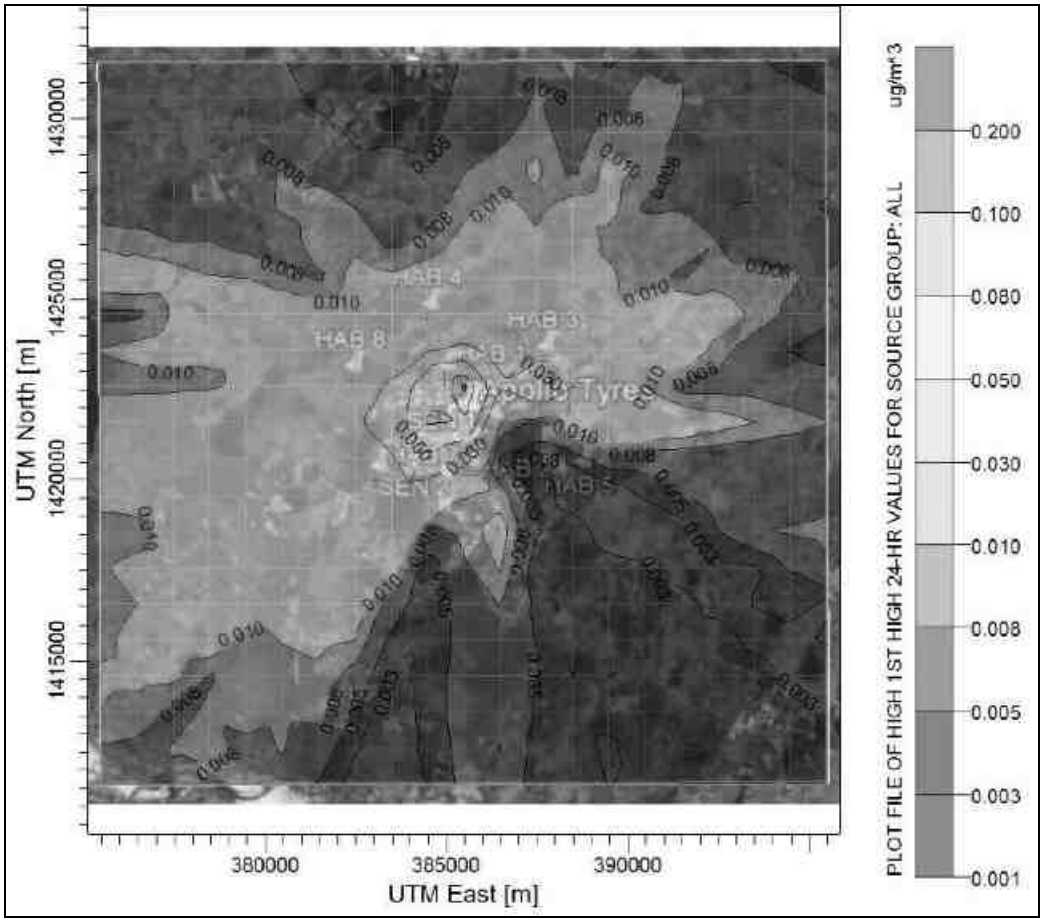


Figure 4-2 Predicted 24-Hrs' GLC's of PM within 10 km Radius of the Study Area

Table 4-2 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations PM_{10}

S. No	Name of the Receptor		UTM coordinates (m)		Conc. ($\mu g/m^3$)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	385479	1422598	0.10431	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	0.07515	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	0.013	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	0.01887	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	0.01647	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.00167	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.01157	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	0.02333	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	0.02029	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	0.01411	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	0.03234	1.6	SW

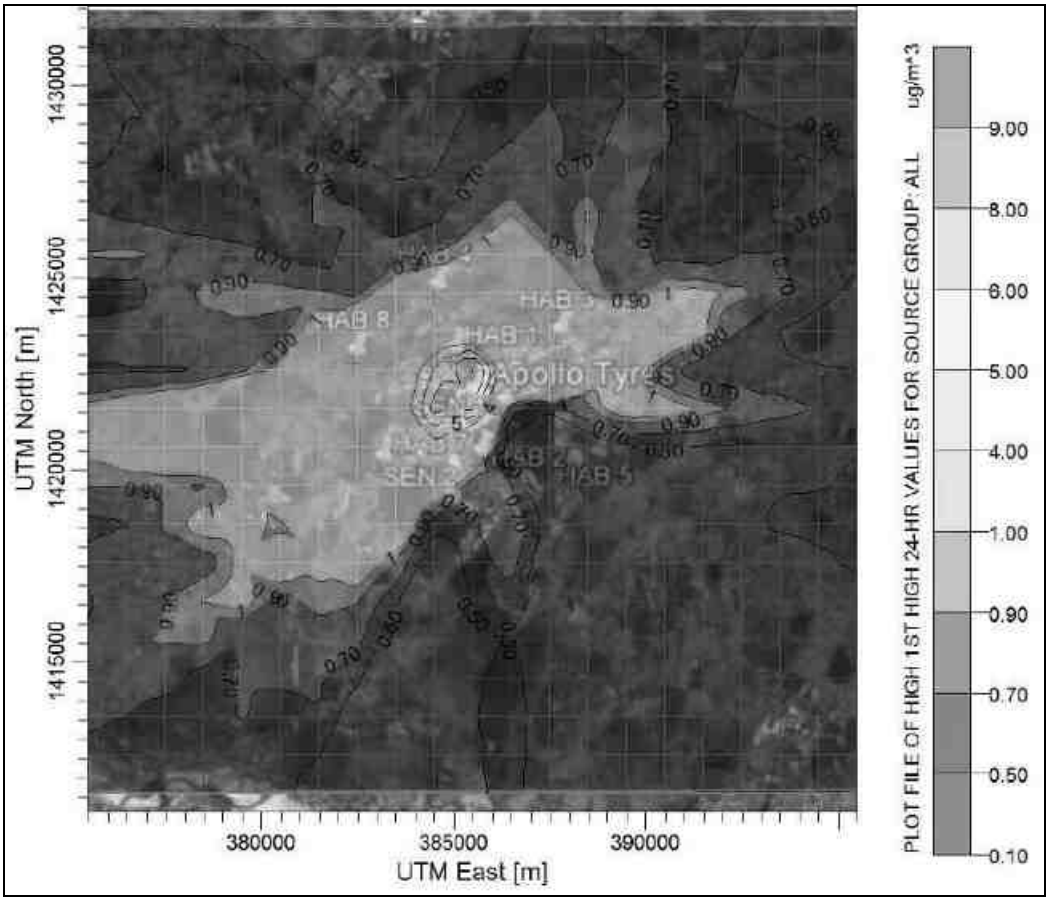


Figure 4-3 Predicted 24-Hrs' GLC's of SO_2 within 10 km Radius of the Study Area

Table 4-3 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations SO_2

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	385479	1422598	8.0717	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	5.81559	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	1.00615	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	1.46041	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	1.27462	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.12904	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.89524	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	1.80524	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	1.56988	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	1.09218	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	2.50275	1.6	SW

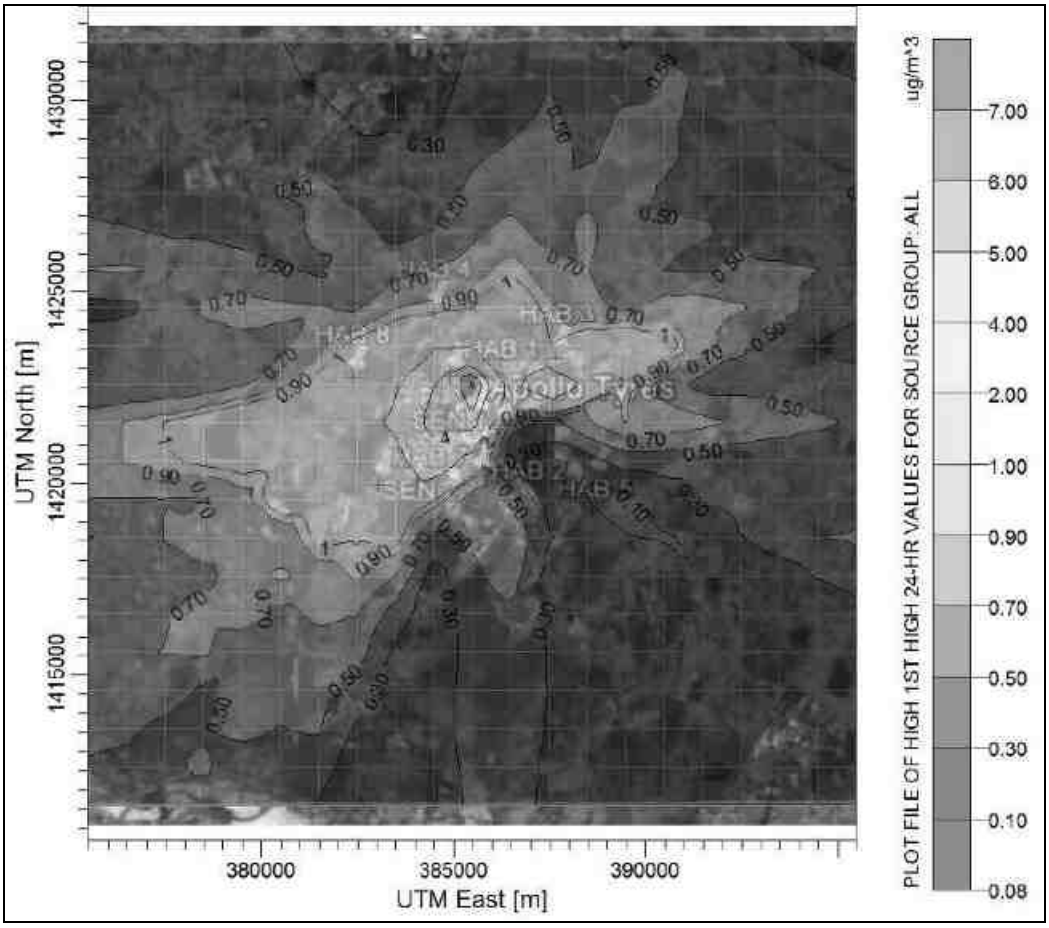


Figure 4-4 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-4 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations NO_X

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	385479	1422598	6.209	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	4.47353	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	0.77396	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	1.12339	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	0.98048	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.09926	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.68865	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	1.38865	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	1.2076	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	0.84014	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	1.92519	1.6	SW

Conclusion

Maximum pollutant concentrations of PM, SO_2 and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in **Table 4-5**.

Table 4-5 Total Maximum GLCs from the Stack Emissions

Pollutant	Max. Base Line Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard
PM10	83.09	0.10	83.19	100
SO_2	15.97	8.07	24.04	80
NO_x	31.94	6.20	38.14	80

4.1.3.2.3 Line Source

Table 4-6 proposed project transportations emission

S. No	Type of Vehicle	No.of.Vehicle	Emission (g/s)	
			PM	NO_X
1	Truck	20	5.56E-04	2.56E-02
Total			5.56E-04	2.56E-02

Source:

Indian Emission Regulations by the Automotive Research Association of India

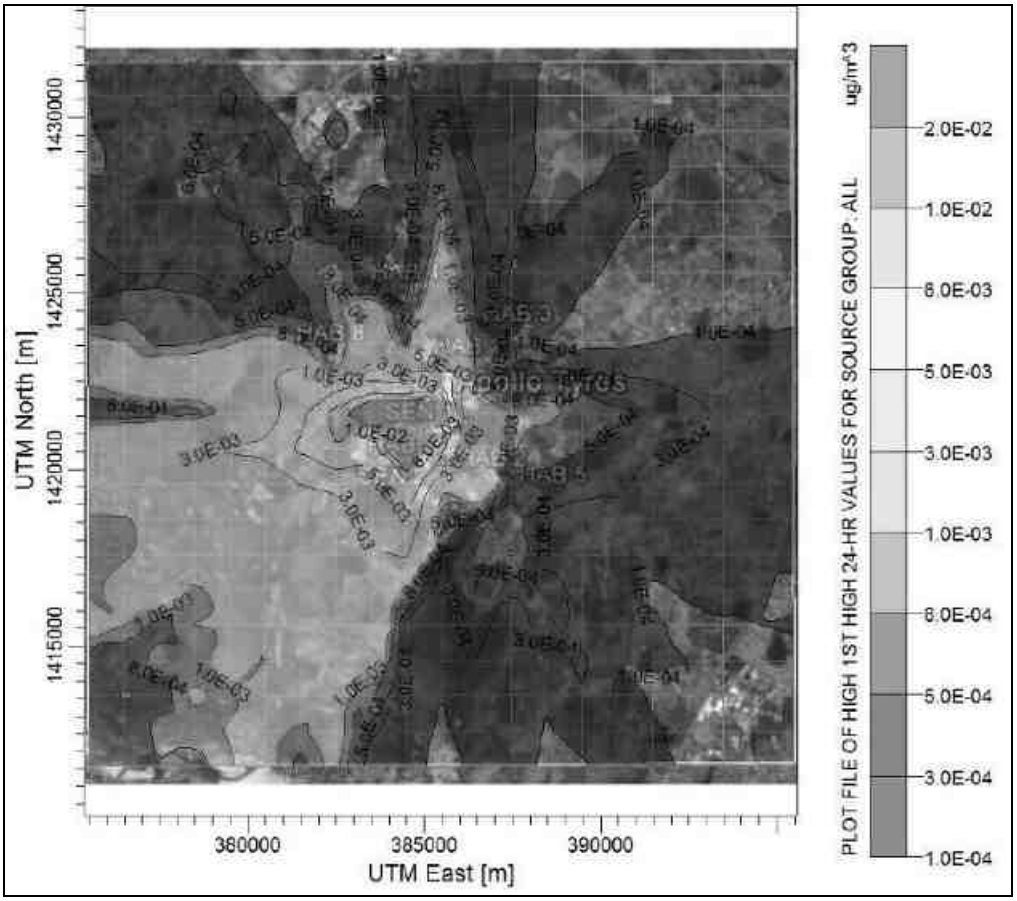


Figure 4-5 Predicted 24-Hrs' GLC's of PM within 10 km Radius of the Study Area

Table 4-7 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations PM_{10}

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	384479	1420598	0.01602	1.41	SW
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	0.00234	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	0.00267	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	0.00025	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	0.00041	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.0005	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.00087	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	0.00437	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	0.0008	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	0.00152	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	0.00631	1.6	SW

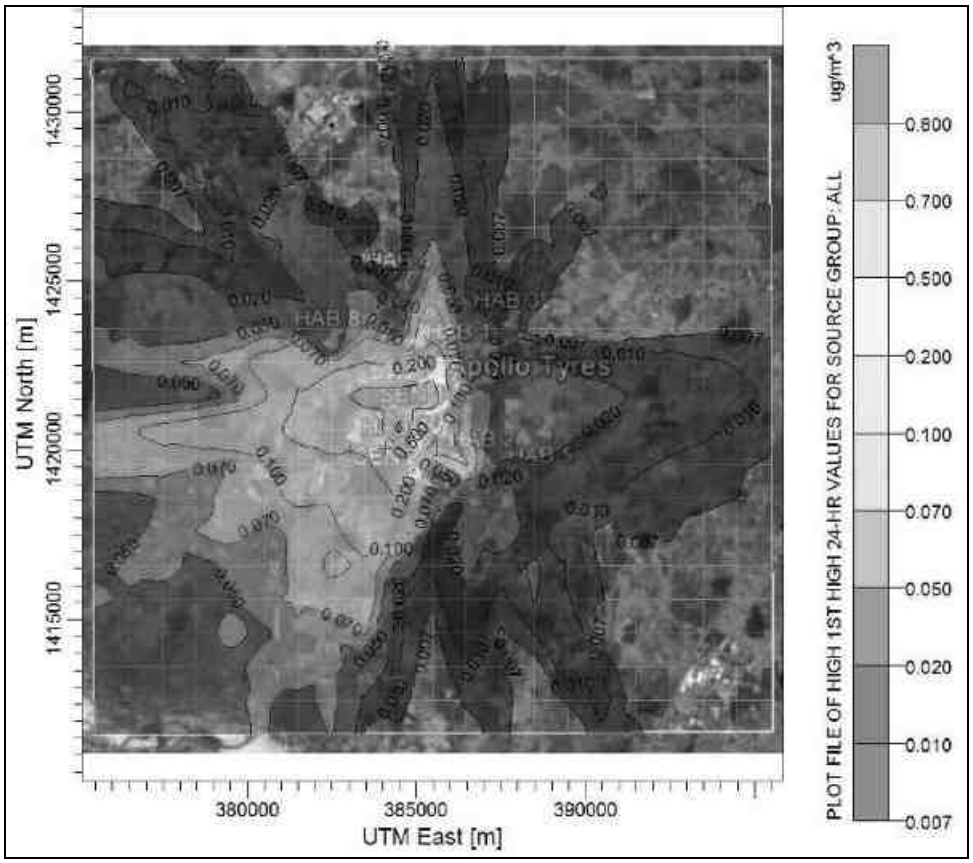


Figure 4-6 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-8 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations NO_X

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	384479	1420598	0.73767	1.41	SW
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	0.10782	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	0.12311	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	0.01169	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	0.01893	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.02312	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.04023	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	0.20103	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	0.03698	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	0.06981	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	0.29036	1.6	SW

Conclusion

Maximum pollutant concentrations of PM and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in **Table 4-9.**

Table 4-9 Total Maximum GLCs from the Transportations Emissions

Pollutant	Max. Base line Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard (µg/m^3)
PM_{10}	83.09	0.01	83.1	100
NO_x	31.94	0.73	32.67	80

4.1.3.2.4 Cumulative

Table 4-10 Proposed project Stack & Transportations Emission (Cumulative)

S. No	Source	Fuel Type	Fuel Quantity (TPD)	Stack Details						Emission (g/s)		
				No. of stacks	Height (m)	Dia (m)	Temp (°C)	Exit velocity (m/s)	Flow rate (Nm^3/hr)	PM	SO_2	NO_X
1	35TPH Boiler	Coal	131.25	1	65	2.5	130	8	94,861	0.1148	8.8867	6.8359
2	60TPH Boiler	Coal	168.75	1	75	2.5	129	7.64	90,818	0.1477	11.4258	8.7891
Transportations												
S. No	**Type of Vehicle**	**No.of.Vehicle**								**PM**	**SO_2**	**NO_X**
1	Truck	20								5.56E-04	-	2.56E-02
Total										**0.2631**	**20.3125**	**15.6506**

Note:

1. The existing boiler will be used for the increased quantity of fuel.

2. ESP is connected to the boiler (to control PM control only).

Source:

1. Emission reference: AP-42: Compilation of Air Emissions Factors (USEPA)

2. Automotive Research Association of India (ARAI)

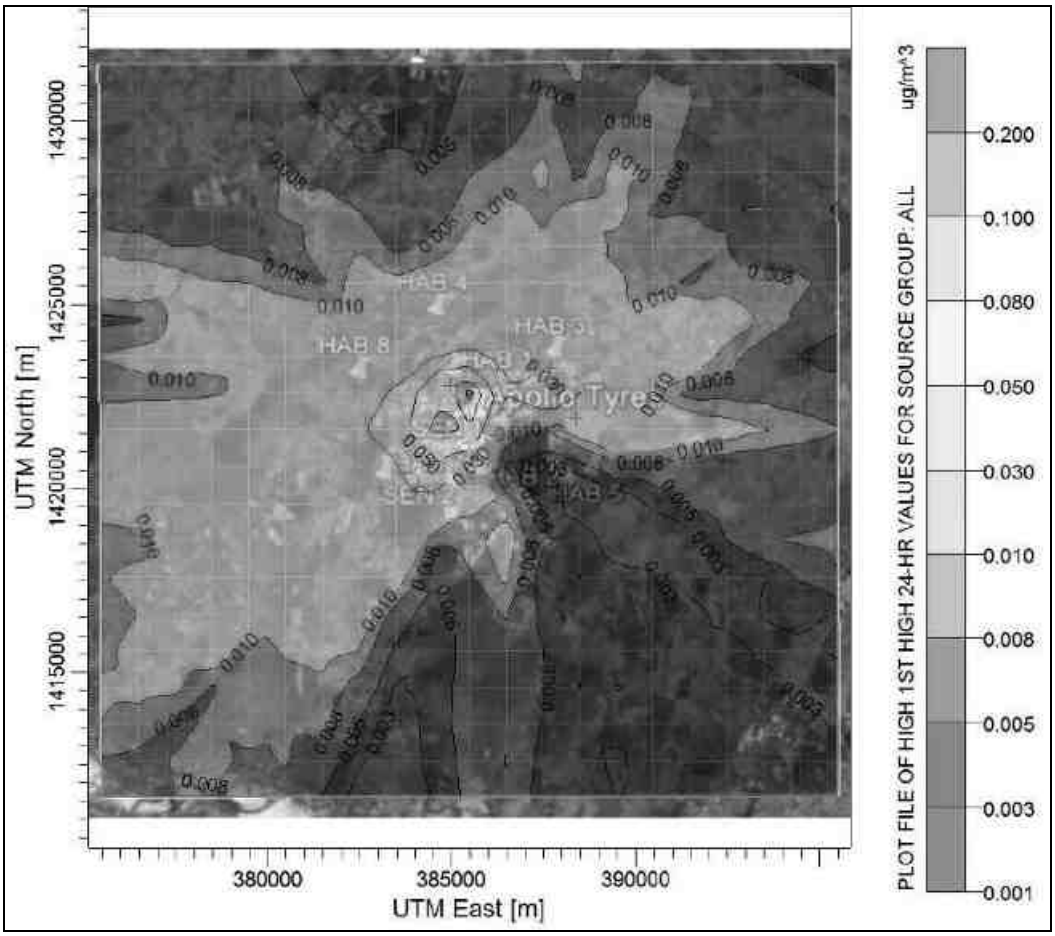


Figure 4-7 Predicted 24-Hrs' GLC's of PM within 10 km Radius of the Study Area

Table 4-11 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations

PM_{10}

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc	385479	1422598	0.1064	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	0.07621	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	0.01317	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	0.01899	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	0.01654	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.00167	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.01184	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	0.02348	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	0.02064	2.55	WNW
Sensitive Area							

10	Vattambakkam RF	SEN 1	386227.92	1421441.21	0.01411	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	0.0327	1.6	SW

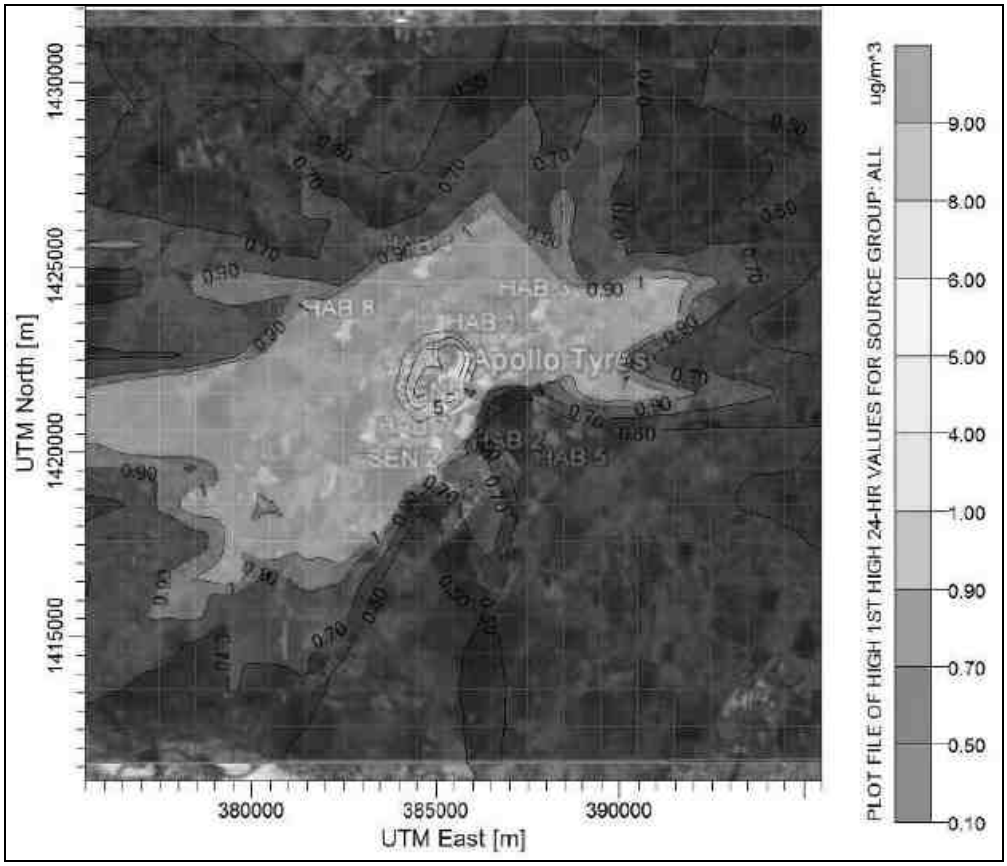


Figure 4-8 Predicted 24-Hrs' GLC's of SO_2 within 10 km Radius of the Study Area

Table 4-12 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations SO_2

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	385479	1422598	8.0717	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	5.81559	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	1.00615	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	1.46041	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	1.27462	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.12904	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.89524	2.34	E
8	Kandigai	HAB 7	383052.07	1419976.83	1.80524	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	1.56988	2.55	WNW

Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	1.09218	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	2.50275	1.6	SW

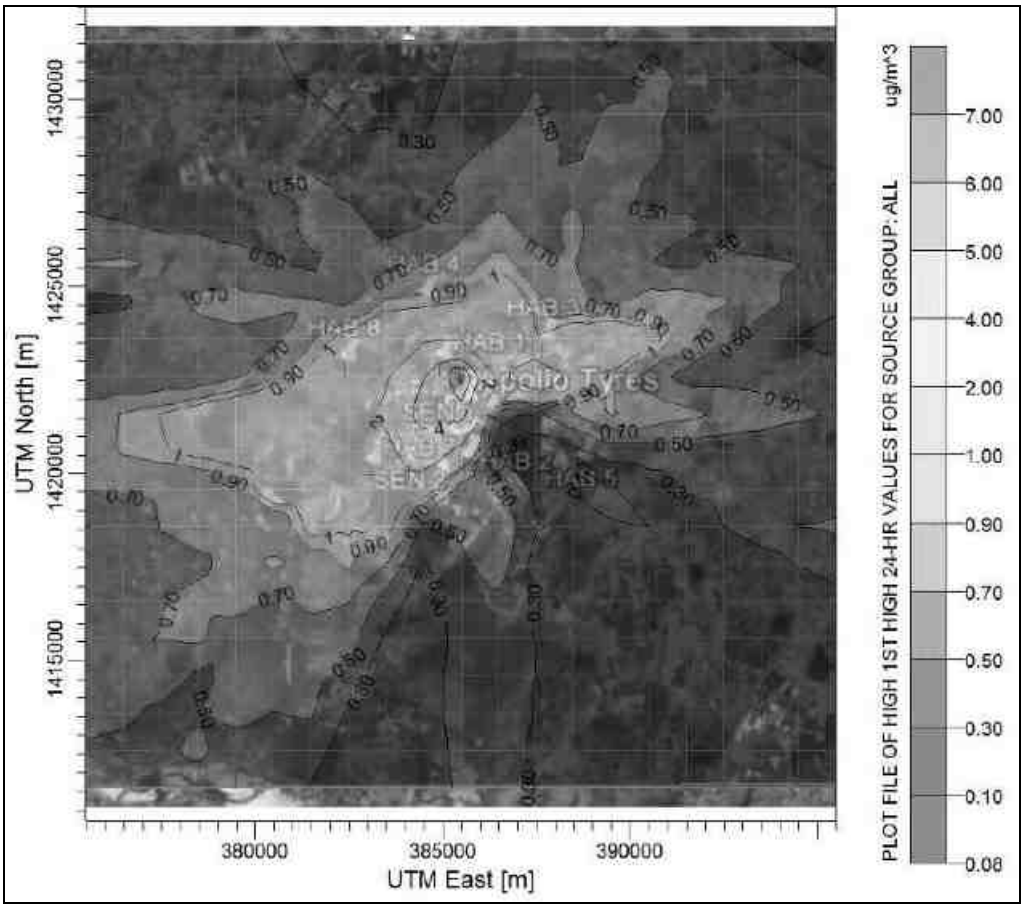


Figure 4-9 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-13 Predicted Highest, Habitation receptors and Sensitive receptors Concentrations NO_X

S. No	Name of the Receptor		UTM coordinates (m)		Conc. (µg/m^3)	Distance from Centre of the project (~km)	Direction from project Centre
	Description	As per contour	E	N			
Highest Concentration for Study Area							
1	Max.conc.	Max.conc.	385479	1422598	6.30525	1	N
Habitation Area							
2	Mattur	HAB 1	384924.04	1422794.45	4.52223	0.63	N
3	Oragadam	HAB 2	385606.65	1420119.35	0.78183	0.95	S
4	Vaipur	HAB 3	387669.24	1423278.2	1.12881	2.16	ENE
5	Vallakkottai	HAB 4	384486.3	1424468.82	0.98351	2.23	NNW
6	Vattambakkam	HAB 5	388653.27	1420070.03	0.09926	2.56	ESE
7	Panappakkam	HAB 6	388362.37	1421921.91	0.70131	2.34	E

8	Kandigai	HAB 7	383052.07	1419976.83	1.39572	2.38	WSW
9	Mettupalaiyam	HAB 8	382374.92	1422754.32	1.22405	2.55	WNW
Sensitive Area							
10	Vattambakkam RF	SEN 1	386227.92	1421441.21	0.84014	0.42	E
11	Vadakkuppattu RF	SEN 2	384095.5	1420055.38	1.94156	1.6	SW

Conclusion

Maximum pollutant concentrations of PM, SO_2 and NO_x observed due to proposed Expansion for an 24hr-average period have been studied. The total increase in concentrations above baseline status to estimate the percentage increase and summarized in **Table 4-14**.

Table 4-14 Total Maximum GLCs from the Stack & Transportations Emissions

Pollutant	Max. Base line Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard (µg/m^3)
PM_{10}	83.09	0.1	83.19	100
SO_2	15.97	8.07	24.04	80
NO_x	31.94	6.3	38.24	80

4.1.3.2.5 Impacts due to Traffic and Transportation

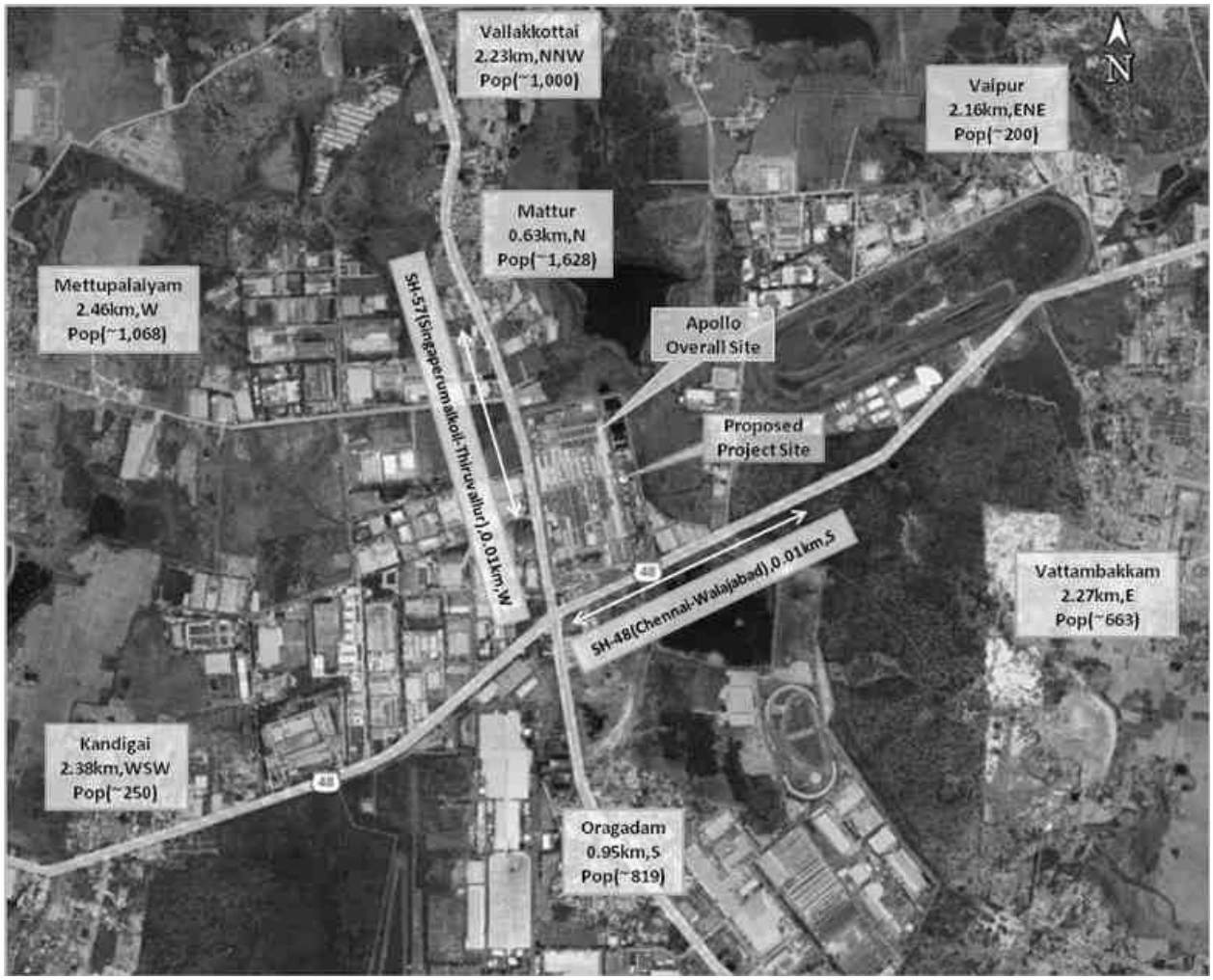


Figure 4-10 Google image of road connectivity to the project site

The vehicular movement for the proposed project is given in **Table 4-15**.

Table 4-15 Existing & proposed vehicular movement per day

S. No	Type of Vehicle	Existing vehicles	Existing PCU	Proposed vehicles	Proposed PCU	Total vehicles after project implementation	PCU Factors IRC (SP 41)	Total PCU after project implementation
1	2 wheeler	1258	944	0	0	1258	0.75	944
2	3 wheelers	850	1700	0	0	850	2	1700
3	4 wheelers/ cars	4874	4874	0	0	4874	1	4874
4	truck/Lorry	2485	9195	20	74	2505	3.7	9269
5	agricultural	87	435	0	0	87	5	435

S. No	Type of Vehicle	Existing vehicles	Existing PCU	Proposed vehicles	Proposed PCU	Total vehicles after project implementation	PCU Factors IRC (SP 41)	Total PCU after project implementation
	tractor							
6	light emission vehicle	1987	3974	0	0	1987	2.0	3974
Total		**11541**	**21121**	**20**	**74**	**11561**	**-**	**21195**

Table 4-16 Traffic Volume after Implementation of the Project

For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification
Existing	11541	21121	35000	0.60	"C"	Restricted Flow
After implementation	11561	21195	35000	0.61	"C"	Restricted Flow

*LOS (Level of Service) categories are A-Free Flow, B- Stable Traffic Flow, C- Restricted Flow, D- High Density Flow, E- Unstable flow, F- Forced or breakdown flow.

Table 4-17 Categories of LOS

S. No.	Level of Service	V/C	Classification
1	A	<0.35	Free Flow Traffic
2	B	0.35 - 0.55	Stable Traffic flow
3	C	0.55 - 0.77	Restricted Flow
4	D	0.77 - 0.92	High Density Flow
5	E	0.92 - 1.0	Unstable Flow
6	F	>1.0	Forced Traffic Flow

After implementation of the proposed project, the traffic volume will remain same as restricted flow.

4.1.3.3 Impact on Noise Levels

- Noise generation sources during operation phase are classified into two categories:
    a. Stationary sources due to operation of heavy duty machineries at the project site like Boilers, Cooling towers, Process Air Compressor etc.
    b. Mobile sources corresponding to mainly vehicular traffic for staff mobilization, materials, material transportation, etc.
- Noise can be expected to generate by various activities associated with the project during operational phase.
- Transportation of raw material will increase the movement of trucks which in turn will increase the noise level.
- The impact of noise beyond the site would be negligible during normal operation phase.

- However, the impacts on workers engaged in the plant area would be considerable due to occupational exposure.

4.1.3.4 Impacts on Water Environment

- During construction phase, spillage or leakage of construction material can lead to groundwater contamination.
- The total wastewater generated from the existing unit is 146.5 KLD and 7 KLD of sewage.
- Effluent from the process and fugitive loss of wastewater can accidently contaminate the ground water and surface water.
- However, no adverse impacts due to the proposed expansion project on the water environment are envisaged.

4.1.3.5 Impacts on Soil

During operation phase, various types of solid waste are likely to be generated which can be broadly categorized as Hazardous Waste and Non-hazardous Waste. Further, the generated solid waste generation may include biodegradable, recyclable and inert compounds. The details of solid waste generation and its management proposed are discussed in **Chapter 2**, **Section 2.9.4.** If the solid waste generated is not properly managed and disposed in unauthorized manner, it will impact on soil quality, groundwater and air quality.

4.2 Measures for Minimizing and / or Offsetting Adverse Impacts Identified

4.2.1 Mitigation Measures during Construction phase

4.2.1.1 Land Environment

- The unused construction material will be stored in proper area to utilise further in construction activities and surplus excavated material shall be disposed of in suitable pre-identified areas.
- It is suggested that the construction waste containing sand, brick, gravel, cement etc. will be used for filling or PCC for construction of internal road or project structures.
- Storage & handling of construction materials will be done properly to avoid spillage or leakage which may cause release of the material in environment causing adverse impacts.
- Appropriate designed closed & properly lined storage area will be provided for storage of construction materials to prevent land/soil contamination.

4.2.1.2 Water Environment

- Construction material will be stored at adequate distance from the water storage in order to prevent any chances of accidental leakage or spillage which could pollute the water storage

- For runoff water guidance runoff routes will be provided and managed properly so the runoff could be collected and treated before release if serious contamination is observed.
- Spillage or leakage of construction material can lead to groundwater contamination and hence care shall be taken to minimise the chances of the Spillage or leakage of construction material.
- Construction materials like Ready Mix Concrete will be used to prevent impacts on water environment.

4.2.1.3 Air Environment

- To reduce the dust generation on site wherever & whenever required water will be sprinkled on ground or stock pile of excavated soil.
- Equipments / machineries will be used efficiently and shall be kept shut in order to reduce air emission, noise pollution and consumption of energy resource
- Transport vehicles will be monitored & maintain regularly to control the emission quality and fuel consumption
- Construction materials would be stored in covered stores or enclosed spaces to prevent chance of airborne construction materials which can lead to air pollution of local area.
- Regular inspection of construction site will be carried out to ensure regular and timely removal of construction debris to the dumping sites or for recycle/reuse.
- Provision of necessary PPEs like face mask & eye-glasses are provided to employees /labours engaged in construction activities

4.2.1.4 Noise Environment

- The machineries/equipment used on site will be of highly maintained so they do work with optimum efficiency generating less noise pollution
- Operation of machineries/equipment causing high noise level will not be operated during the night time and all such operations shall be planned for day time only.
- The vehicles engaged in construction activities & transportation of materials will be equipped with the horn of low noise level as recommended by RTO/concern authority to avoid impacts on noise level. Further, adequate silencers must be attached with all vehicles to reduce the noise.
- Construction vehicles, equipments & machinery will be turned off when not in use.

4.2.1.5 Biological Environment

- Construction premises shall be kept only on-site basis in order to limit the biological damage.
- Regular monitoring shall be done to avoid and/or locate any hazards to natural habitats.
- Minimize contamination of each parameter such as air, water etc in order to maintain the biological balance of the site and adjoining region.

- Upmost care needs to be taken with the use of natural resources of site because considerable destruction or bio-magnification of contamination can occur due to the imbalance of the habitats
- Ecological protection plan like greenbelt development shall be formulated and implemented in the very inception of the construction activity.

4.2.1.6 Impact on Socio-Economic

1 Increase in employment opportunities and reduction in migration to outside for employment.
2 Increase growth in service sector
3 Improvement in socio cultural environment of the study area.
4 Improvement in transport, communication, health and educational services.
5 Increase in employment due to increased business, trade and commerce and service sector.

The overall impact on the socio economic environment will be beneficial.

4.2.2 Mitigation Measure during Operation phase

4.2.2.1 Land Environment

The proposed expansion will be carried out within the existing facility hence there will be no change in land use pattern.

4.2.2.2 Water Environment

Various mitigation measures are proposed to minimize the impact on the water environment due to the wastewater/runoff generation during the operation phase of the project. Treatment of sewage and effluent to ensure Zero Liquid Discharge and reusing treated effluent for utilities and treated sewage for green belt development.

Effluent Management:

Table 4-18 Effluent generation details

S. No	Details	Existing (KLD)	Proposed (KLD)	After expansion (KLD)	Disposal Method
1	RO Reject	67.5	12.5	80.0	The generated effluent is being treated in RO followed by MEE of existing ETP capacity of 1100 KLD (300KLD X3; 200 KLD X 1) and the same will be followed after the expansion. In addition, ZLD is being followed, and the same will be followed after expansion as well.
2	DM Plant regeneration	20.5	-12.5	8.0	
3	Auxiliary Cooling Blow Down	24.0	2.0	26.0	
4	Boiler Blow Down	34.5	10.5	45.0	
Total		**146.5**	**12.5**	**159.0**	

The schematic diagram of process flow of ETP is enclosed as **Annexure - 16.**

Sewage Management:

Table 4-19 Sewage generation details

S. No	Details	Sewage (KLD)	Treatment Unit capacity (KLD)	Disposal
1	Existing	7	350 (2X100 and 1X150)	The generated sewage is being treated in existing combined STP of capacity 350 KLD and the same will be followed after expansion. The treated water is being used for greenbelt development.
2	Proposed	0.75		
3	After expansion	7.75		

The schematic diagram of process flow of STP is enclosed as **Annexure - 17.**

Mitigation Measures:

- The operational set up will be kept leak proof at all the times to reduce consumption of water
- 70% recycling is being practiced on regular basis to reduce the quantity of freshwater intake and the same will be followed after expansion.
- The treated wastewater after confirming the prescribed norms will be reused for greenbelt development, as required.
- Rain water harvesting program also being implemented for conservation of water.

4.2.2.3 Air Environment

- The sources of emission are the boilers coal crushing, coal loading and unloading, and process. However, Electrostatic Precipitator is provided with adequate stack height of 75m from ground level along with the ash handling system.
- Fugitive emissions from the coal crusher and coal transporation is being prevented using bag filter and enclosed system / belt transfer system respectively. These control measures will be carried out after expansion as well.
- Regular monitoring of the ambient air is being carried out and the same will be followed after expansion.
- The fly ash generated from the process is being collected in the storage silo and disposed to the authorised brick manufacturer by truck covered in tarpaulin and the same is proposed to follow after expansion.
- Monitoring of emission as per Environmental Monitoring Plan and records will maintain for further review & improvement in EMP as well as Air Pollution Control Activities/ Technologies
- Emission level will be maintained below permissible limits prescribed by concern environmental authority.

- The greenbelt is developed for 24.66% of the total plant area including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87% which will act as the absorbent of air emissions.
- The record of the monitoring programs & measured quality will be maintained regularly.

4.2.2.4 Noise Environment

The noise due to the operation of the proposed project will have only marginal impact on the baseline noise levels by adopting the following noise control Measures:

- Properly designed plant and machinery (i.e. by providing inbuilt mechanisms like silencers, mufflers, and enclosures for noise generating parts) and shock absorbing pads at the foundation of vibrating equipment will be provided.
- In the high noise intensity working areas/zones ear muffs or ear plugs or any other suitable personal protective equipment would be provided to the workmen.
- Provision of isolation for major noise generating equipments.
- Regular noise level monitoring would be carried out for taking corrective action, wherever required.
- The steam turbine generator would be housed in closed buildings, which would considerably reduce the transmission of noise from the generators to outside environment. The inlet air and exhaust gas streams would be provided with silencers for noise reduction.

4.2.2.5 Solid Waste Management

- The municipal solid waste from the domestic use is being disposed to the Municipal authorized bin and the same will be followed after expansion.
- Since the industry following ZLD process, the sludge from wastewater treatment plant is being utilised in the ETP and STP process.
- Hazard waste would be generated from the process, maintenance activity and wastewater treatment plant. These wastes are being stored in the hazardous waste storage area and disposed to TSDF.
- The storages area of any kinds and production unit will be lined properly to ensure impervious lining to prevent seepage of chemical in soil.
- Immediate action shall be taken upon first reporting of incident of spill/leak of chemical material
- Emergency actions will be taken by responsible personnel as per guidelines provided in specific Emergency Response Protocol for spilled/leaked chemical.
- The Proponent will maintain necessary records & documents of Hazardous waste management/disposal as per MoEF/ CPCB guidelines.

4.2.2.6 Biological Environment

Due to the pollution such as air emissions, wastewater and solid waste, there may be a negligible impact on the biological environment, since the mitigation measures will be strictly followed to avoid impact on the environment.

Since the project is proposed in the existing facility, there is no removal of trees and vegetation is involved. Additionally, the study area does not contain any eco sensitive zone. Hence, there will not be adverse impact on the ecology and biodiversity.

4.3 Irreversible and Irretrievable Commitments of Environmental Components

Irreversible commitments of resources are those which cause either direct or indirect use of natural resources such that the resources cannot be restored or returned to their original condition. An irreversible or irretrievable commitment of environmental components refers to impacts due to proposed project activities on various environmental components that cannot be recovered or reversed

Material and energy resources committed for the unit would include construction materials (e.g., steel, concrete) and fuels (e.g., coal and rice husk). All energy used during construction and operation would be irreversible and irretrievable.

During transportation & utility operation, fossil fuels like coal will be consumed which is irretrievable but can be minimized by adopting sophisticated technology.

4.4 Mitigation Measures of the Project

The emissions from coal transportation, storage, burning etc have been assessed and mitigation measures for the same are given below;

- The sewage of 7.75 KLD is being routed to the existing combined STP (capacity: 150KLD X 1, 100KLD X 2) which is common to R&D plant, power plant and main tyre plant.
- The generated effluent of 146.5KLD is being treated in the existing combined ETP (capacity: 300KLD X 3 & 200KLD & 1) which is common to R&D plant, power plant and main tyre plant. After expansion, 159 KLD of effluent will be treated in the same existing combined ETP facility and will maintain the ZLD process.
- If contaminated, proper expertise will be brought to schematize the various recharge mechanism to reduce or nullify the impact effects.
- **Solid and Hazardous waste:** The wastes generated will be stored in temporary storage facility and transferred to nearby Treatment, Storage and Disposal

Facility (TSDF) and also to the approved vendors of State Pollution Control Board (SPCB) landfill and Co-processing.

- These waste will be segregated & stored and will be disposed off by giving it to the TNPCB authorized dealers/recyclers/TSDF within a stipulated period of time (90 days).
- Hazardous waste will be disposed to TNPCB authorized TSDF/recyclers as applicable.
- The project site is surrounded by the existing greenbelt of 24.66%. Additionally 8,312 no of trees were developed as proposed greenbelt in 16.55 acres, adjacent to the site. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.

Table 4-20 Mitigation measures of the project

S. No	Source of emission	Prevention and control measures
1	Coal transportation	1. Transportation of coal will be by road and all equipment will be maintained properly to meet the norms.(By the vendor) 2. Maintenance and monitoring of this equipment will be strictly adhered to as per the preventive maintenance schedule of the plant. 3. The trucks will be covered with tarpaulin sheets to prevent the coal ash from spilling / creating air pollution nuisance. 4. A green belt will be developed all around the plant boundary and also along the roads to mitigate fugitive & transport dust emission
2	Coal loading and unloading	1. All handling & transport will be exercised in totally covered and enclosed containers/belt transfer system.
3	Emission from coal storage yard	1. Emissions from coal yard will be reduced by sprinkling water. 2. A centralized control room with latest microprocessor based control system will be provided for safe and reliable operation of this system. 3. TNPCB guidelines for coal handling units will be followed. 4. Sprinkling of water will be applied at the dust generating areas.
4	Coal crushing and screening	1. Coal dust generated while crushing & screening is collected through dust extraction system. 2. Adequate dust suppression/extraction system at crusher house as well as for the coal stock yard will be provided to abate dust nuisance.
5	Ash Handling	Collected ash from ESP conveyed to ash storage vessel thorough pipelines & fly ash disposed through truckers.

CHAPTER – 5

ANALYSIS OF ALTERNATIVE (TECHNOLOGY & SITES)

5. ANALYSIS OF ALTERNATIVE (TECHNOGY & SITES)

5.1 Site Selection

Due to the need increased in the power requirement, ATL is proposed to set up a "Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW" additional to the existing 4.6 MW power plant. The Components of existing Co-generation plant has the AFBC boilers of capacity 35TPH and 60TPH, 4.6MW turbine and compressors. In addition to the above, for the proposed project, turbine of capacity 10MW with suitable Air Cooled Condenser will be installed with the existing facility.

The criterion for site selection also included the below mentioned points:

- The project site to be suitable from feasibility of power evacuation point of view since it is situated just next to the manufacturing unit.
- The project site shall require minimum displacement of habitation and away from the habitation area. As it is located inside the SIPCOT industrial area, there is no habitation present inside the project area.
- The project site to be closer to highway with hindrance free approach for transportation of heavy equipment and the required fuel i.e. coal.
- The land allotted for the project site is flat and stable to increase its resistance against any natural disturbances like earthquake.
- The project site is above the flood level and thus will avoid any accident in case of any severe flooding from the nearby pond.
- The project site is free from any environmental restrictions like forest, natural parks; wild life sanctuaries as is present in the government approved and Government notified Industrial Park (SIPCOT).
- The project does not involve any displacement of local residents as it is located inside the campus of the existing tyre manufacturing unit.

5.2 Project Alternative

The purpose of having a captive power plant at Apollo Tyres site at Oragadam is to reduce the cost on buying power from the Tamil Nadu grid and also reduce the already existing stress on the district power supply. Thus such a project would help reduce stress on the power deficient condition of the state of Tamil Nadu. Also, transmission and distribution losses continue to remain a problem throughout the country, which is not the case in captive power plants. Moreover Oragadam being an industrial area, a captive power plant for this Apollo tyre project will avoid usage of power for the other smaller industries in the area, along with safeguarding power supply for the localities. The

project being a co-generation project, envisages utilization of steam for both power production as well as steam consumption for process requirements. Consequently, thermal energy is utilized more efficiently than a conventional power plant. Therefore, the 'no project' alternative is considered to be less advantageous.

5.3 Site Alternatives

The project is adjacent to the existing tyre plant in the Oragadam SIPCOT. SIPCOT is providing the water requirement for the project, and the land is already available next to the tyre manufacturing unit. Being a captive power plant, the same has to be located close to the site. Considering the fact that the power plant is a co-generation power plant, requiring supply of steam to the main plant, in addition to supply of power, the plant must necessarily be located adjacent to the mother plant to avoid transportation of steam across longer distances. Locating the plant adjacent to the site also leads to the elimination of any transmission and distribution losses and avoids additional land acquisition for laying the transmission and distribution lines for evacuating power. Consequently offsite location of the power plant has not been proposed, and the site next to the tyre unit is proposed.

5.4 Fuel Alternatives

A wide variety of fuels can be used for power plants including wind, coal / lignite, gas, hydro, nuclear and other hydrocarbons. Looking at the project requirements (a small, captive power plant with co-generation facilities for a continuous load application) wind, hydro and nuclear options get annulled. Gas is not easily available in the area, whilst coal is easily importable through the Chennai Port. Considering the same, coal (imported) has been selected as fuel for the power plant.

5.5 Technology alternatives

The thermal power plant option selected is a co-generation thermal power plant with Atmospheric Fluidized Bed Combustion (AFBC) boilers.

a) Conventional Method of Power Generation

The conventional method of power generation and supply to the user is wasteful in the sense that only about a third of the primary energy fed into the power plant is actually made to available to the user in the form of electricity. In conventional power plants, efficiency is only 35% and remaining energy is lost as heat through the stack or condenser water. The major loss in the conversion process is the heat rejected to surrounding water or air due to the inherent constraints of the different thermodynamic cycles employed in power generation.

b) Co-generation

Co-generation is the merging of a system designed to produce electric power and a system used for producing industrial heat and steam for industrial processes. This system is a more efficient way of

using energy inputs and allows the recovery of otherwise wasted thermal energy for use in an industrial process. In addition, the electricity generated by the co-generation plant is normally used locally, leading to negligible transmission and distribution losses. It is an accepted fact that co-generation therefore offers energy savings ranging between 15-40% when compared against the supply of electricity and heat from the power stations and boilers. Its long term future in the global energy markets is secured by its ability to provide operational, financial and environmental benefits from to a single unit of a fuel. The following benefits arise as co-generation is a well proven technology, recognized world over as a cleaner alternative to traditional centralized generation:

- Base load electrical supply
- Security of supply
- Increased diversity on heating and hot water
- Steam raising capabilities

Considering the above points, Apollo Tyres Ltd has selected co-generation as its chosen power generation option over a conventional option.

CHAPTER – 6

ENVIRONMENTAL MONITORING PROGRAM

6. ENVIRONMENTAL MONITORING PROGRAM

6.1 Technical Aspects of Monitoring the Effectiveness of Mitigation Measures

6.1.1 Introduction

The primary aim of environmental monitoring program is to formulate a systematic, site-specific plan for monitoring the environmental parameters within the impact area, during and after commissioning of the project, which would aid in assessing the effectiveness of mitigation and environmental protection measures implemented for the proposed project based on the existing environmental scenario and probable environmental impacts appraisal.

The plan framed for the intended facility will describe:

- The details of the proposed mitigation measures taken for safeguarding the environment at the project site as well as in the vicinity of the industrial site.
- Details of management plans (Greenbelt development plan, Solid waste management plan etc.)
- Post project environmental monitoring programme to be undertaken after commissioning of the project.
- The associated cost components of the pollution control systems installed at the site.

For each of the environmental attributes, the monitoring plan specifies the parameters to be monitored, location of monitoring sites, frequency and duration of monitoring and it also denotes the applicable standards, implementation and supervising responsibilities.

6.1.2 Objectives

- Ensure day to day operational activities are conducted in a manner in compliance with the applicable regulatory approvals including legislation and industry standards.
- Evaluate the adequacy of mitigation and pollution control measures implemented for reducing the adverse impacts caused during the construction and operation stage and suggest additional mitigation measures, if appropriate, in the light of the results.
- Define a detailed framework to monitor and document for achieving full compliance with statutory requirements.
- Encourage good environmental management practices through planning, commitment and continuous improvement.
- Develop clearly defined environmental monitoring program designed to assess the nature and extent of environmental impacts of the proposed operations and progressively refine such programs against the targets

- Define roles and responsibilities of site personnel and ensure that all people onsite are fully informed of their responsibilities and accountabilities with regard to the environment.
- To comply with all regulations stipulated by the Central Pollution Control Board (CPCB)/ State Pollution Control Board (SPCB) related to air emission and liquid effluent discharge as per air and water pollution control act/ laws.
- To handle hazardous wastes as per the Hazardous Waste (Management & Handling) Rules 1989and Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and subsequent amendments.
- Review, improve and update environmental management procedures and standards.
- Establish response procedures for actual/potential environmental impacts including community complaints and ensure corrective action is taken.
- Perspective budgeting and allocation of funds for environmental management expenditure, Continuous development and search for innovative technologies for a cleaner and better environment.

6.2 Environment Monitoring Program

The goal of having a Post Project Monitoring (PPM) is to ensure that, an action plan has been implemented in accordance with the conditions specified, that appropriate measures corresponding with those required and the conditions imposed on the action have been adequately met. In the process, PPM is supposed to provide essential feedback about the actual environmental impacts of the project and also check if the implementation of the environment management plan is having the desired mitigative effects.

6.2.1 Environment Monitoring Program – Construction phase

During construction to assess the environmental parameters, monitoring will be carried out which include Ambient Air Quality, noise, water and soil quality of site and surrounding areas. Monitoring programme including areas, number and location of monitoring stations, frequency of sampling and parameters to be covered is summarized in **Table 6-1.**

Table 6-1 Environmental Monitoring Plan for construction phase

S. No.	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1	Ambient Air Quality	One station at site	Once a month	All the parameters as per NAAQ Standards
2	Noise	One location at site	Once a month	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
3	Water	One surface and ground water sample	Once a month	All the parameters as per IS 10500:2012 and IS 2296:1992

S. No.	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
		near the site		
4	Vehicular Emissions	One at site	During peak hours Once a week	Air emission and noise, PUC
5	Soil	One location within the site	Once a month	Physico chemical properties, Nutrients, Heavy metals

6.2.2 Environment Monitoring Program – Operation Phase

After commissioning of the project, post project monitoring of environmental parameters will be carried out at regular intervals. The monitoring programme in different areas of the environment has been based on the findings of the impact assessment studies. The post project monitoring programme including areas, number and location of monitoring stations, frequency of sampling and parameters to be covered is summarized in **Table 6-2.**

Table 6-2 Environmental Monitoring Plan for operational phase

S. No	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1.	Micro Meteorology	One	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	3 Stations (one at site, one in up wind and one in downwind)	Quarterly (ans as per CTO condition)	All the 13 parameters as per NAAQ Standards
3.	Noise	2 (one within plant premises and one outside plant premises)	Once a month	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
4.	Water	Two surface and ground water sample near the site	Once a month	All the parameters as per IS 10500:2012 and IS 2296:1992
5.	Soil	2 (one within plant premises and one outside plant premises)	Quarterly	Physicochemical properties, Nutrients and Heavy metals
6.	Wastewater analysis	Effluent inlet and outlet	Weekly	pH, Temp, Conductivity, Oil and Grease, TSS, TDS, BOD.
		STP inlet and outlet	Monthly	pH, TSS, BOD & COD
7.	Exhaust from boilers	Stack of boilers	Monthly	PM, SO_2, & NO_x
8.	Vehicular Emissions	Parking area	Periodic monitoring of vehicles	Air emission and noise, PCU

6.2.3 Monitoring Methodologies

Monitoring of environmental samples shall be done as per the guidelines provide by MoEF&CC/CPCB/TN PCB. The methods conducted or applied shall be approved or sanctioned by the any recognized body or authority i.e. MoEF&CC/CPCB/TNPCB.

6.3 Submission of Compliance Reports

All the necessary reports and documents shall be prepared complying with the statutory rules & regulations. Proper and due care will be taken to adhere to the laid down rules and regulation by the government. Regular and periodic record will be kept in order to ensure easier, comparable and brisk review and projection of past, present and future performances. Also, due the management shall ensure to prepare separate records for water, wastewater, solid waste, air, emission, soil & manure regularly and periodically in order to provide better and smooth vigilance.

The management will look into the fact that as soon as the preparation of reports gets over it shall be forwarded to the concerned authority with due care for the purpose of reviewing. Adhering to the rules and regulations the management will ensure that the outcome of the reports and the conclusions been drawn shall be prepared as per the laid down regulations and procedures. No breach of any convention will be availed.

These reports/documents will be regularly and periodically reviewed and any changes/discrepancies found in mitigation measures/operation/management/technology shall be brought into notice instantaneously and all possible corrective actions shall be taken to match the discrepancies been witnessed.

As a part of environmental monitoring programme, following compliance report will be submitted to TNPCB and Regional Office of MoEF&CC.

- Half yearly compliance reports of Environmental Clearance terms and conditions on 1stJune and 1stDecember every calendar year
- Environmental statement (Form-V) for the financial year ending March 31 to TNPCB on or before September 30 every year.
- Format for maintaining records of hazardous waste in Form-3 as per Hazardous and other Wastes (Management and Handling and Transboundary movement) Rules, of 2008.

6.4 Emergency Procedure

6.4.1 On-Site Mock Drill Requirements

On-site mock drills are very important as it helps employees to be aware of the safety procedures and how to react during the time of crisis. Conducting mock drills at regular intervals will enhance

preparedness and checks the viability of environmental/disaster management plan. Mock drills are essential for the following reasons:

- Helps in revising/improving the environmental/disaster management plan
- Helps to evaluate whether the responsible officials are trained efficiently for the unforeseen event
- Helps in evaluating whether the emergency equipment are being maintained at the premises

To ensure efficient environmental/disaster management, EHS department/EMP cell is conducting periodic on-site mock drills in case of occurrence of the following activities:

- Fire
- Natural calamities (cyclones, floods, earthquakes)
- Collapse of storage tanks/scrubber

Mock drills should also involve fire department, police, municipal authorities, hospitals and other department/agencies that are mandated to provide emergency support. Documenting the outcome of mock drills is an important aspect as this helps in enhancing the proposed plans more efficiently. In all safety programmes the right personnel need to be employed and this is of utmost importance.

6.5 Budget for Environmental Monitoring

Periodically environmental monitoring for the project will be outsourced to NABL accredited laboratories. Budget for Environmental monitoring is given in **Table 6-3** and **Table 6-4**.

Table 6-3 Budget for Environmental Monitoring plan – Construction phase

S. No	Item	Parameters	Unit Cost (Rs)	Sampling/ Year	Cost / Year
1	Ambient air quality	All the parameters as per NAAQ Standards	2800	24	67,200
2	Noise level	Equivalent Noise levels	500	24	12,000
3	Ground water	Physical, chemical and bacteriological	1800	24	43,200
4	Surface water	Physical, chemical and bacteriological	1800	24	43,200
5	Soil	General parameters	5000	24	1,20,000
Total					**2,85,600**

Table 6-4 Budget for Environmental Monitoring plan – Operation phase

S. No	Item	Parameters	Unit Cost (Rs)	Sampling/ Year	Cost / Year
1	Ambient air quality	PM_{10}, $PM_{2.5}$, So_2&Nox	2800	8	22,400
2	Noise level	Equivalent Noise levels	500	8	4,000
3	Exhaust from	PM, SO_2, NO_x	2000	12	24,000

S. No	Item	Parameters	Unit Cost (Rs)	Sampling/ Year	Cost / Year
	stacks				
4	Ground water quality	Physical, chemical and bacteriological	1800	8	14,400
5	Surface water quality	Physical, chemical and bacteriological	1800	8	14,400
6	Waste Water analysis	pH, BOD, COD, TSS, TDS	700	24	16,800
7	Soil quality	General parameters	5000	8	40,000
Total					**1,36,000**

CHAPTER – 7

ADDITIONAL STUDIES

7. ADDITIONAL STUDIES

7.1 Public Hearing

The proposed project is termed under 1(d) – Thermal Power Plant, Category – 'B' as per the EIA Notification, 2006 and its amendments. Also, Public Hearing is mandatory as per the obtained ToR. The draft EIA report was prepared as per the ToR issued for the project vide SEIAA-TN/F.No. 7412/SEAC/1(d)/ToR – 1298/2022 dated 26 October, 2022 and submitted to TNPCB for public hearing. After completion of public hearing, action plan along with PH Compliance will be addressed in Final EIA report and to be submitted in Parivesh portal for seeking Environmental Clearance.

7.2 Risk Assessment

Hazard Identification and Risk Assessment (HIRA) is carried for identification of undesirable events that can lead to a hazard, the analysis of hazard of this undesirable event, that could occur and usually the estimation of its extent, magnitude and likelihood of harmful effects. It is widely accepted within industry in general that the various techniques of risk assessment contribute greatly toward improvements in the safety of complex operations and equipment.

The specific objectives of the study are:

- Identification and assessment of major accident hazard potential in the plant operations.
- The report includes a description of the hazards arising out of the activity together with an account of the controls that are in operation.

The detailed HIRA Report is enclosed as **Annexure-13.**

7.3 Disaster Management Plan

A disaster in the thermal power plant has the potential to cause serious injuries or loss of live or extensive damage to the property and / or environment and serious disruption both inside and / or outside the works. In such cases sometimes outside agencies are required to call for help in handling the situation. The causative factors like equipment failure, human error, earthquake, sabotage etc. will normally manifest in various forms viz. Fire and Structure collapse etc.

Despite best design and layout, safe operating procedures and various preventive measures the possibility of a disaster cannot be totally ruled out. During this event timely and organized action must be taken to control the situation and to minimize the damage or loss to the office, human beings and environment. Hence the need of a proper "Emergency Preparedness and Response Plan (EPRP)". Such plan gives the guidelines for employees, contractors, transporters and Visitors etc. The EPRP not only defines the responsibilities but also inform about prompt rescue / evacuation / co-ordination operations and some more.

7.3.1 Objectives of Disaster Management Plan

The purpose of DMP is to give an approach to detail organizational responsibilities, actions, reporting requirements and support resources available to ensure effective and timely management of emergencies associated to production and operations in the site. The overall objectives of DMP are:

- Ensure safety of people, protect the environment and safeguard commercial considerations
- Immediate response to emergency scene with effective communication network and organized procedures.
- Obtain early warning of emergency conditions so as to prevent impact on personnel, assets and environment;
- Safeguard personnel to prevent injuries or loss of life by protecting personnel from the hazard and evacuating personnel from an installation when necessary
- Minimize the impact of the event on the installation and the environment, by:
    - ✓ Minimizing the hazard as far as possible
    - ✓ Minimizing the potential for escalation
    - ✓ Containing any release.
- To provide guidance to help stack holders take appropriate action to prevent accidents involving hazardous substances and to mitigate adverse effects of accidents that do nevertheless occur.

7.3.2 Emergencies

An emergency is a situation, which may lead to or cause a large-scale damage or destruction to life or property or environment within or outside the site. Sometimes, the emergency results uncontrollable situations and lead towards disaster. Such an unexpected severe situation may be too great for the normal workforce in the area within.

Emergencies related to Safety, Health & Environment:

- Fire
- Electrical fire/short circuiting
- Natural calamities
- Structural collapse
- Medical Emergency

7.3.2.1 Action Plan to Various Emergencies

i. Fire

In case of any fire incident the following steps are to be followed by the site occupants:

- Be concerned about your own safety as well as that of others.
- Inform others by verbal signal: “FIRE, FIRE, FIRE”.

- If the fire is controllable by nearby fire extinguishing equipment and you know firefighting, control the fire without undue personal risk.
- Shut off the electrical supply quickly.
- Use fire hydrant system point located nearer to the affected area.
- If you can't extinguish it alone, activate the fire alarm/MCP and get help.
- Inform to Safety and security team-nearest helpdesk
- Inform to manager and site controller
- Make certain you know your escape route and assembly point/safe place.
- Do not panic.
- People not involved in firefighting operation directly, should quickly move through emergency exit routes & assemble at nearest emergency assembly point/safe place.
- For any other assistance – Call emergency number.

ii. Electrical Fire

In case of any electrical fire occurred due to short circuiting or any other reason the following procedure needs to be followed by the occupants:

- Switch off the main power panel and isolate the system.
- Activate the fire alarm/MCP and get help.
- Before using a fire extinguisher make sure that it is not outdated, and it is of Carbon dioxide type.
- Inform to site controller/location Head/fire department
- Make certain you know your escape route and assembly point/safe place.
- Do not panic. Inform Utility or security person
- Inform to Admin and site controller
- Make certain you know your escape route and assembly point/safe place.
- Do not panic.
- For any other assistance call emergency number.

iii. Natural Calamities

In case any natural disaster like earthquake the following procedure should be followed by the occupants:

- Take a safe position (e.g. Under the table, concrete wooden beam, concrete column, door bracket.)
- Do not use lift. Do not stand near doors, gate
- Keep away from walls, building, and electric pole/wires.
- Keep away from building, sheds, electric wires
- Keep cool & keep others cool.

After the earthquake:

- There can be more such jerks immediately hence go to open space.
- Close connections of LPG, Electricity, water.
- Do not smoke, ignite matchstick, or put on main switches.
- Do not touch electric wires.
- Do not go near partially collapsed buildings.
- Keep roads clear for traffic.

In case of flood:

- Be ready to evacuate as directed by the Emergency Coordinator.
- Follow the recommended primary or secondary evacuation routes.
- Climb to high ground and stay there.
- Avoid walking through flood water.
- For further help, contact emergency disaster team.
- Look for emergency rescue kits in the site.

In case of cyclone:

- You should remain in the shelter, protecting yourself from lighting and thunderstorm.
- Get rid of any loose hanging wires in the site.
- Clear debris from your premises immediately.
- Report the correct losses to appropriate authorities

iv. Structural Collapse

- Raise the emergency alarm immediately.
- Evacuate the site immediately and assemble at Assembly point/safe place
- Isolate & Barricade if necessary.
- Head count to be taken by the security or emergency response team.
- Rescue Operation to be carried out in case of missing personals.
- Hospitalize the victims in case of injury.

v. Medical Emergency

- Provide information to Emergency Response Team immediately.
- Move injured person to hospital.
- Local legal requirement to be carried out.
- Information to be given to branch manager.

7.3.3 Key Elements of Disaster Management Plan

Following are the key elements of Disaster Management Plan:

- Basis of the plan
- Accident / emergency response planning procedures
- On-site Disaster Management Plan
- Off-site Disaster Management Plan

7.3.3.1 Basis of the Plan

Identification and assessment of hazards is crucial for on-site emergency planning and it is therefore necessary to identify what emergencies could arise in production of various products and their storage. Hazard analysis or consequence analysis gives the following results.

- Hazards from spread of fire or release of flammable chemicals from storage, production units and transportation facilities
- Hazards due to formation of pressure waves due to vapour cloud explosion of flammable gases

7.3.3.2 Emergency Planning and Response Procedures

Emergency rarely occurs therefore activities during emergencies; require coordination of higher order than for planned activities carried out according to fixed time schedule or on a routine day-to-day basis. To effectively coordinate emergency response activities, an organizational approach to planning is required. The important areas of emergency planning are Organization and Responsibilities, Procedures, Communication, Transport, Resource requirements and Control Center. Offsite emergency requires additional planning over and above those considered under onsite plans, which should be properly integrated to ensure better coordination. The emergency planning includes anticipatory action for emergency, maintenance and streamlining of emergency preparedness and ability for sudden mobilization of all forces to meet any calamity.

7.3.3.3 On-Site Emergency Plan

An accident/ incident that take place in a factory, with effects being confined to the factory premises, involving only the persons working in the factory and the property inside the factory is called On-site Emergency. Furthermore, Onsite Emergency Plan has been prepared and the same is attached as **Annexure - 14**. It can further be classified as minor and major emergency based on severity of the incident.

1. Minor Emergency (Evacuation is not required)

In the case of minor emergency there is no need for evacuation siren and the respective department personnel will handle the same with assistance of Safety Squad.

2. Major Emergency (Evacuation is required)

In case of major emergency, there must be an emergency siren and situation is tackled as per the plan.

7.3.3.4 Off-Site Disaster Management Plan

If the accident is such that it affects inside the factory uncontrolled and it may spread outside the factory premises, it is called as Off-site Emergency. Assessment reveals that an Off-site emergency is a very remote possibility in the factory. If situation dictates, local police may be availed to warn and advice the local public on mitigation in an emergency situation.

The objective of the present assignment is to prepare an area specific Offsite Emergency Action Plan for the district which can be practically implemented / activated at a short notice to ensure minimal impact on life and property due to emergencies arising out of Chemical Accidents or during Transportation of Hazardous Chemicals in the district. The plan should be regularly updated when there are changes occurring in the Industrial set up, Transportation Aspects, Key Manpower and Administrative Changes etc., Regular drills, Training of key persons, increasing safety awareness etc is extremely important areas that must be looked into for sound preparedness.

7.4 Social impact Assessment, R&R Action Plan

7.4.1 Social Impact Assessment

Currently, 45 no of peoples employed in the existing power plant and 4051 no of people in the whole plant. During construction phase, local employers will be preferred for construction activities. Thus, the proposed project will have long term-irreversible positive impact on the employment pattern of the study area.

7.4.2 R&R Action Plan

As the proposed project will be carried out in the existing premises, the project does not involve in the Resettlement and Rehabilitation issue.

CHAPTER – 8

PROJECT BENEFITS

8. PROJECT BENEFITS

8.1 Improvement in the Physical Infrastructure

i) By providing captive power plant, there would be decreased load on the state electricity grid.
ii) The transmission loss will be low.

8.2 Improvement in the Social Infrastructure

i) The project site to be closer to highway with hindrance free approach for transportation of heavy equipment and the required fuel i.e. coal.
ii) The infrastructure of Mathur Govt High School and Chennakuppam Govt Adi Dravidar Welfare Hr Sec School will be developed under CER activity.

8.3 Employment Potential – Skilled, Semi Skilled and Unskilled

i) Socio-economic benefit to the locals as it would provide employment during construction and in operation phase.

8.4 Other Tangible Benefits

i) The project site shall require no displacement of habitation and away from the habitation area, as it is located inside the SIPCOT industrial area.
ii) Water is being planned to be recycled and reused in this project.
iii) The project site is surrounded by the existing greenbelt of 24.66% and including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.
iv) Overall it will benefit the tyre industry as a whole since the power generated will be utilized for tyre manufacturing.

8.4.1 Corporate Social Responsibility

8.4.1.1 Vision

"Corporate Social Responsibility (CSR)" means the activities undertaken by a Company in pursuance of its statutory obligation laid down in section 135 of the Act in accordance with the provisions contained in these rules, but shall not include the activities specified in clauses (i) to (vi) of the Rules. Apollo Tyres Ltd has a company vision of being "Driving Progress & Together".

8.4.1.2 Company Hierarchy on CSR

The hierarchy of the team in CSR at Apollo Tyres Limited is given below

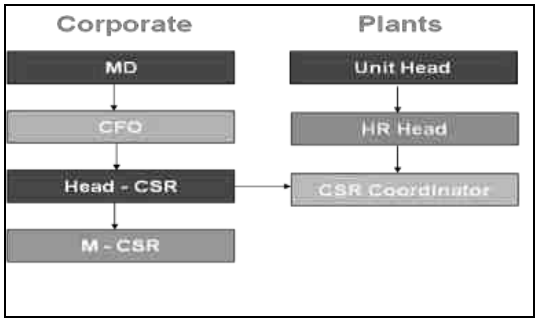


Figure 8-1 Company Hierarchy on CSR

8.4.1.3 Current Corporate Social Responsibility Programs

The CSR initiatives are categorised under 4 major themes:

1. Healthcare for Trucking Community
2. Solid Waste Management and Sanitation (SPARSH)
3. Livelihood for Underprivileged Rural Women (Navya)
4. Biodiversity Conservation

1) Healthcare for Trucking Community

- HIV-ADS Awarness & prevention - The programme offers counselling, spreads awareness through Peer Educators and provides testing support through Integrated Counselling and Testing Centres (ICTC), in partnership with State AIDS Control Society (SACS) and initiated in 2001.
- Vision Care – to provide regular and affordable vision check-ups for the trucking community under its vision-care programme. Periodic eye check-up camps, spectacles distribution to the affected and cataract treatment at nearby hospitals are also facilitated at transhipment hubs.
- Awarness on Tuberculosis (TB) – a joint initiative of the Government of India and USAID - Apollo Tyres is committed to eliminating TB in India by 2025.
- Other Non-Communicable Disease (NCDs) - The alarming rise in the number of cases across the trucking community spurred diabetes and hypertension screening at our healthcare centres, which has resulted in early detection and proper treatment.
- Mobile Medical Units – Designed to provide healthcare services to long-distance truck drivers, this mobile medical unit provides its services at highways, district borders and trucking halt points.
- Oral Hygiene - High addiction to tobacco (smoking and chewing) and poor oral hygiene is a major health risk, among truck drivers. Apollo Tyres began the oral hygiene services in FY2020 with dedicated initiatives to spread awareness and encourage oral care.

- Tele Medicine Consultation - Apollo Tyres initiated Tele Medicine Consultation facility, in partnership with Telerad Foundation, for the trucking community, across all 32 healthcare centres. Under this service, patients could avail online doctor consultation and collect medicines from the centres.

2) Solid waste Management and Sanitation (SPARSH)

SPARSH, Apollo Tyres' very own cleanliness programme, was launched in 2013 to address the critical issue of Solid Waste Management and support the 'Clean India' campaign. Conceived to create awareness on the 3 R's of Reduce, Reuse and Recycle, this extensive project facilitates effective on-ground initiatives to tackle waste generation. SPARSH stands for S – Segregate Waste; P – Practise Composting; A – Awareness Generation; R – Reduce, Reuse & Recycle; S – Safe Sanitation; H – Hygiene for All.

- Clean My Transport Nagar - aimed at improving waste management and cleanliness in these areas.
- Clean My Village - to benefit communities around our manufacturing locations.
- Sanitation Management - hygiene and sanitation is the basic right of every individual and imperative to a healthy environment too. To meet this cause, the company has undertaken several sanitation management projects in line with the Clean India campaign.
- End of Life Tyres playground (ELT) - methods and processes that help in greening the product life cycle. Recycling-used tyres are a critical part of this strategy and application where the company converts waste tyres into exciting play structures.

3) Livelihood for Underprivileged Rural Women (Navya)

Navya, the company's flagship endeavor, is an attempt to empower rural women economically, socially, and emotionally. It supports the livelihood needs of underprivileged rural women by providing them with income generation opportunities at their doorstep. The programme also undertakes several initiatives to mitigate gender discrimination and educate on gender rights.

- Self-help Group (SHG) – With Navya, Apollo Tyres undertakes a two-thonged approach towards SHGs – a) help strengthen existing ones b) create new ones. Through this, it inculcates the habit of savings among women, along with basic training on financial literacy, book-keeping, documentation, and others.
- Livelihood training and income generation – The training includes farm-based and non-farm-based activities. Livestock care and management training is also provided to help widen the scope of income generation.
- Linkage with government schemes and markets – While the govt. schemes provide financial aid, the liaison with markets and service sector helps drive entrepreneurship.

4) Biodiversity Conservation

- Mangrove conservation - The company spearheaded the Kannur Kandal Project in 2016 at Kunhimangalam Panchayat, Kannur, Kerala.The project aims to popularise the ecological significance of the Mangroves as natural coast guards amongst communities. Under this initiative, awareness sessions are conducted for the local community. For mangrove restoration and conservation periodic plantation activities are conducted in different panchayats of Kannur district.
- Afforestation project - To address the issue, the organisation has undertaken massive tree plantation drives across various districts of Tamil Nadu and Gujarat region. A total of 3, 50,000 teak and red sandal trees were planted at Tamil Nadu and 10,000 trees are planted under Miyawaki project at Gujarat region for emission reduction. The project also engages with local farmers to provide agriculture interventions for soil productivity enhancement.

8.4.1.4 Corporate Environmental Responsibility

The company is aware of the obligations towards the Environment and to fulfil the social obligations. As per OM F. No: 22-65/2017-IA.III dated 1st May 2018 M/s. Apollo Tyres Limited will allocate 1.0% of the project cost (40 Crore) towards CER i.e. 1.0% of 40 Crores = 40 lakh.

Table 8-1Cost breakup allocated for CER Activities

S. No	CER Activity	Amount in lakhs
		2024-25
1	Government Higher Secondary School - Mathur Govt High School • Painting of entire school • Sanitation facility & drinking water plant • Library & Solar lighting • Sanitary napkin incinerator • Construction of hand washing system • Avenue Plantation along the school boundary	20
2	Government Higher Secondary School - Chennakuppam Govt Adi Dravidar Welfare Hr Sec School • Painting of entire school • Sanitation facility & drinking water plant • Library & Solar lighting • Sanitary napkin incinerator • Construction of hand washing system • Avenue Plantation along the school boundary	20
Total		**40**

CHAPTER – 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

(Not recommended for scoping stage)

CHAPTER – 10

ENVIRONMENTAL MANAGEMENT PLAN

10.ENVIRONMENTAL MANAGEMENT PLAN

10.1 Description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of the EIA

10.1.1 Environmental Management Plan

A Sustainable Environmental Management Plan aims to achieve a specific outcome and provides guidance on the management of activities that have an adverse impact on the environment, will be controlled, mitigated, and monitored. An EMP consists of;

- Environment Protection Plan to reduce impacts and risks. Issues related to existing legislation, codes of good engineering practice, proponent commitment, and similar other tasks are also discussed here.
- Summary of Impacts and Risks. These are the actual expected impacts and risks of the projects, which will need to be managed, monitored, and reported.
- Impact Management and Environmental Enhancement to balance adverse impacts by providing alternate benefits to adversely impacted persons or biophysical systems.
- Environmental Effects Monitoring (monitoring plans).
- Impact Reporting.

As part of an EMP, environmental impacts will be addressed during the design, construction, and operation phases of a project. All aspects of the project must be considered in terms of environmental protection. Environmental specifications/recommendations are made to achieve this goal. Overall an EMS provides a well-organized and detailed way to incorporate environmental considerations into day-to-day operations and it also promotes continual improvement of the environment and human health.

An EMS can assist a company in the following ways:

- EMS constantly manages an organization away from constraints imposed by future regulations, material shortages, community complaints, and other issues and minimize environmental liabilities
- EMS improvise the operational process therefore it maximize the efficient use of resources
- EMS provides Regular feedback on environmental opportunities for continual improvement
- EMS reduce waste by achieving regular implementation of operational process
- Well structured EMS helps to achieve good corporate image for any organization
- EMS improves the awareness of environmental concern among employees which inspire and guide the occupants to achieve better positive environmental performance

- EMS detailed and planned out requires all the policies which are going to be implemented to achieve better positive environmental performance
- EMS provides better understanding of the environmental impacts of business activities
- EMS increases profit, improving environmental performance, through more efficient operations

10.1.2 Objective of EMP

Each organization has to achieve environmental protection objective and each organization comprises of individual operations and affairs hence each organization requires its own unique Environmental Management Plans. The component and content of individual EMP varies to suite type of organization, the complexity of its processes and the maturity of the organization in understanding its environmental responsibilities. The level of detail and length of an EMP will vary depending on the type as well.

The main objectives of the EMP are as follows

- To establish the present environmental scenario.
- To prepare a detailed action plan for implementation of mitigation measures.
- To suggest preventive and mitigation measures to minimize adverse impact and to maximize beneficial impacts.
- To prepare an afforestation or Greenbelt Development scheme.
- To suggest a rain water harvesting scheme and energy conservation actions
- To suggest a monitoring programmed to evaluate the effectiveness of mitigation measures.
- To suggest the formation of a core group (Environment Management Cell) responsible for implementation of environmental control & protective measures as well as monitoring of such implementation.
- To prepare a capital cost estimate and annual recurring cost for Environmental Management Plan.

10.1.3 EMP Roles & Responsibility

10.1.3.1 Environmental Management Cell

- In order to plan and implement projects, each industry should establish a Department/Section/Cell with trained personnel to take on model responsibility for environmental management.
- The environmental activities in the industry will be managed efficiently by an Environmental Cell comprising the Managing Director and department heads.
- The EMC is responsible for managing environmental and social issues within the project being undertaken.

- It is the responsibility of the EMC to plan, implement, and monitor all mitigation and compensation measures for the environment.

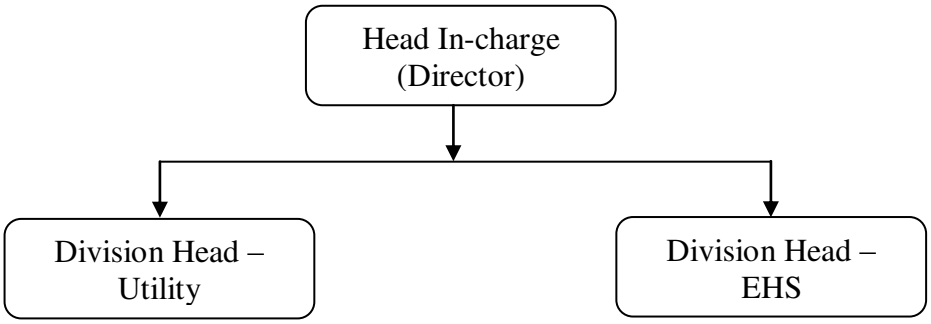


Figure 10-1 Structure of Environmental Management Cell

However, Director of the company will be responsible for the total environmental management cell. The roles and responsibility of Environmental Management Cell is described in the following table as follows;

Table 10-1 Roles and Responsibility of EMC Cell

S. No	Designation	Responsibility
1.	Director (Head in-charge)	✓ Establish an environment management cell. ✓ Responsible for ensuring the environmental health of the organization. ✓ Provide regular feedback regarding all activities performed under EM and give directions to succeeding components in coordination with EHS Head. ✓ To reduce the impact of the environment on the environment, provide sufficient funds for the environmental management cell. ✓ A discussion will take place in the board about any deviations from compliance and violations of environmental norms.
2.	Division Head - Utility	✓ Collaborating with EHS department manager to create policies for efficient utility use. ✓ Establishing contingency plans for utility challenges ✓ Following all applicable laws and rules on utility consumption and management. ✓ Scheduling regular maintenance for equipment such as boilers, air conditioning systems pumps or water treatment facilities. ✓ Monitoring performance of utilities and recording the performance on daily basis to analysis the efficiency.
3.	Division Head - EHS	✓ Continually inform the management of all EMC-related activity. ✓ To make sure that the appropriate safety measures and facilities are in place and regularly used, to prevent harmful acts and conditions, safety trainings, practice exercises, and the availability of on-site as well as off-site emergency plans must be organized.

		✓ Develop and carry out the Good Safety Committee.

In addition to the above, company has Integrated Management System Policy to adhere with standard operating procedure in order to comply with the statutory and bring into focus any infringement of any norms and directives with regards to the Integrated Management System Policy and to take further corrective actions.

The Integrated Management System Policy of the Apollo Tyres Limited is given in the **Figure 10-2**.

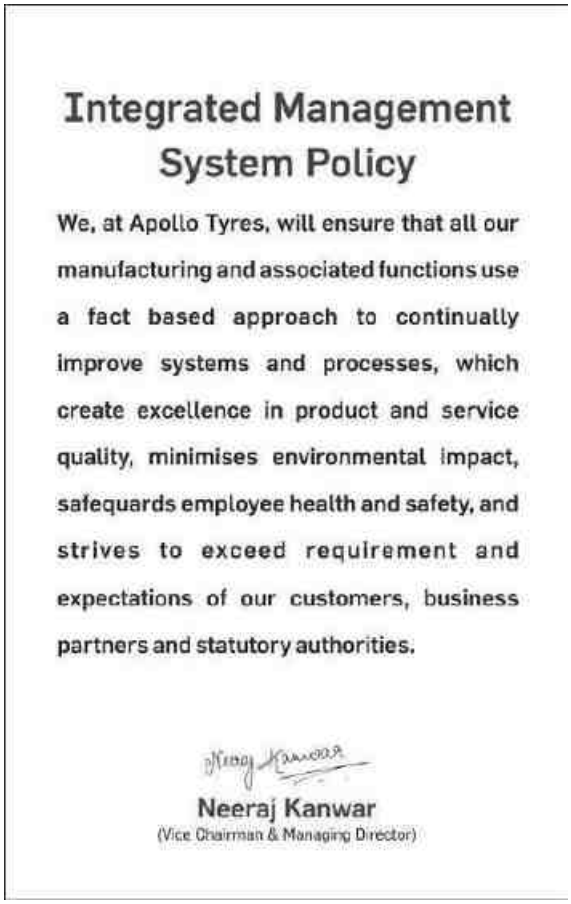


Figure 10-2 EHS Policy of the company

10.2 Mitigation Measures for Construction Phase Impacts

As the site is located in a government approved SIPCOT, there would not be any major considerable impacts of pre-construction & construction activities. However, some potential impacts from the activities are considered for planning of mitigation measures to reduce the impacts to negligible extend of significance.

10.2.1 Land Environment

- The unused construction material will be stored in proper area to utilise further in construction activities and surplus excavated material shall be disposed of in suitable pre-identified areas.

- It is suggested that the construction waste containing sand, brick, gravel, cement etc. will be used for filling or PCC for construction of internal road or project structures.
- Storage & handling of construction materials will be done properly to avoid spillage or leakage which may cause release of the material in environment causing adverse impacts.
- Appropriate designed closed & properly lined storage area will be provided for storage of construction materials to prevent land/soil contamination.

10.2.2 Water Environment

- Construction material will be stored at adequate distance from the water storage in order to prevent any chances of accidental leakage or spillage which could pollute the water storage
- Wherever required impervious lining will be provided to storage premises to avoid accidental mixing or mixing due to fugitive losses
- Runoff from the construction work will not be unmanaged or haphazard to prevent entry of contaminant arising from construction work/site.
- For runoff water guidance runoff routes will be provided and managed properly so the runoff could be collected and treated before release if serious contamination is observed.
- Spillage or leakage of construction material can lead to groundwater contamination and hence care shall be taken to minimise the chances of the Spillage or leakage of construction material.
- Construction materials like Ready Mix Concrete will be used to prevent impacts on water environment.

10.2.3 Air Environment

- To reduce the dust generation on site wherever & whenever required water will be sprinkled on ground or stock pile of excavated soil.
- Equipments / machineries will be used efficiently and shall be kept shut in order to reduce air emission, noise pollution and consumption of energy resource
- Transport vehicles will be monitored & maintain regularly to control the emission quality and fuel consumption
- Construction materials would be stored in covered stores or enclosed spaces to prevent chance of airborne construction materials which can lead to air pollution of local area.
- Regular inspection of construction site will be carried out to ensure regular and timely removal of construction debris to the dumping sites or for recycle/reuse.
- Provision of necessary PPEs like face mask & eye-glasses are provided to employees /labours engaged in construction activities.

10.2.4 Noise Generation

- The machineries/equipment used on site will be of highly maintained so they do work with optimum efficiency generating less noise pollution
- Operation of machineries/equipment causing high noise level will not be operated during the night time and all such operations shall be planned for day time only.
- The vehicles engaged in construction activities & transportation of materials will be equipped with the horn of low noise level as recommended by RTO/concern authority to avoid impacts on noise level. Further, adequate silencers must be attached with all vehicles to reduce the noise.
- Construction vehicles, equipments & machinery will be turned off when not in use.
- Proponent shall ensure that the labours engaged in construction site of high noise area are provided with necessary PPEs.

10.2.5 Solid Waste Management

- The sources of waste are from construction materials and by site workers.
- The generated solid waste includes are metal pieces, cardboards, wooden scrap, sand, gravels etc., generation of chemical waste by general site practices (e.g. vehicle and plant maintenance/servicing), municipal waste generated by site workers during construction phase.

10.2.6 Biological Environment

- Construction premises shall be kept only on-site basis in order to limit the biological damage.
- Regular monitoring shall be done to avoid and/or locate any hazards to natural habitats.
- Minimize contamination of each parameter such as air, water etc in order to maintain the biological balance of the site and adjoining region.
- Upmost care needs to be taken with the use of natural resources of site because considerable destruction or bio-magnification of contamination can occur due to the imbalance of the habitats
- Ecological protection plan like greenbelt development shall be formulated and implemented in the very inception of the construction activity.

10.2.7 Social Environment

- Construction activities shall be regulated by adequate safety codes and tools
- The employees shall be provided with adequate safety equipment
- Employees/contractors/ person associated with construction activities shall be provided with proper training before starting their works.
- During the construction phase proper traffic management shall be maintained to avoid problems due to the construction activities

- Proper traffic schedule shall be prepared and made available to all transport officers with adequate guidelines for the traffic management and easy movement on approach road to national & state high ways.
- Employment for the construction work shall be conducted with priority to local villager.

10.2.8 Miscellaneous Measures

- All activities must be conducted as per the guidelines and methodology / procedure provided by the project authority
- In addition to the above, environment management cell shall be formulated and the cell shall update the mitigation measure depending on the details of identified impacts as mentioned in EIA Study as well as defined in environmental management record during the construction phase by the official appointed at site.

10.3 Environment Management Plan for Operation Phase

Operational phase incorporates day to day activities of proposed project and it is followed by construction phase. The pollution generates through operational phase can create more damage to the environment as it can get accumulated by the passing time. The operational set up is mostly of long term establishment therefore it can create imbalance in ecological balance of the premises.

To minimize the operational phase impacts EMP formulation shall be done keeping in mind such adverse impacts and accordingly mitigation methods shall be designed in order to nullify such impacts. Information like operational actions of the habitants, nature of the substances or components, nature of emission, geological and ecological feature along with other allied feature shall be systematically collected and analysed. Further, the production process, utility operations, equipment/machineries/technologies used in operations, maintenance works, technical & administrative work, etc. shall also be given due consideration.

The following mitigation measures shall be considered in order to minimize the effects to the maximum extent possible during the operation phase.

10.3.1 Land Environment

- Air emissions are effectively controlled by following APC measures and monitored the emission levels. Hence, deposition of air pollutants in and around the premises is not envisaged.
- Solid and Hazardous waste are disposed to the authorised vendors. So, impact on the land environment is negligible.
- Since the plant is following ZLD system, there is no discharge of effluent on the land environment.

- Hence, impact on the land environment due to different pollution is not envisaged.

10.3.2 Water Environment

- The generated effluent of 146.5KLD is being treated in the existing combined ETP (capacity: 300KLD X 3 & 200KLD & 1) which is common to R&D plant, power plant and main tyre plant. After expansion, 159 KLD of effluent will be treated in the same existing combined ETP facility and will maintain the ZLD process.
- The sewage is being routed to the existing combined STP (capacity: 150KLD X 1, 100KLD X 2) which is common to R&D plant, power plant and main tyre plant.
- After expansion, 7.75KLD of sewage will be treated in the existing combined STP and the treated water will be used for the greenbelt development, cooling tower makeup and dust suppression process.
- The operational set up will be kept leak proof at all the times to reduce consumption of water
- 70% recycling is being practiced on regular basis to reduce the quantity of freshwater intake and the same will be followed after expansion.
- The treated wastewater after confirming the prescribed norms will be reused for greenbelt development, as required.
- Rain water harvesting program also being implemented for conservation of water.

10.3.2.1 Rain Water Harvesting

Rain water harvesting is one of the ways to recharge the ground water and to reduce the use of fresh water. Hence, the Apollo Tyres Limited has developed numerous recharge pits in the site for the collection of rain water from the roof top and lane area. All the recharge pits are internally connected and directed towards rainwater harvesting ponds. Furthermore, the three rain water harvesting ponds are developed over an area of 1.3010 Ha (3.23acres) in its premises.

The capacity of the rainwater harvesting ponds are mentioned in the below table;

Table 10-2 Capacity of the rainwater harvesting ponds

S. No	Description	Capacity (m^3)
1	Rain water pond – 1	7900.2
2	Rain water pond – 2	10803.2
3	Rain water pond – 3	5079.35
Total		**23782.75**

The rainwater harvesting layout showing the ponds and recharge pits are shown in **Figure 10-3**.

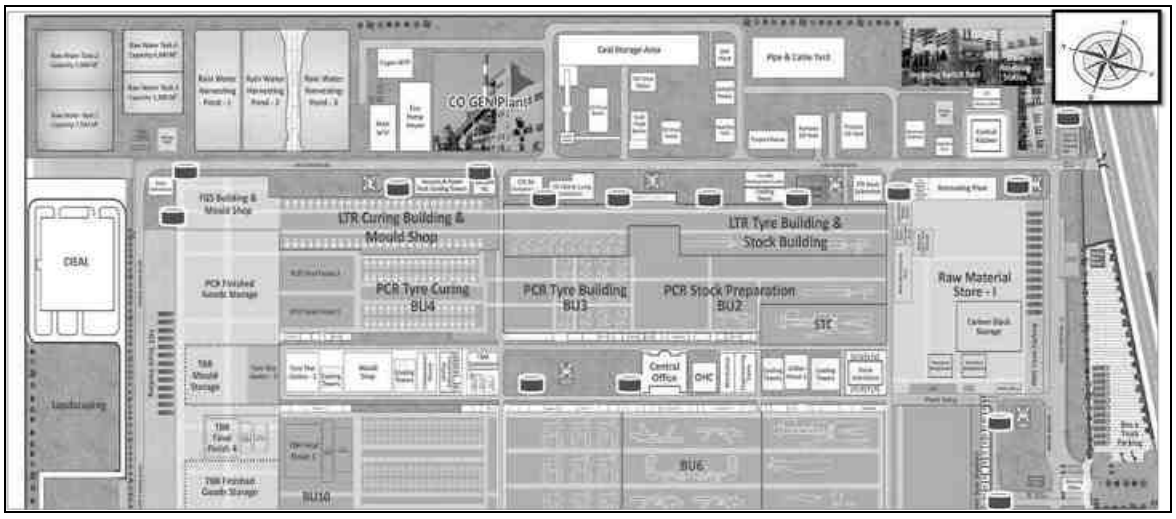


Figure 10-3 Layout showing the Rain water harvesting pond and recharge pits

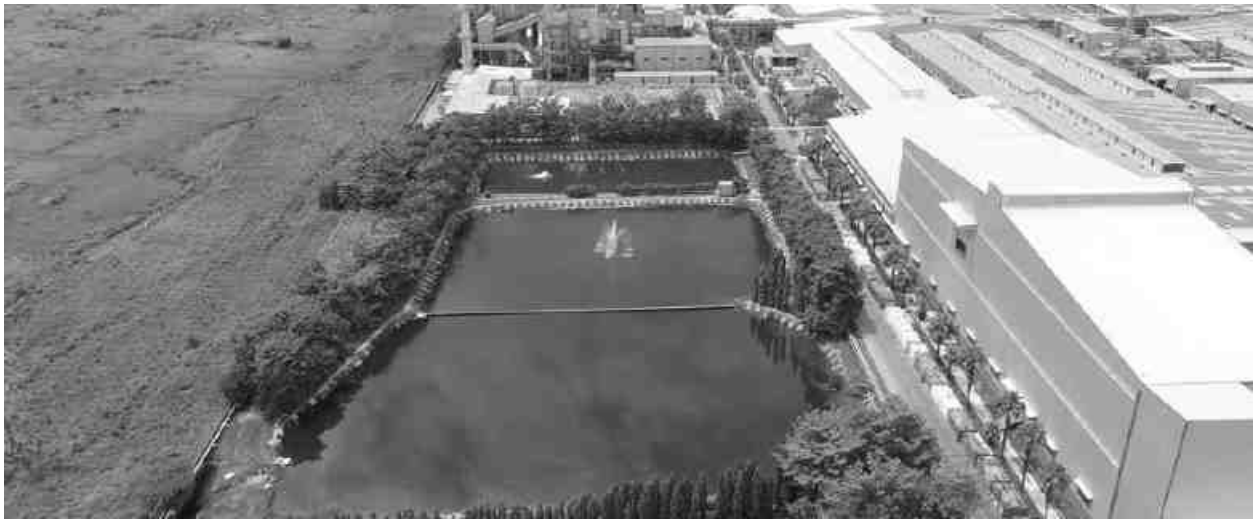


Figure 10-4 Rainwater Harvesting ponds

10.3.3 Air Environment

Implementation of following mitigation measures is suggested to prevent air pollution due to emissions:

- Electrostatic Precipitator is provided for boilers with adequate stack height of 75m from ground level along with the ash handling system.
- Fugitive emissions from the coal crusher and coal transportation is being prevented using bag filter and enclosed system / belt transfer system respectively. These control measures will be carried out after expansion as well.
- The fly ash generated from the process is being collected in the storage silo and disposed to the authorised brick manufacturer by truck covered in tarpaulin and the same is proposed to follow after expansion.

- Adequate method & facilities for handling of raw materials will be developed & implemented to prevent contamination of air due to the toxic chemicals
- Upmost priority will be given to regular maintenance & un-interrupted operation of Air pollution control devices
- Monitoring of emission as per Environmental Monitoring Plan and records will maintain for further review & improvement in EMP as well as Air Pollution Control Activities/ Technologies
- Emission level will be maintained below permissible limits prescribed by concern environmental authority.
- The greenbelt is developed for 24.66% of the total plant area and including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87% which will act as the absorbent of air emissions.
- The record of the monitoring programs & measured quality will be maintained regularly.

10.3.4 Solid and Hazardous Waste Management

- The municipal solid waste from the domestic use is being disposed to the Municipal authorized bin and the same will be followed after expansion.
- Since the industry following ZLD process, the sludge from wastewater treatment plant is being utilised in the ETP and STP process.
- Hazard waste would be generated from the process, maintenance activity and wastewater treatment plant. These wastes are being stored in the hazardous waste storage area and disposed to TSDF.
- The storages area of any kinds and production unit will be lined properly to ensure impervious lining to prevent seepage of chemical in soil.
- Immediate action shall be taken upon first reporting of incident of spill/leak of chemical material
- Emergency actions will be taken by responsible personnel as per guidelines provided in specific Emergency Response Protocol for spilled/leaked chemical.
- The Proponent will maintain necessary records & documents of Hazardous waste management/disposal as per MoEF/ CPCB guidelines.

10.3.5 Noise Generation

- Acoustic enclosure is being provided to high noise generating equipment/ machineries/ utilities or such facilities will be housed in closed room to prevent noise propagation in surrounding area.
- Proper maintenance & lubrication of the plant machineries & equipments will be done regularly to reduce the level of noise generation.

- Transport vehicles shall be set in operation only at time convenient with the residents equipped with low noise engine
- Noise generating and vibrating equipments/machineries will be provided with rubber padded foundations.
- Proper maintenance of greenbelt will also help in attenuating noise pollution.

10.3.6 Biological Environment

Due to the pollution such as air emissions, wastewater and solid waste, there may be a negligible impact on the biological environment, since the mitigation measures will be strictly followed to avoid impact on the environment.

Since the project is proposed in the existing facility, there is no removal of trees and vegetation is involved. Additionally, the study area does not contain any eco sensitive zone. Hence, there will not be adverse impact on the ecology and biodiversity.

10.3.7 Socio-Economic Environment

- Impact on Socio-economic environment will be positive due to the employment opportunities. Currently, 45 no of peoples employed in the existing power plant and 4051 no of people in the whole plant.
- During construction phase, local employers will be preferred for construction activities.
- As the proposed project will be carried out in the existing premises, the project does not involve in the Resettlement and Rehabilitation issue.

10.3.8 Available Safety System

10.3.8.1 Fire Hydrant System

Fire hydrant is installed across the plant & required fire-fighting equipments like extinguishers, fire buckets etc are provided where ever required. Trained people are available to mitigate the fire during emergency and regular mock drills are conducted to enrich the knowledge of the people. Fire Hydrant layout is attached as **Annexure - 18.**

10.3.8.2 First Aid Center

Medical Officer will review and add/delete the medicines/equipment required specific to the industry based on experience. This will be kept under lock and key and it will be opened only during emergency. A List of items to be kept at first aid centre is given below

1. Sufficient dressing material
2. Medicines special to the industry as recommended by the doctor.

3. First aid box, emergency box kit.
4. Medical grade oxygen cylinders
5. Portable lamps/torches
6. Burn sheets
7. Rescue blankets
8. Oxygen breathing kit
9. Instant glucose
10. Paramedic scissors and Bandage scissors
11. Forceps, bandages and gloves
12. Suction unit
13. Cervical collar (3 sizes) and Eye pads
14. Intravenous fluid
15. Pocket masks/eye-wash bottles
16. Orthopedic stretcher
17. Artificial resuscitators
18. Trauma medicines
19. Portable respirators
20. Ophthalmic solution
21. Blood pressure equipment
22. Gloves
23. Snake bite antidotes

10.3.8.3Occupational Health Center

M/s. Apollo Tyres Limited has provided Occupational Health Center within their premises. The Health center comprises a total built up area of 1000 sq.ft with a carpet area of 850 sq.ft. The Occupational health center consists of two Doctor Consultation rooms, one Physiotherapy room, one nursing station and a separate Counseling room.

The following are the key features of the Occupational Health Center;

- Functions of the OHC comprise First aid management in case of Industrial injury and Outpatient treatment with follow-up
- The services offered by the OHC are 24/7
- On-role (CMO & FMO), 2 Off-role (SMOs) Occupational Health Physicians are available round the clock
- Physiotherapist is available 6 days /week (2PM-5PM)
- Psychologist is available 5 days /week (10AM-5PM)

- 7 Staff Nurses and 3 Ambulance Drivers have been deployed as Paramedic support staff sourced by Kauvery
- Staff nurse and Ambulance drivers have been trained and awarded with BLS certification
- 3 observation bed clinical set-up with Vitals Monitor, PFT Respirometer & Audiometer are available
- BLS Ambulance service is available all round the year
- Daily routine awareness on Medical, Physical and Emotional Wellness are being conducted round the year
- In-house Pre-employment medical examination for NAPS and Trainees are conducted round the year
- TNPCB authorized Bio-medical Waste generating facility with disposal partnered with GJ Multiclave
- Statutory Medical Examination conducted annually for those who are involved in Hazardous processes (700 persons)
- Executive Health Check conducted annually as per policy
- Health Screening and Camps are conducted as per plan
- Digitalized facility with Electronic Medical Record software with patient records available from 2019

The organisation structure of the OHC consists of chief medical officer, medical officer and phychologist. The detailed structure is given below as follows;

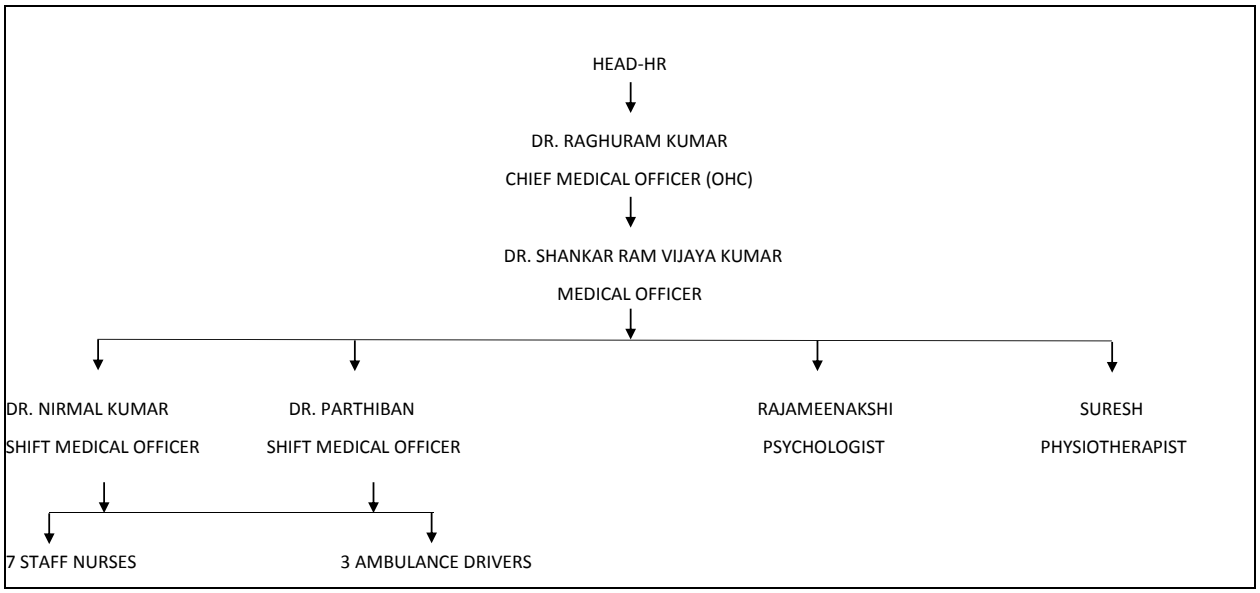


Figure 10-5 Organisation structure of Occupational Health Center

10.3.8.4 Safety & Emergency Plan

Safety of both men and material during construction and operation stages is of concern to industries. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster is possible due to leakage of hazardous chemicals collapse of structures and fire/explosion etc. Keeping in view, the safety requirement during construction, operation and maintenance phase Apollo Tyres would formulate safety policy keeping in view the following requirements:

- To allocate sufficient resources to maintain safe and healthy conditions at work.
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment.
- To ensure that adequate safety instructions are given to all employees.
- To provide wherever necessary protective equipment, safety appliances and clothing, and to ensure their proper use.
- To inform employees about materials, equipment or processes used in their work, which are known to be potentially hazardous to health or safety.
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge.
- To provide appropriate instruction, training, retraining and supervision in health and safety, first aid and to ensure that adequate publicity is given to these matters.
- To ensure proper implementation of fire prevention and an appropriate fire fighting service together with training facilities for personnel involved in this service.
- To ensure that professional advice is made available wherever potentially hazardous situations exist or might arise.
- To organize collection, analysis and presentation of data on accident sickness and incident involving personal injury or cause of sickness with a view to taking corrective, remedial and preventive action.
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees.
- To publish/notify regulations, instructions and notices in the common language of employees.
- To prepare separate safety rules for each type of occupation/process involved in a power station.
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipment, work places and operations.

Safety & Emergency Management Practices in the Current Facility

A) Details of Safety Management System like Health and Safety Policy, organisation of safety department, Safety committee, and work permit system, personal protective equipment etc.

1. Apollo Tyres Limited has the IMS (Integrated Management System) policy in place which includes the commitment from the management to safeguard employee health and safety.
2. The Safety Department being an engineering related support function, reports to Engineering Department and has two qualified Safety Officers.
3. Safety Induction Training is conducted for all new members including the contractors.
4. The Safety Department conducts Fortnightly Safety Meetings with all the contractors to discuss the safety violations at site and the scope for improvement.
5. The Safety Department conducts Monthly SHE audits in all the Bus/Departments to identify the scope for improvement.
6. SHE Committee has been formed in each Business Unit/Department and comprises of the SHE Representative (Team Leader of the BU), SHE Coordinator and SHE Champions. The monthly SHE Audit is conducted along with the SHE Committee Meeting.
7. Work Permit System is in place for carrying out non routine activities. Hot Work Permit is taken for any non routine activity involving the generation of sparks. Excavation Permit is taken before carrying out any digging activity. Night/Holiday Work Permit is taken for carrying out any activity during the night time or on a holiday.
8. The quality of the Personal Protective Equipment needed is ensured by the Safety Department. The required stock of the PPE is maintained by the BU/ Department SHE Champion.
9. The Safety Department trains all the members including the contractors on safety aspects periodically.

B) Details about emergency preparedness like availability of Emergency Management Plan, training & mock drills, mutual aid arrangement etc.

The members trained about the emergency preparedness and response. Furthermore, Onsite Emergency Plan has been prepared and the same is attached as **Annexure - 14**.

C) Accident reporting and investigating system: All incidents including the Near Miss Incidents are investigated by the concerned BU/Department and submitted to the Safety Incharge for validation of the corrective action/preventive action taken. All the contractors are also required to investigate all incidents including the Near Miss Incidents and submit the corrective action/preventive action taken to the Safety Incharge.

D) Security department manpower, safety sirens, alarms

The Security Guards report to Security Officers who in turn report to Team Member - Security. All the Team Members report to the Team Leader – Admin & Facilities. There is also a security advisor.

Smoke Detectors have been installed in all the substations and the Main Receiving Station. Manual Call Points have been installed all around the plant interconnected with the hooters. One MIMIC Panel is being installed in the Security Room which gives indication about the location/zone operated in case a Smoke Detector or Manual Call Point is operated.

10.4 Cost Estimate for Environmental Management Plan (EMP)

The cost estimate for the Environmental Management Plan is provided in the following table;

Table 10-3 Budget estimation for EMP

S. No.	Description	Capital Cost (Rs. In Lakhs)	Operating cost (Rs. In Lakhs)
1.	Greenbelt Devlopment	5.0	1.0
2.	Solid waste Management (Organic waste converter)	10.0	2.5
3.	Rainwater harvesting	8.0	0.5
4.	Air pollution Control measures	3.5	1.0
5.	Energy Conservation (Solar Panel)	15.0	1.5
6.	Miscellaneous	8.5	4.0
Total Cost		**50.0**	**10.5**

10.5 Greenbelt Development Plan

Green belts are an effective mode of control of air pollution, where green plants act as absorbent for pollutants and acts as a sink for pollution. Plants grown to function as pollution sink are collectively referred as greenbelts. An important aspect of a greenbelt is that the plants are living organism with their varied tolerance limit towards the air pollutants. A green belt is effective as a pollutant sink only within the tolerance limit of constituent plants. Apart from function as pollution sink, greenbelt would provide other benefit like aesthetic improvement of the area and providing suitable habitats for birds and animals.

As per the rules and regulations laid by Ministry of Environment and Forest, Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB), it is legally mandatory to earmark 33% of the project area for greenbelt development to promote integration of environmental issues with industrial development projects. Plants grown to function as pollution sink are collectively referred as greenbelts. An important aspect of a greenbelt is that the plants are living organism with their varied tolerance limit towards the air pollutants.

The total area of the site is 50.71 Ha (125.307 acres), out of which 12.51 Ha (30.913 acres) of land is earmarked to develop greenbelt of 24.66% in the site premises. Currently, total of 3,314 no of trees were developed in the allocated area for greenbelt. The details of the greenbelt developed in the existing plant premise are given below;

Table 10-4 Existing trees in the greenbelt development

S. No	Common name	Scientific name	No. of trees
1.	Teak tree	*Tectona grandis*	2
2.	Arjuna tree	*Terminalia arjuna*	46
3.	California fan palm	*Washingtonia filifera*	235
4.	Geiger tree	*Cordia sebestena*	162
5.	Gulmuhar tree	*Delonix regia*	6
6.	African tulip tree	*Spathodea campanulata*	122
7.	Sultan champa	*Calophyllum inophyllum*	38
8.	Cyas	*Cycas revoluta*	2
9.	Mahagony tree	*Swietenia macrophylla*	29
10.	Bamboo	*Bambusa*	444
11.	Cuban royal palm	*Roystonea regia*	30
12.	Trumpet tree	*Tabebuia rosea*	950
13.	Mango tree	*Mangifera indica*	7
14.	Almond tree	*Terminalia catappa*	26
15.	Butterfly tree	*Bauhinia purpurea*	27
16.	Portia tree	*Thespesia populnea*	110
17.	drumstick tree	*Moringa oleifera*	3
18.	Jamun tree	*Syzygium cumini*	1
19.	Black siris	*Albizia lebbeck*	376
20.	Cook pine	*Araucaria columnaris*	1
21.	Fig	*Ficus carica*	1
22.	Jackfruit	*Artocarpus heterophyllus*	3
23.	Ashoka tree	*Saraca asoca*	208
24.	red silk-cotton tree	*Bombax ceiba*	199
25.	Custard apple tree	*Annona reticulata*	1
26.	Neem tree	*Azadirachta indica*	63
27.	Indian beech	*Pongamia pinnata*	198
28.	Golden shower tree	*Cassia fistula*	24
Total			**3,314**

Additionally, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 to an extent of 16.55 acres (6.70 Ha) which is adjacent to the site. Hence, the additional land allocated by SIPCOT for the development of greenbelt is considered as the proposed greenbelt development for this project. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%. The allocation letter from the SIPCOT is attached as the **Annexure - 4**.

The existing greenbelt development photographs are shown below;

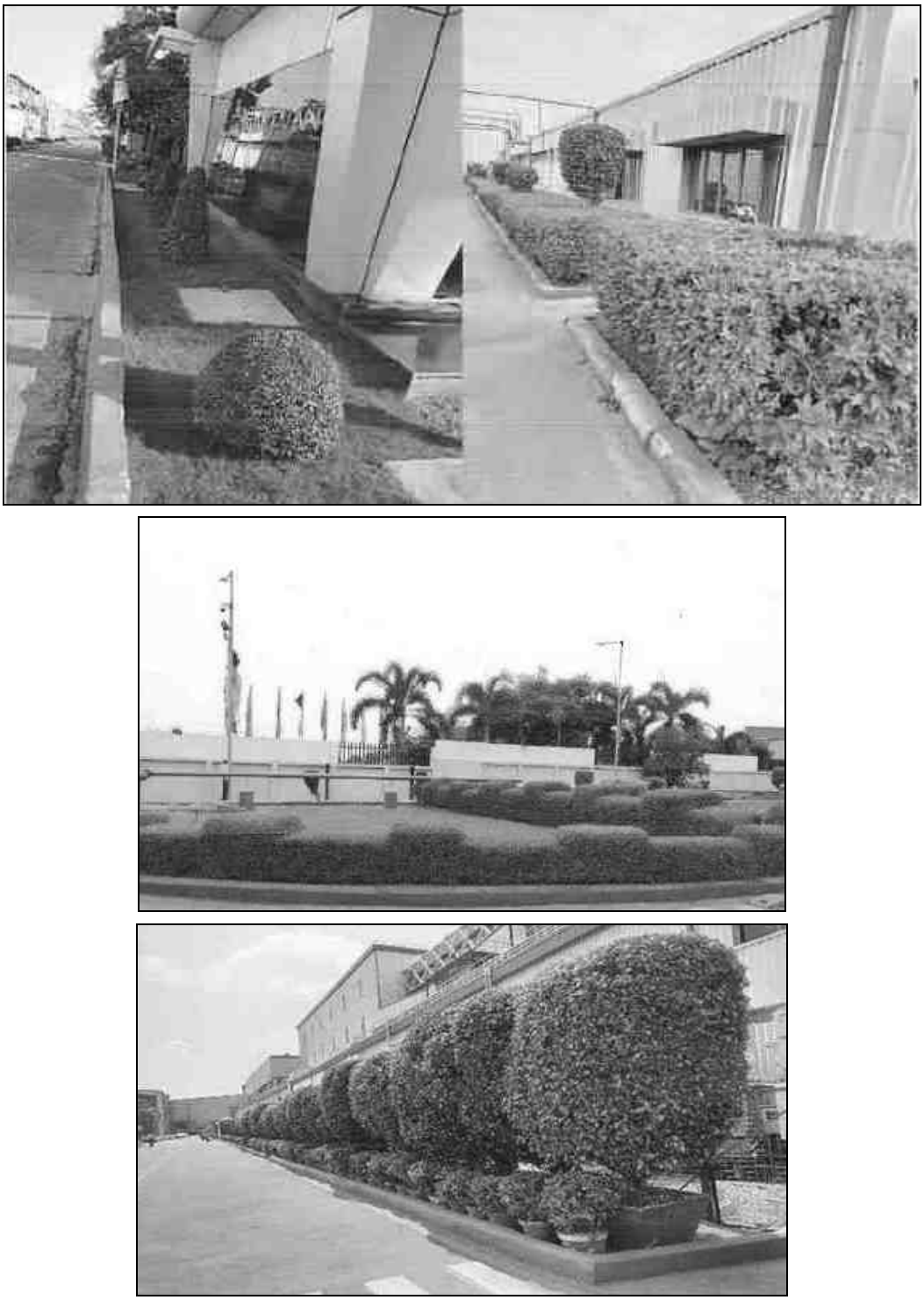


Figure 10-6 Existing Greenbelt area in the site

The existing greenbelt development in the plant layout is demarcated and shown below;

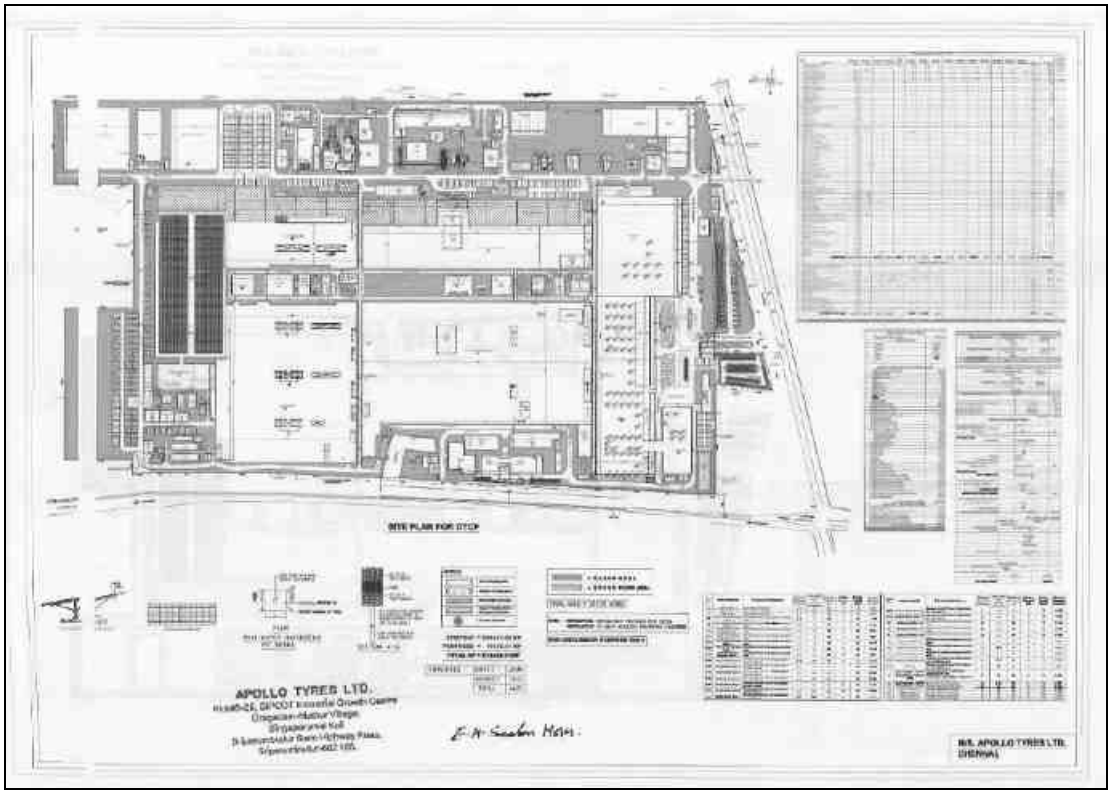


Figure 10-7 Layout showing the existing greenbelt development in the site

CHAPTER – 11

SUMMARY & CONCLUSION

11.SUMMARY & CONCLUSION

11.1 Overall Justification for Implementation of the Project

M/s. Apollo Tyres Limited (ATL) is an international tyre manufacturer and the leading tyre brand in India. The company has a total of six manufacturing units - 4 in India and 1 each in the Netherlands and Hungary. The tyre manufacturing facility at Oragadam, Sriperumbudur, Kancheepuram has R & D plant along with 4.6MW of coal based Co-generation plant in it which is operating with the valid CTO. Due to the need increased in the power requirement, ATL is proposed to set up a 1 X 10 MW Coal based Co-Gen Thermal Power Plant additional to the existing 4.6 MW power plant.

The Components of existing Co-generation plant has the AFBC boilers of capacity 35TPH and 60TPH, 4.6MW turbine and compressors. In addition to the above, for the proposed project, turbine of capacity 10MW with suitable Air Cooled Condenser will be installed with the existing facility. The installed capacity of existing thermal power plant is 7.5 MW; however, TNPCB restricted the thermal power plant to generate only 4.6 MW and issued CTO for the same.

The purpose of having a captive power plant at Apollo Tyres Limited at Oragadam is to reduce the cost on buying power from the Tamil Nadu grid and also reduce the already existing stress on the district power supply. Thus such a project would help reduce stress on the power deficient condition

of the state of Tamil Nadu. Also, transmission and distribution losses continue to remain a problem throughout the country, which is not the case in captive power plants. Moreover Oragadam being an industrial area, a captive power plant for this Apollo tyre project will avoid usage of power for the other smaller industries in the area, along with safeguarding power supply for the localities. The project being a co-generation project, envisages utilization of steam for both power production as well as steam consumption for process requirements. Consequently, thermal energy is utilized more efficiently than a conventional power plant.

11.2 Explanation of How, Adverse Effects Have Been Mitigated

11.2.1 Meterological Environment

a) Ambient Air Quality

The ambient air quality has been monitored at 8 locations as per NAAQS, 2009 within the study area. The results obtained are summarised as below:

- The average baseline levels of PM_{10} vary from 55.00 to 69.91 µg/m³.
- The average baseline levels of $PM_{2.5}$ vary from 31.90 µg/m³ to 41.95 µg/m³.
- The average baseline levels of SO_2 vary from 9.70 µg/m³ to 13.44 µg/m³.
- The average baseline levels of NO_2 vary from 19.18 µg/m³ to 26. µg/m³.

b) Noise Environment

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

- In Industrial area (Project site, vaipur, Panayur, Panrutti, Vallam Kandigai), day time noise level was about 63.8 dB (A) to 68.8 dB (A) and 57.6 dB (A) 60.1 dB (A) during night time, which is within prescribed limit by CPCB for Industrial area (75 dB (A) Day time & 70 dB (A) Night time).
- In Residential area (Mattur, Umaiyaparanacheri, Sirumangadu) day time noise levels varied from 53.1 dB (A) to 54.9 dB (A) and night time noise levels varied from 43.2 dB (A) to 44.8 dB (A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area are within the limit prescribed by CPCB for Residential area (55 dB (A) Day time & 45 dB (A) Night time).

c) Surface Water Quality

Surface water sample results are discussed below:

- Water sampling results are compared with Surface water standards IS 2296:1992.

- pH in the collected surface water samples varies between 6.75 to 8.23 which is within the limit of IS 2296:1992.
- The Total Dissolved Solids (TDS) value of collected surface water sample ranges from 300 mg/l to 787 mg/l.
- The Total hardness value of the collected surface water sample ranges between 130 mg/l to 395 mg/l.
- BOD value of surface water varies from 2 mg/l to 4 mg/l
- COD value of surface water varies from 12 mg/l to 64 mg/l

d) Ground Water Quality

A summary of analytical results are presented below:

- The ground water results of the study area indicate that the pH range varies between 6.81 and 7.41. It is observed that the pH range is within the permissible limit of IS 10500:2012.
- The Total Dissolved Solids range of the collected ground water sample is varied between 328 mg/l – 732 mg/l.
- The acceptable limit of the chloride content is 250mg/l and permissible limit is 1000 mg/l. The chloride content in the collected ground water samples in the study area ranges between 73.52 mg/l – 219.30 mg/l.
- The acceptable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. the sulphate content in the collected ground water samples in the study area is varied between 29.4 mg/l – 88.9 mg/l. It is observed that all the samples are meeting the acceptable limit of the IS 10500: 2012.
- The Total hardness ranges is between 170 mg/l – 395 mg/l for ground water samples. It is observed that all the samples are within the permissible limit of the IS 10500: 2012.

e) Soil Quality

Summary of analytical results are as follows;

- The pH of the soil samples ranged from 6.22 to 7.22 Indicating that the soils are slightly acidic to moderately alkaline in nature.
- Conductivity of the soil samples ranged from 95 to 365 µmhos/cm.
- Nitrogen content in the collected soil samples ranged from 84.30 mg/kg to 142.60 mg/kg.
- Phosphorous content ranged from 9.00 mg/kg to 15.30 mg/kg.
- Potassium content ranges from 45.20 mg/kg to 76.40 mg/kg.

f) Biological Environment

The project site is found in non-forest area. Therefore, management plan is not required. The proposed project will not have any impact of terrestrial ecology of the area. However, the project area has greenbelt by planting native species to maintain the good environment.

g) Socio-economic Status

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

11.2.2 Mitigation Measures

The pollution from various source have been assessed and mitigation measures for the same are given below;

- **Air Pollution:** The sources of emission are the boilers coal crushing, coal loading and unloading, and process. However, Electrostatic Precipitator is provided with adequate stack height of 75m from ground level along with the ash handling system.
- Fugitive emissions from the coal crusher and coal transporation is being prevented using bag filter and enclosed system / belt transfer system respectively. These control measures will be carried out after expansion as well.
- The fly ash generated from the process is being collected in the storage silo and disposed to the authorised brick manufacturer by truck covered in tarpaulin and the same is proposed to follow after expansion.
- **Water Pollution:** The sewage of 7.75 KLD is being routed to the existing combined STP (capacity: 150KLD X 2, 100KLD X 1) which is common to R&D plant, power plant and main tyre plant.
- The generated effluent of 146.5 KLD is being treated in the existing combined ETP (capacity: 300KLD X 3 & 200KLD X 1) which is common to R&D plant, power plant and main tyre plant. After expansion, 159 KLD of effluent will be treated in the same existing combined ETP facility and will maintain the ZLD process.
- If contaminated, proper expertise will be brought to schematize the various recharge mechanism to reduce or nullify the impact effects.
- **Solid and Hazardous waste:** The wastes generated will be stored in temporary storage facility and transferred to nearby Treatment, Storage and Disposal Facility (TSDF) and

also to the approved vendors of State Pollution Control Board (SPCB) landfill and Co-processing.

- These waste will be segregated & stored and will be disposed off by giving it to the TNPCB authorized dealers/recyclers/TSDF within a stipulated period of time (90 days).
- Hazardous waste will be disposed to TNPCB authorized TSDF/recyclers as applicable.
- **Noise pollution:** The steam turbine generator would be housed in closed buildings, which would considerably reduce the transmission of noise from the generators to outside environment. The inlet air and exhaust gas streams would be provided with silencers for noise reduction.
- Properly designed plant and machinery (i.e. by providing inbuilt mechanisms like silencers, mufflers, and enclosures for noise generating parts) and shock absorbing pads at the foundation of vibrating equipment will be provided
- **Greenbelt Development:** The total area of the site is 50.71 Ha (125.307 acres), out of which 12.51 Ha (30.913 acres) of land is earmarked to develop greenbelt of 24.66% in the site premises. Currently, total of 3,314 no of trees were developed in the allocated area for greenbelt.
- Additionally, SIPCOT – Oragadam has allocated OSR maintenance of greenery parcel at sy. no. 6 to an extent of 16.55 acres (6.70 Ha) which is adjacent to the site. Hence, the additional land allocated by SIPCOT for the development of greenbelt is considered as the proposed greenbelt development for this project. In this greenery parcel, total of 8,312 no of plants has been planted and being maintained by the ATL. Including the SIPCOT OSR land, the overall greenbelt percentage will be 37.87%.

11.2.3 Environmental Monitoring Programme

Environmental monitoring programme has been formulated and the same will be implemented. The effective implementation and close supervision of the environmental management to mitigate the environmental impacts, which are likely to arise due to operation phases of the project.

11.2.4 Project Benefits

i) By providing captive power plant, there would be decreased load on the state electricity grid.
ii) The transmission loss will be low.
iii) Socio-economic benefit to the locals as it would provide employment during construction and in operation phase.
iv) The project site shall require no displacement of habitation and away from the habitation area, as it is located inside the SIPCOT industrial area.
v) Water is being planned to be recycled and reused in this project.

vi) Overall it will benefit the tyre industry as a whole since the power generated will be utilized for tyre manufacturing.

11.3 Conclusion

The Environmental Impact Assessment report studied the proposed project and assessed its predicted impacts on land, water, air, soil and biological environment of the region. The proposed project was found to be complying with all the environmental, health and safety standards, and is planning to use efficient equipments and advanced technologies to reduce its air emission, water and waste generation. It is also taking proper care in its hazardous chemicals and waste handling. It has also laid down solid plans to monitor and combat any disaster or emergency situation in the project.

Other than the above, proposed project will be bringing in various economical, social and environmental benefits to Oragadam region and to the county. The Social, Economical and Environmental benefits of the project includes the ones mentioned in the earlier chapter.

With the above benefits, and the environmental and societal commitment and readiness of the project, the environmental impact assessment report strongly affirms and recommends the proposed project

CHAPTER – 12

DISCLOSURE OF CONSULTANTS

12.DISCLOSURE OF CONSULTANTS

In order to assess the potential environmental impacts due to the proposed Expansion of Coal Based Co-Gen (Captive) Thermal Power Plant from 4.6 MW to 14.6 MW with additional installation of 1 x 10 MW" by M/s. Apollo Tyres Limited engaged M/s. Hubert Enviro Care Systems (P) Limited, Chennai to undertake EIA study. The nature of consultancy service rendered covers terrestrial environmental assessment.

12.1 Brief Profile of Hubert Enviro Care Systems (P) Limited (HECS)

HECS is a total Environmental management company which provides Environmental consultancy services, Analytical testing services, turnkey solutions and Operation-Maintenance services for water and wastewater facilities.

The company provides solutions to several industries like Refineries, Thermal Power Plant, Pharma, R&D Facilities, Electroplating and Manufacturing, IT Parks, Residential Complexes, Mines, Dairies, Food Processing, Textile mills, Breweries, etc.

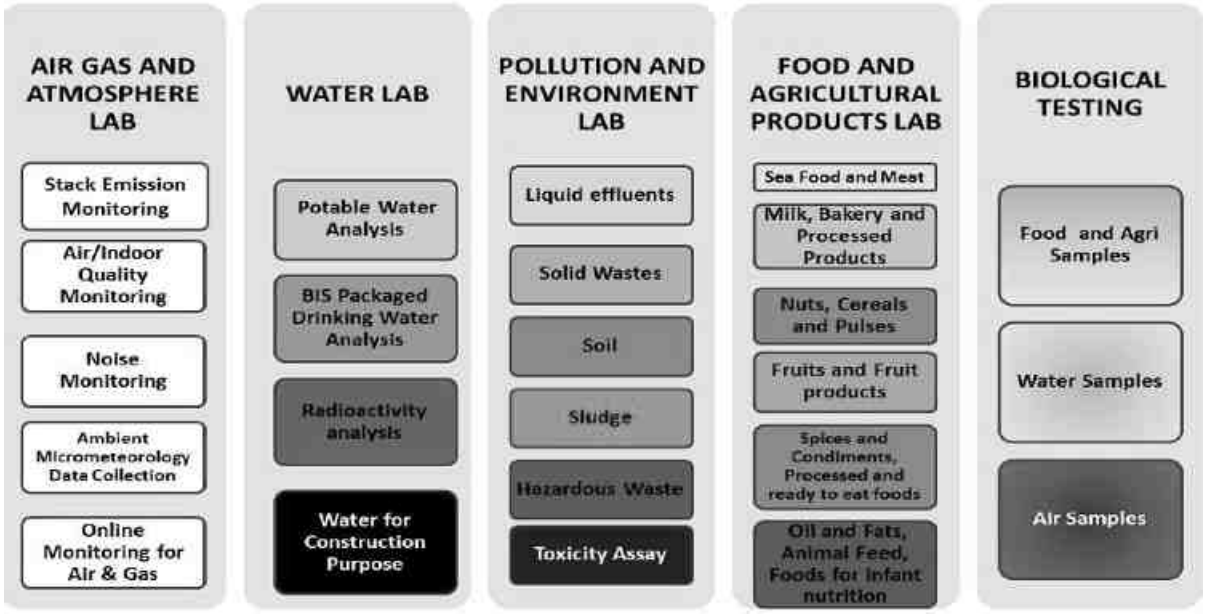
The company is specialized in executing projects right from concept development, supply, erection, commissioning and operation on turnkey basis. HECS has successfully executed more than 300 environmental engineering projects for various industrial sectors both in India and overseas.

Consultancy Profile

- HECS is accredited by QCI-NABET
- An approved consultant for carryout EIA studies across India
- India's leading multidisciplinary Environmental Consultancy organization
- HECS- Consultancy division comprises of technical skilled and competent Team of 40 people. The team consists of Three Doctorates & about thirty postgraduates
- HECS has industry specific prominent expert to provide solutions & recommendations
- Serving client more than 25 years & pan India presence in the following sectors:
    - Environmental Clearance
    - Coastal Regulation Zone
    - Risk Assessment, DMP, HAZOP studies
    - Feasibility/ treatability studies
    - Due diligence studies
    - Ground water Clearance
    - DISH, PESO and other statutory approvals
    - Consent to Establish, Consent to Operate

- Hazardous waste, bio medical waste authorization
- Other environmental approvals

➢ Has an in-house laboratory wherein the following activities are being carried out:



QCI – NABET Accreditation

Consultancy	Hubert Enviro Care Systems Pvt. Ltd., Chennai
NABET Certificate No	NABET/EIA/24-27/RA 0335 valid up to 31.03.2027
MoEF Reg. Lab	F.No. Q-15018/13/2016-CPW

National Accreditation Board for Education & Training (NABET) is a constituent board of the Quality Council of India (QCI). QCI, NABET has accredited HECS for carrying out Category 'A & Category B' EIA studies in the following sectors:

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

NABET

National Accreditation Board for Education and Training

Certificate of Accreditation

Hubert Enviro Care Systems, Chennai

A-21, III Phase, Thiru Vi Ka Industrial Estate– 600032

*The organization is accredited as **Category-A** under the QCI-NABET **Scheme for Accreditation of EIA Consultant Organization, Version 3**: for preparing EIA/EMP reports in the following Sectors-*

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals including opencast / underground mining	1	1 (a) (i)	A
2.	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3.	River Valley projects	3	1 (c)	A
4.	Thermal power plants	4	1 (d)	A
5.	Mineral beneficiation	7	2 (b)	A
6.	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
7.	Cement plants	9	3 (b)	A
8.	Petroleum refining industry	10	4 (a)	A
9.	Pesticides industry and pesticide specific intermediates (excluding formulations)	17	5 (b)	A
10.	Petro-chemical complexes	18	5 (c)	A
11.	Petrochemical based processing	20	5 (e)	A
12.	Synthetic organic chemicals industry	21	5 (f)	A
13.	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	A
14.	Bio-medical waste treatment facilities	32A	7(d a)	B
15.	Ports, harbours, break waters and dredging	33	7 (e)	A
16.	Highways,	34	7 (f)	B
17.	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
18.	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
19.	Building and construction projects	38	8 (a)	B
20.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated May 31, 2024, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/24/3292 dated June 25, 2024. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems, Chennai following due process of assessment.

Issue Date
June 25, 2024

Valid up to
March 31, 2027

Mr. Ajay Kumar Jha
(Sr. Director, NABET)

Certificate No.
NABET/EIA/24-27/RA 0335

Prof (Dr) Varinder S Kanwar
(CEO- NABET)

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

Further details may be seen on the following URL: *www.hecs.in*.