

Arima Cements Private Limited

**Proposed Thoothukudi Cement Grinding Unit
(0.2 MTPA @ 600 TPD PPC/OPC)
(Stand Alone Grinding Unit)**

**Survey No. 399/1B Part, Therku Veerapandiyapuram Village,
Ottapidaram Taluk, Thoothukudi District, Tamil Nadu**

**Environmental Clearance under EIA Notification 2006
Schedule SI. No. 3(b) - Category 'B1'**

**Draft Environmental Impact Assessment Report
(after TOR for Public Hearing)**

TOR Awarded vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022

TOR Validity Extension vide TO25B1103TN5340356A dated 25.09.2025

October 2025

EIA Consultant



ABC Techno Labs India Private Limited, Chennai

Accreditation Certificate : NABET/EIA/2225/RA0290 dated 11.06.2023

with Validity till 16.11.2025 (SI. No. 4 of QCI/NABET List)

Lab Accreditation : NABL Certificate No. TC-5770 dated 03.04.2024-valid till 02.04.2026

Content

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
I	Content	2
II	Project Proponent Declaration	6
III	EIA Consultant Undertaking	7
IV	Awarded TOR	8
V	TOR Validity Extension	21
VI	Awarded TORs & their Incorporation in the EIA Report	23
	Executive Summary	31
1.0	Introduction	33
1.1	Proposal Summary	33
1.2	Project Proponent	36
1.3	Need for the Proposal	36
1.4	Site & Land Use	36
1.5	Site in Possession	41
1.6	Proposed Land Use	41
1.7	Environmental Setting	41
1.8	Project Cost	45
1.9	Employment Potential	45
1.10	Project Benefits	45
1.11	EIA Report	46
2.0	Project Profile	47
2.1	Proposed Layout & Construction	47
2.2	Description of the Project	47
2.3	Raw Materials, Source & Mode of Transportation	49
2.4	Action Plan for developing Connecting and Internal Roads	49
2.5	Size/Magnitude of Operation	49
2.6	Action Plan for Stock Piles	49
2.7	Process	50
2.8	Power & Fuel Demands	53
2.9	Action Plan to limit PM Emission from all Stacks below 30 mg/Nm ³	53
2.10	Noise Levels	54
2.11	Action Plan for gradual shifting of Ground Water usage to Surface Water Source	54
2.12	Solid Wastes	55
2.13	Action Plan for Green Belt Development	55
2.14	Occupational Health	56
2.15	Raw Materials & Fuel Linkages	56
2.16	CREP Compliance	56
3.0	Description of the Environment	58
3.1	Study Area	58
3.2	Environmental Components	58
3.3	Methodology Adopted	62
3.4	Micrometeorology	66
3.5	Ambient Air Quality	71
3.6	Noise Levels	84
3.7	Water Environment	85

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
3.8	Land Environment	90
3.9	Flora & Fauna	95
3.10	Socioeconomic Environment	102
3.11	Summary of Baseline Status	112
4.0	Anticipated Environmental Impact and Mitigation Measures	113
4.1	Identification of Impacts	113
4.2	Construction Phase	113
4.3	Operation Phase	114
5.0	Analysis of Alternatives (Technology & Site)	124
5.1	Technology	124
5.2	Alternative Sites Considered	124
6.0	Environmental Monitoring Programme	126
6.1	Environment Cell and Compliances	126
6.2	Post Project Monitoring	126
7.0	Additional Studies	127
7.1	Hazards Identification & Risk Assessment	127
7.2	Disaster Management Plan (DMP)	132
8.0	Project Benefits	139
9.0	Environmental Cost Benefit Analysis	139
10.0	Environmental Management Plan	140
10.1	Construction Phase	140
10.2	Operation Phase	140
10.3	EMP Budget	143
11.0	Summary EIA	144-156
12.0	Disclosure of Consultants	157
	Annexures	
Doc-1	Lease Agreement	167
Doc-2	MOU for Clinker Supply	171
Doc-3	MOU for Gypsum Supply	175
Doc-4	MOU for Fly Ash Supply	178
Doc-5	Adangal Copy	181
Doc-6	ROC & Directors	182
Doc-7	Authorised Signatory	184

List of Figures

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
Fig. 1.1	Index Map	34
Plate I	Arima Cements Thoothukudi Grinding Unit Location in Regional Map	37
Plate II	Site in High Resolution Satellite Imagery	38
Plate III	Site in FMB Sketch	39
Plate IV	Site Photographs	40
Fig. 1.2	Topo Map -10 km Radius	42
Fig. 1.3	Environmental Setting-10 km Radius	43
Plate IV	Google Map of ESZ of Gulf of Mannar Marine National Park	44
Fig. 2.1	Plant Layout	48
Fig. 2.2	Process Flow Diagram	51
Fig. 2.3	Flow Chart	52
Fig. 2.4	Water Balance Diagram	55
Fig. 3.1	Environmental Quality Monitoring Stations	59
Fig. 3.2	Physiography & DEM	60
Fig. 3.3	Drainage Pattern	61
Fig. 3.4	Seasonal Wind Rose	70
Fig. 3.5	Satellite Imagery	93
Fig. 3.6	Land Use Pattern	94
Fig. 4.1	Predicted GLC- PM10	119

List of Tables

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
Table 1.1	Proposed Land Use	41
Table 2.1	Various Cements & their Composition	47
Table 2.2	Raw Materials Demand, Source & Mode of Transportation	49
Table 2.3	Proposed Storage Capacities	50
Table 2.4	Proposed Stack Data	53
Table 2.5	Water Demand & Wastewater Generation	54
Table 2.6	Green Belt Development	55
Table 2.7	Compliance to CREP Guidelines	56
Table 3.1	Micrometeorological Data -April 2022	67
Table 3.2	Micrometeorological Data – May 2022	68
Table 3.3	Micrometeorological Data – June 2022	69
Table 3.4	Ambient Air Quality Monitoring Stations - Location & Bearing	71
Table 3.5-3.12	Ambient Air Quality Data	72-79
Table 3.13	Abstract of Ambient Air Quality Data	80
Table 3.14	Ambient Air Quality Status	82
Table 3.15	Ambient Noise Level Data (Abstract)	84
Table 3.16	Ground Water Levels-TWAD Data	86
Table 3.17	CPCB Criteria for Designated Best Use of Water	86
Table 3.18	Surface Water Quality Data	88
Table 3.19	Ground Water Quality Data	89
Table 3.20	Water Quality Status	90
Table 3.21	Soil Status	91
Table 3.22	Land Use Pattern	92
Table 3.23	List of Flora in the Study Area	95
Table 3.24	List of Fauna	100
Table 3.25	Demographic Profile – 2011 Census	103
Table 3.26	Occupation of Population and Work Forces	105
Table 3.27	Educational Facilities	107
Table 3.28	Medical Facilities	108
Table 3.29	Communication & Transport Facilities	109
Table 3.30	Water & Drainage Facilities	110
Table 3.31	Other Facilities in the Study Area	111
Table 4.1	Traffic Volume due to the Unit	115
Table 4.2	Existing Traffic Volume - Baseline Status	115
Table 4.3	Level of Service & Performance of a Road	116
Table 4.4	Predicted Traffic Scenario at NH 44 Junction	116
Table 4.5	Predicted GLC-PM10	117
Table 4.6	Estimation of Quantum of Runoff Available	121
Table 5.1	Alternate Site Analysis	125
Table 6.1	Post Project Monitoring	126
Table 7.1	Fuel Storages	128
Table 7.2	Effect of Heat Radiation	131
Table 7.3	Radiation Exposure and Lethality	131
Table 10.1	EMP Budget	143



Project Proponent Declaration

[in compliance with MoEF Office Memorandum No. J-11013/41/2006-IA.II (I) dated 04.08.2009]

We, **M/s. Arima Cements Private Limited (ACPL)**, have applied to the State Level EIA Authority - Tamil Nadu (SEIAA-TN) for prior Environmental Clearance of our proposed Cement Grinding Unit (0.2 MTPA PPC/OPC) in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu. TOR Application filed vide Proposal No. SIA/TN/IND/76000/2022 on 21.04.2022 was deliberated in the State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 293rd Meeting held on 08.07.2022 and recommended the Terms of References (TORs) for carrying out Environmental Impact Assessment (EIA) Study. SEIAA-TN has approved the TORs in its 538th Meeting held on 02.08.2022. TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. With TOR validity expired on 01.08.2025, ACPL has applied and obtained **TOR Validity Extension** from SEIAA-TN vide TO25B1103TN5340356A dated 25.09.2025 for another one year.

The EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-9 (Cement Plants) for Category 'A' by NABET vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of the List) which will be extended by NABET periodically. ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2024 with validity till 02.04.2026.

The Environmental Impact Assessment (EIA) Report and Summary Environmental Impact Assessment Reports have been prepared in compliance with the awarded TORs and as per the generic structure proposed in EIA Notification 2006 and submitted. The data submitted in the EIA Report are factually correct.

For Arima Cements Private Limited

A handwritten signature in black ink, appearing to be "V. O. J.", is written over a faint circular stamp.

Date : 28.10.2025

Place : Thoothukudi

Director & Authorised Signatory



EIA Consultant Undertaking

[in compliance with MoEF Office Memorandum No. J-11013/41/2006-IA.II (I) dated 04.08.2009]

M/s. Arima Cements Private Limited (ACPL), have applied to the State Level EIA Authority -Tamil Nadu (SEIAA-TN) for prior Environmental Clearance of their proposed Cement Grinding Unit (0.2 MTPA PPC/OPC) in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu. TOR Application filed vide Proposal No. SIA/TN/IND/76000/2022 on 21.04.2022 was deliberated in the State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 293rd Meeting held on 08.07.2022 and recommended the Terms of References (TORs) for carrying out Environmental Impact Assessment (EIA) Study. SEIAA-TN has approved the TORs in its 538th Meeting held on 02.08.2022. TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. . With TOR validity expired on 01.08.2025, ACPL has applied and obtained **TOR Validity Extension** from SEIAA-TN vide TO25B1103TN5340356A dated 25.09.2025 for another one year.

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Date : 28.10.2025

For ABC Techno Labs India Private Limited


Authorized Signatory



ABC TECHNO LABS INDIA PRIVATE LIMITED

(Accredited by NABL, NABET, Approved by FSSAI, APEDA & Agmark, Recognised by MoEF&CC, BIS)

(An ISO : 9001, ISO : 14001, ISO : 45001 & ISO : 20000 Certified Company)

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**THIRU.DEEPAK S.BILGI, I.F.S.
MEMBER SECRETARY**

**STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY-TAMILNADU**

3rd Floor, Panagal Maaligai,
No.1, Jeenai Road, Saidapet,
Chennai - 600 015.
Phone No. 044-24359973
Fax No. 044-24359975

TERMS OF REFERENCES (ToR)

Letter No. SEIAA-TN/F. No.9194/ 3(b) /ToR-1216/2022 dated:02.08.2022

To

M/s. Arima Cements Private Limited
1/38A, East Street ,
Therkuveerapandiyapuram
Thoothukudi - 628 002

Sir/Madam,

Sub: SEIAA-TN – Terms of Reference (ToR) – Proposed stand alone grinding unit (0.2MTPA @ 600TPD PPC/OPC) at SF.No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu by M/s. Arima Cements Private Limited– Category “B1” and Schedule S.No. 3(b) All standalone cement Grinding Units (<1.0 million tonnes/annum production capacity) – **Terms of Reference (ToR) with Public Hearing Issued** – Preparation of EIA Report – Regarding.

Ref: 1. Online Proposal No. SIA/TN/IND/76000/2022, dated: 21.4.2022.
2. Your application for Terms of Reference dated: 25.04.2022.
3. Minutes of the 293rd meeting of SEAC held on 08.07.2022.
4. Minutes of the 538th meeting of SEIAA held on 02.08.2022.

Kindly refer to your proposal submitted to the State Level Impact Assessment Authority for Terms of Reference (ToR).


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SEIAA-TN**

The project proponent M/s. Arima Cements Private Limited submitted application seeking Terms of Reference, in Form-1, Pre- Feasibility report and draft TOR for the Proposed stand alone grinding unit (0.2MTPA @ 600TPD PPC/OPC) at SF.No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu.

Discussion by SEAC and the Remarks:-

Proposed stand alone grinding unit (0.2MTPA @ 600TPD PPC/OPC) at SF.No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu by M/s. Arima Cements Private Limited - For Terms of reference (SIA/TN/IND/76000/2022 Dt. 21.4.2022)

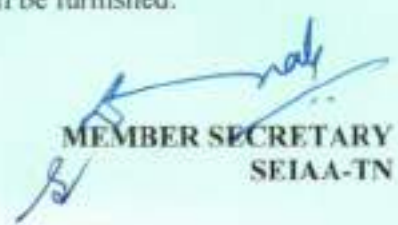
The proposal was placed in this 293rd SEAC Meeting held on 8.7.2022. The project proponent gave detailed presentation. The details of the project furnished by the proponent are available in the website (parivesh.nic.in).

The project proponent gave detailed presentation. SEAC noted the following:

1. The Proponent, M/s. Arima Cements Private Limited has applied for Terms of reference for the proposed stand alone grinding unit (0.2MTPA @ 600TPD PPC/OPC) at SF.No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu.
2. The project/activity is covered under Category "B1" of item 3(b) "Cement plant" of the Schedule to the EIA Notification, 2006.
3. The proposal consists stand alone Cement Grinding Unit 0.2MTPA @ 600TPD PPC/OPC with plot area – 4.05 Ha.
4. The Raw material are Clinker- 570 TPD, Gypsum- 30TPD & Fly Ash – 180 TPD . It is proposed to grind Clinker with other Raw Materials for producing PortlandPozzolana Cement (PPC) and Ordinary Portland Cement (OPC) @0.2 Million Tonnes per Annum (MTPA) @ 600 Tonnes per day (TPD).

Based on the presentation and documents/clarifications furnished by the project proponent, SEAC after detailed deliberations, decided to **recommend the proposal for the grant of Terms of Reference (ToR) with public consultation**, subject to the following ToRs in addition to the standard terms of reference for EIA study and details issued by the MoEF & CC to be included in EIA/EMP report:

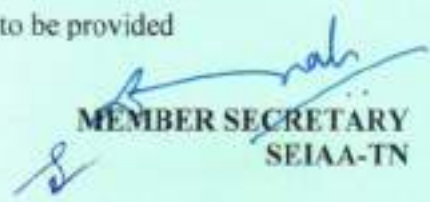
1. Clear village map, FMB sketch & A Register shall be furnished.


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2. Ground water for industrial purpose to be phased out in 5 years. The industry to explore possibilities to meet the Water consumption for industrial purpose through treated sewage obtained from nearest local body/rain water harvesting.
3. The project proponent has to submit the reclassification certificate from unclassified land to Industrial Land for the proposed project from the competent Authority.
4. Details of fugitive emission and control measures shall be furnished.
5. Air modeling study shall be conducted for the CPCB parameters considering the impact on the proposed plant to the nearby village.
6. CER proposal shall be furnished as per the MOEF & CC OM dated: 01.05.2018.
7. A green belt plan at thick canopy shall be furnished all along the boundary at the proposed site along with name of the species, no. of species etc.,
8. The GPS co-ordinates for the boundaries at the green belt proposed & proposed project site shall be furnished separately.

A. STANDARD TERMS OF REFERENCE

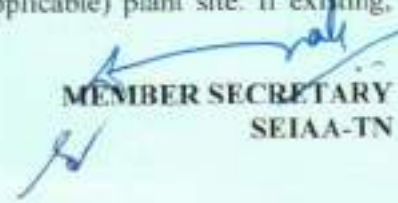
- 1) Executive Summary
- 2) Introduction
 - i. Details of the EIA Consultant including NABET accreditation
 - ii. Information about the project proponent
 - iii. Importance and benefits of the project
- 3) Project Description
 - i. Cost of project and time of completion.
 - ii. Products with capacities for the proposed project.
 - iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
 - iv. List of raw materials required and their source along with mode of transportation.
 - v. Other chemicals and materials required with quantities and storage capacities
 - vi. Details of Emission, effluents, hazardous waste generation and their management.
 - vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
 - viii. Process description along with major equipments and machineries, process flow sheet (quantities) from raw material to products to be provided


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- ix. Hazard identification and details of proposed safety systems.
- x. Expansion/modernization proposals:
 - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing I existing operation of the project from SPCB shall be attached with the EIA-EMP report.
 - b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification, 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

- i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
- ii. A top sheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)
- iii. Details w.r.t. option analysis for selection of site
- iv. Co-ordinates (lat-long) of all four corners of the site.
- v. Google map-Earth downloaded of the project site.
- vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
- vii. Photographs of the proposed and existing (if applicable) plant site. If existing,


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show photographs of plantation/greenbelt, in particular.

- viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)
- ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
- x. Geological features and Geo-hydrological status of the study area shall be included.
- xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)
- xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
- xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

- i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)
- ii. Land use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha),
- iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
- iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.
- v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area


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- vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.

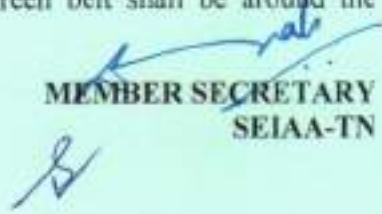
6) Environmental Status

- i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.
- ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
- iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQPM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.
- iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.
- v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
- vi. Ground water monitoring at minimum at 8 locations shall be included.
- vii. Noise levels monitoring at 8 locations within the study area.
- viii. Soil Characteristic as per CPCB guidelines.
- ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
- x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
- xi. Socio-economic status of the study area.


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7) Impact and Environment Management Plan

- i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
- ii. Water Quality modelling - in case of discharge in water body
- iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.
- iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.
- v. Details of stack emission and action plan for control of emissions to meet standards.
- vi. Measures for fugitive emission control
- vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.
- viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.
- ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the


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project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

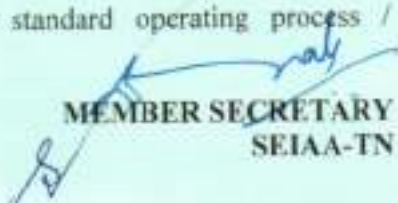
- x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.
- xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.
- xii. Action plan for post-project environmental monitoring shall be submitted.
- xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

- i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers
- ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.
- iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,
- iv. Annual report of health status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

- i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
- ii. Does the Environment Policy prescribe for standard operating process /


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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.

- iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.
 - iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report
- 10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.
 - 11) Enterprise Social Commitment (ESC)
 - I. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.
 - 12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.
 - 13) A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR CEMENT PLANTS

1. Limestone and coal linkage documents along with the status of environmental clearance of limestone and coal mines
2. Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to;
3. For large Cement Units, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site.
4. Present land use shall be prepared based on satellite imagery. High-resolution satellite

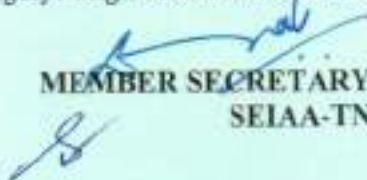

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image data having 1m-5m spatial resolution like quick bird, Icons, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.

5. If the raw materials used have trace elements, an environment management plan shall also be included.
6. Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be prepared.
7. Energy consumption per ton of clinker and cement grinding
8. Provision of waste heat recovery boiler
9. Arrangement for use of hazardous waste.

Discussion by SEIAA and the Remarks:-

The proposal was placed in the 538th meeting of Authority held on 01.08.2022. The Authority noted that this proposal was placed for appraisal in the 293rd meeting of SEAC held on 08.07.2022. After detailed deliberation, the Authority accepted the recommendation of SEAC and decided to grant Terms of Reference (ToR) along with Public Hearing for the preparation of Environment Impact Assessment Study and Environment Management Plan subject to the ToRs as recommended by SEAC & subject specific standard ToR in addition to the following ToRs:

1. As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.
2. The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.
3. The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.
4. The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.


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5. The Environmental Impact Assessment should study impact on standing trees and the trees should be numbered.
6. The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and hydrological cycles.
7. The Environmental Impact Assessment should study impact on climate change, GHG emissions, temperature rise, pollution and above soil & below soil carbon stock.
8. The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways.
9. The project proponent shall furnish the details of trees in the project site with all trees numbered and protected.
10. The project proponent shall furnish the detailed study regarding impact on the Reserve Forests within within 10-15km. (if applicable)
11. The project proponent shall furnish the detailed study on health with regard to respiratory distress due to allergens on workers and nearby villagers.
12. The project proponent shall furnish the impact around proposed grinding unit regard to raw materials transported from long distance.
13. The project proponent shall furnish the impact on dust pollution on the nearby habitation and livelihoods.
14. The project proponent shall furnish the Risk assessment plan, EMP and Disaster management plan which should be prepared after thorough study.
15. The GPS co-ordinates for the boundaries at the green belt proposed & proposed project site shall be furnished separately.
16. Air quality modelling study shall be conducted for the CPCB primary air pollutants specified by considering the impact on the proposed plant to the nearby villages.

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

- 1) Project name and location (Village, District, State, Industrial Estate (if applicable).
- 2) Products and capacities. If expansion proposal then existing products with capacities and reference to earlier EC.
- 3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative)
- 4) Process description in brief, specifically indicating the gaseous emission, liquid effluent

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and solid and hazardous wastes.

- 5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
- 6) Capital cost of the project, estimated time of completion.
- 7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt/ private land, status of its acquisition, nearby (in 2-3 km.) water body, population, within 10km other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary)
- 8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
- 9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
- 10) Likely impact of the project on air, water, land, flora-fauna and nearby population
- 11) Emergency preparedness plan in case of natural or in plant emergencies
- 12) Issues raised during public hearing (if applicable) and response given
- 13) CSR plan with proposed expenditure.
- 14) Occupational Health Measures
- 15) Post project monitoring plan

Besides the above, the below mentioned general points should also be followed:-

- a. A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.
- b. All documents may be properly referenced with index, page numbers and continuous page numbering.
- c. Copy of permission related to Port facility, Desalination plant, wind mill /solar power plant from competent Authority.
- d. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
- e. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.


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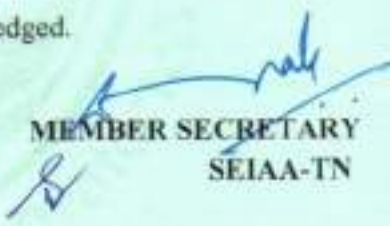
f. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard circular no F. No.J - 11013/77/2004-IA-II(I) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website <http://www.moef.nic.in/> may be referred.

- After preparing the EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

- The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.

- The TORs prescribed shall be valid for a period of three years from the date of issue, for submission of the EIA/EMP report as per OMNo.J-11013/41/2006-IA-II(I)(part) dated 29th August 2017.

The receipt of this letter may be acknowledged.


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Copy to:

1. The Additional Chief Secretary to Government, Environment & Forests Dept, Govt. of Tamil Nadu, Fort St. George, Chennai - 9.
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD Cum-Office Complex, East Arjun Nagar, New Delhi 110032.
3. The Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai-600 032.
4. The APCCF (C), Regional Office, MoEF&CC (SZ), 34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungambakkam, Chennai - 34.



File No.: 12533
Government of India
Ministry of Environment, Forest and Climate Change
(Issued by the State Environment Impact Assessment Authority(SEIAA),
TAMIL NADU)



Dated 25/09/2025



To,

Mr V Subramanian
M/s Arima Cements Private Limited
1/38A, East Street, Therkuveerapandiapuram, Thoothukudi - 628002 , TUTICORIN, TAMIL NADU-
628002
info@arimacements.com

Subject: Extension of validity of Terms of Reference with Public Hearing to the project under the provision of the EIA Notification 2006 and as amended thereof regarding.

Sir/Madam,

Sub: SEIAA, Tamil Nadu – Extension of validity of Terms of Reference with Public Hearing for the Proposed Stand Alone Cement Grinding Unit (0.2 MTPA @ 600TPD PPC/OPC) at Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu by M/s Arima Cements Private Limited– issue of extension of validity of Terms of Reference with Public Hearing – Regarding.

Ref: 1. MoEF&CC Office Memorandum dated: 08.06.2022
2. Earlier ToR issued by SEIAA-TN vide Lr.No.SEIAA/TN/F.No.9194/3(b)/ToR-1216/2022, Dated 02.08.2022
3. Online Proposal No. SIA/TN/IND1/545880/2025, Dated: 30/07/2025
4. Minutes of the 610th meeting of SEAC held on 28.08.2025
5. Minutes of the 886th SEIAA meeting held on 15.09.2025

2. The particulars of the proposal are as below :

(i) TOR Identification No.	TO25B1103TN5340356A
(ii) File No.	12533
(iii) Clearance Type	Amendment in TOR
(iv) Category	B1
(v) Schedule No./ Project Activity	3(b) Cement plants
(vi) Name of Project	TOR Validity Extension for Proposed Cement Grinding Unit of 0.2 MTPA in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District of Tamil Nadu by M/s

- (vii) Location of Project (District, State)
 (viii) Issuing Authority
 (ix) Applicability of General Conditions

Arima Cements Private Limited (SEIAA-
 TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022)
 TUTICORIN, TAMIL NADU
 SEIAA
 No

In the reference 2nd cited above, the Terms of Reference along with Public Hearing was accorded to M/s Arima Cements Private Limited for the Proposed Stand Alone Cement Grinding Unit (0.2 MTPA @ 600TPD PPC/OPC) at Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu with validity upto **01.08.2025**.

Now, the Project Proponent has applied for extension of validity of Terms of Reference vide reference 3rd cited.

SEAC Remarks:

The proposal was placed in the 610th meeting of SEAC held on 28.08.2025.

The SEAC noted the following:

1. The Project Proponent, M/s Arima Cements Private Limited has applied for extension of validity of Terms of Reference for the Proposed Stand Alone Cement Grinding Unit (0.2 MTPA @ 600TPD PPC/OPC) at Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu.
2. The proposed quarry/activity is covered under Category “B1” of Item 3(b) “Cement Plant” of the Schedule to the EIA Notification, 2006, as amended.
3. ToR along with Public Hearing issued vide Lr.No.SEIAA/TN/F.No.9194/3(b)/ToR-1216/2022, Dated 02.08.2022 with validity for a period of three years (i.e., 01.08.2025).
4. Now, the PP has requested for extension of validity of Terms of reference(ToR) for another one year with no change in scope of the proposal.

As per MoEF&CC Office Memorandum dated: 08.06.2022, the validity of ToR shall be for a maximum period of four years. Hence, the validity of the ToR issued is deemed to be valid upto **01.08.2026**.

Based on the presentation & documents furnished by the project proponent, the Committee decided to recommend extension of validity of the ToR for a period of 1 year, i.e., **up to 01.08.2026** subject to the following conditions.

Decision of SEIAA:

The subject was placed in the 886th Authority meeting held on 15.09.2025. The authority noted that the subject was appraised in the 610th meeting of SEAC held on 28.08.2025. SEAC has furnished its recommendations for granting extension of validity of Terms of Reference (ToR) subject to specific conditions stated therein.

After detailed discussions, the Authority taking into account the recommendations of SEAC, decided to grant extension of validity of Terms of Reference (ToR) for a period of 1 year, i.e., up to **01.08.2026** subject to the specific conditions stipulated by SEAC. All other conditions stipulated in the ToR vide Lr.No.SEIAA/TN/F.No.9194/3(b)/ToR-1216/2022, Dated 02.08.2022 shall remain unchanged and unaltered.

Awarded TORs and their Compliance in EIA Report

I Additional TORs

Sl. No.	Additional TORs	Incorporation in EIA Report Page No.
Additional TORs by SEAC :-		
1	Clear village map, FMB sketch & A Register shall be furnished.	39
2	Ground water for industrial purpose to be phased out in 5 years. The industry to explore possibilities to meet the Water consumption for industrial purpose through treated sewage obtained from nearest local body/rain water harvesting.	No ground water drawl proposed. 54
3	The project proponent has to submit the reclassification certificate from unclassified land to Industrial Land for the proposed project from the competent Authority.	92
4	Details of fugitive emission and control measures shall be furnished.	120
5	Air modeling study shall be conducted for the CPCB parameters considering the impact on the proposed plant to the nearby village.	117-119
6	CER proposal shall be furnished as per the MOEF & CC OM dated: 01.05.2018.	156
7	A green belt plan at thick canopy shall be furnished all along the boundary at the proposed site along with name of the species, no. of species etc.,	55 122-123
8	The GPS co-ordinates for the boundaries at the green belt proposed & proposed project site shall be furnished separately.	48
Additional TORs by SEIAA :		
1	As per the MoEF & CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	Will be complied
2	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	122-123
3	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	122-123
4	The Terms of Reference should specifically study impact on soil health, soil erosion. the soil physical, chemical components and microbial components.	90-91 122-123
5	The Environmental Impact Assessment should study impact on standing trees and the trees should be numbered.	No trees at the Site
6	The environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and hydrological cycles.	41 61 85-86
7	The Environmental Impact Assessment should study impact on climate change, GHC emissions. temperature rise, pollution and above soil & below soil carbon stock.	122-123

Sl. No.	Additional TORs	Incorporation in EIA Report Page No.
8	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways.	41-43
9	The project proponent shall furnish the details of trees in the project site with all trees numbered and protected.	No trees at the Site
10	The project proponent shall furnish the detailed study regarding impact on the Reserve Forests within 10-15 Km (if applicable)	No RF in the Study Area
11	The project proponent shall furnish the detailed study on health with regard to respiratory distress due to allergens on workers and nearby villagers.	123
12	The project proponent shall furnish the impact around proposed grinding unit regard to raw materials transported from long distance.	115-116
13	The project proponent shall furnish the impact on dust pollution on the nearby habitation and livelihoods.	117-120
14	The project proponent shall furnish the Risk assessment plan, EMP and Disaster management plan which should be prepared after thorough study.	127-13
15	The GPS co-ordinates for the boundaries at the green belt proposed & proposed project site shall be furnished separately.	38 48
16	Air quality modelling study shall be conducted for the CPCB primary air pollutants specified by considering the impact on the proposed plant to the nearby villages.	117-119

II. Standard TOR in respect of Industry Sector

Sl. No.	General TOR	Incorporation in EIA Report Page No.
1	Executive Summary	34-35
2	Introduction	
i	Details of the EIA Consultant including NABET accreditation	35 & 157-166
ii	Information about the project proponent	36
iii	Importance and benefits of the project	45
3	Project Description	
i	Cost of project and time of completion.	45
ii	Products with capacities for the proposed project.	47
iii	If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	New Proposal
iv	List of raw materials required and their source along with mode of transportation.	49
v	Other chemicals and materials required with quantities and storage capacities	49
vi	Details of Emission, effluents, hazardous waste generation and their management.	54-55
vii	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)	54-55
viii	Process description along with major equipment and machineries, process flow sheet (Quantities) from raw material to products to be provided	50-53

Sl. No.	General TOR	Incorporation in EIA Report Page No.
ix	Hazard identification and details of proposed safety systems.	127-138
x	Expansion/modernization proposals:-	Not Applicable
a	Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MoEF&CC/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment, Forest and Climate Change as per circular dated 30 th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing /existing operation of the project from SPCB/PCC shall be attached with the EIA-EMP report.	Not Applicable
b	In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005 - 2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	Not Applicable
4	Site Details	
i	Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	33-34
ii	A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)	41-43
iii	Details w.r.t. option analysis for selection of site	124-125
iv	Co-ordinates (lat-long) of all four corners of the site.	38 & 41
v	Google map-Earth downloaded of the project site.	38
vi	Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	47-48
vii	Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.	40
viii	Landuse break-up of total land of the project site (identified and acquired), government/private-agricultural, forest, wasteland, water bodies, settlements, etc., shall be included (not required for industrial area).	36 41
ix	A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area	45
x	Geological features and Geo-hydrological status of the study area shall be included.	58 85-86
xi	Details of Drainage of the project upto 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)	58 61 No Flood Hazard
xii	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	41
xiii	R&R details in respect of land in line with state Government policy	No R&R-41

Sl. No.	General TOR	Incorporation in EIA Report Page No.
5	Forest and wildlife related issues (if applicable):	Not Applicable
i	Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable).	-
ii	Land use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha).	-
iii	Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	-
iv	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.	-
v	Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area.	-
vi	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife	-
6	Environmental Status	
i	Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	117
ii	AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO ₂ , NO _x , CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	71-84
iii	Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	71-84
iv	Surface water quality of nearby River (60m upstream and downstream) and their surface drains at eight locations as per CPCB/MoEF&CC guidelines.	87-88
v	Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC.	No
vi	Ground water monitoring at minimum at 8 locations shall be included.	87 & 89
vii	Noise levels monitoring at 8 locations within the study area.	84-85
viii	Soil Characteristic as per CPCB guidelines.	90-91
ix	Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	115-116
x	Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	95-102
xi	Socio-economic status of the study area.	102-112
7	Impact and Environment Management Plan	
i	Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the	117-119

Sl. No.	General TOR	Incorporation in EIA Report Page No.
	project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.	
ii	Water Quality modelling - in case, of discharge in Waterbody	Not Applicable
iii	Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.	115-116
iv	A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.	120-121
v	Details of stack emission and action plan for control of emissions to meet standards.	53-54
vi	Measures for fugitive emission control	120
vii	Details of hazardous waste generation and their storage, utilization and disposal. Copies of MOU regarding utilization of solid and hazardous waste shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.	121
viii	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	49-50 & 53
ix	Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc., shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.	55 122
x	Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.	121
xi	Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.	143
xii	Action plan for post-project environmental monitoring shall be submitted.	126
xiii	Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.	132-138
8	<u>Occupational Health</u>	
i	Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers.	123 45
ii	Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre-designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analysed data of abovementioned parameters as per age,	New Proposal

Sl. No.	General TOR	Incorporation in EIA Report Page No.
	sex, duration of exposure and department wise.	
iii	Details of existing occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure Level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.	New Proposal
iv	Annual report of health status of workers with special reference to Occupational Health and Safety.	New Proposal
9	<u>Corporate Environment Policy</u>	
i	Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.	36
ii	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.	36
iii	What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.	36
iv	Does the company have system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.	36
10	Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	113
11	Enterprise Social Commitment (ESC) Adequate funds (at least 2.5% of the Project Cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing Issues and Item-wise details along with time bound action plan shall be included. Socio economic development activities need to be elaborated upon.	143
12	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	No 41
13	A tabular chart with index for point wise compliance of above ToRs.	Complied

III. Specific TORs for EIA Studies for Cement Plants

Sl. No.	Additional TOR	Incorporation in EIA Report Page No.
1	Limestone and coal linkage documents along with the status of environmental clearance of Limestone and Coal mines.	Grinding Unit
2	Quantum of production of coal and limestone from mines and the projects they cater to.	Grinding Unit
3	For large Cement Units, a 3-D view ie. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site	60
4	Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like	92-94

	quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.	
5	If the raw materials used have trace elements, an environment management plan shall also be included.	Nil 50
6	Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be prepared.	56-57
7	Energy consumption per ton of clinker and cement grinding	Grinding Unit Not Applicable
8	Provision of waste heat recovery boiler	Grinding Unit Not Applicable
9	Arrangement for use of hazardous waste.	Grinding Unit Not Applicable

IV. Executive Summary

Sl. No.	Executive Summary	Incorporation in EIA Report Page No.
1	The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points: 1. Project name and location (Village, District, State, Industrial Estate (if applicable)) 2. Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC. 3. Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative) 4. Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes. 5. Measures for mitigating the impact on the environment and mode of discharge or disposal. 6. Capital cost of the project, estimated time of completion 7. Site selected for the project – Nature of land – Agricultural (single/double crop), barren, Govt/private land, status of is acquisition, nearby (in 2/3 km.) water body, population, with in 10km other industries, forest, eco/sensitive zones, accessibility, (note – in case of industrial estate this information may not be necessary) 8. Baseline environmental data – air quality, surface and ground water quality, soil characteristic, flora and fauna, socio/economic condition of the nearby population 9. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk. 10. Likely impact of the project on air, water, land, flora/fauna and nearby population 11. Emergency preparedness plan in case of natural or in plant emergencies 12. Issues raised during public hearing (if applicable) and response given 13. CSR plan with proposed expenditure. 14. Occupational Health Measures 15. Post project monitoring plan	Chapter 11 144-156

The following general points shall be noted:

Sl. No.	General Points	Incorporation in EIA Report Page No.
a.	A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided	Complied
b.	All documents may be properly referenced with index, page numbers and continuous page numbering	Complied
c.	Copy of permission related to Port facility, Desalination plant, wind mill / solar power plant from competent authority.	Not Applicable
d.	Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated	Complied
e.	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MOEF&CC vide O.M. No. J/11013/41/2006/IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry shall also be followed	Complied
f.	The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard, circular no. F.No.J-11013/77/2004-IA-II(I) dated 2 nd December, 2009, 18 th March 2010, 28 th May 2010, 28 th June 2010, 31 st December 2010 & 30 th September 2011 posted on the Ministry's website http://www.moef.nic.in/ may be referred.	Chapter 12 157-166

Executive Summary

M/s. Arima Cements Private Limited (ACPL), have applied to the State Level EIA Authority -Tamil Nadu (SEIAA-TN) for prior Environmental Clearance of their proposed Cement Grinding Unit (0.2 MTPA PPC/OPC) along with a standby DG Set of 2,500 KVA in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu. We have executed the Lease Deed for initial 33 years with Land Owner M/s.VV Mineral on 09.12.2021.

It is proposed to grind Clinker with other Raw Materials for producing PPC and OPC @ **0.20 Million Tonnes per Annum (MTPA) @ 600 Tonnes per day (TPD)** to cater the local Market Demand. Main process of manufacturing of PPC involves inter-grinding of Clinker, Fly Ash and Gypsum in the ratio of 65:30:5 and OPC involves inter-grinding of Clinker and Gypsum in the ratio of 95:5.

Clinker will be imported from Omen, UAE and the MOU has been signed with M/s. Pioneer Cement Industries, UAE on 25.01.2022. Other Raw materials will be sourced locally. **No Railway Sidings, no Township and no Workshop** are proposed. The Grinding Unit requires about 2.0 MW power which will be sourced from TANGEDCO Grid. There will also be a **DG Set of 2.5 MW** for standby operations.

The proposed Site is located inbetween 08°49'07.30"-08°49'16.82" N Latitude & 78°03'52.90"-78°03'59.85" E Longitude (Survey of India Topo Sheets No. 58 H/13). There is no environmental issue about the site. Gulf of Mannar Marine National Park (GoMMNP) – Eco Sensitive Area (ESA) is notified vide SO 08(E) dated 01.01.2020 with its Eco Sensitive Zone (ESZ). GoMMNP ESA boundary is located at a distance of 13.5 km in the east and ESZ is at 10.7 km in the east. Gulf of Mannar Marine Biosphere Reserve (GoMBR) is one of the Ramsar Sites in Tamil Nadu. There is **no National Park/Wild Life Sanctuary/Reserved Forest/Hot Spot exist** within 10 km radius area.

The seasonal Korampallam Odai flows at 8.3 km (SE). There are Small, Medium and Major Industries in the SIPCOT Complex. The Site is well connected by road and rail modes and is accessible from nearby National Highway NH-38. Thoothukudi Corporation Area is located within 5-10 km distance from the site in the east. Meelavittan is the nearest settlement with a total population of 45,863 (23,167 Males and 22,696 Females-Census-2011).

Clinker, Fly Ash and Cement will be stored in RCC Silos. Gypsum & Wet Fly Ash will be stored in covered sheds. All the conveyors for material handling will be completely covered. All point sources and material transfer points are provided with Bag Filters to control PM emission <30 mg/Nm³. The dust collected from the Bag Filters will be recycled in the Cement manufacturing process. The DG Set will have adequate Stack Height and In-built acoustic measures.

As this is only a grinding unit, water is mainly required for equipment cooling, domestic consumption, etc. Raw Water is required for Equipment Cooling (20 KLD), Domestic Use (3 KLD) and Green Belt (7 KLD). The total Water Demand of 30 KLD will be met from local Desalination Plant/water supply agencies and no ground water drawl will be there.

There will be no trade effluent generation from the Unit. Domestic sewage to the tune of 2.5 KLD from the Unit will be biologically treated in Septic Tank of adequate size followed by a Dispersion Trench. Thus, '**Zero Effluent Discharge-ZLD**' will be adopted/practiced.

No solid waste is envisaged from the process. Spent/waste Oil (Cat. 5.1) will be about 100 Lits./year which will be stored and sold to TNPCB Authorised Recyclers for recovery and further use. Filter Bags Scrap (20 kg/year) will also be generated which will be sold to Vendors.

The **Project Cost is Rs.23.00 crores**. A budgetary allotment of Rs.5.00 crores has been made as Capital Cost for EMP Measures and Rs.10.00 lakhs per annum towards Operating Cost Adequate Budget will be earmarked for CSR and for addressing Public Hearing issues.

As per Environmental Impact Assessment (EIA) Notification 2006 [SO 1533 (E) dated 14.09.2006], all Stand Alone Grinding Units have been kept at Sl. No. 3(b) under Category 'B' for Environmental Clearance from State Level EIA Authority -Tamil Nadu (SEIAA-TN). Accordingly, online TOR Application was filed to SEIAA-TN and TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. With TOR validity expired on 01.08.2025, ACPL has applied and obtained **TOR Validity Extension** from SEIAA-TN vide TO25B1103TN5340356A dated 25.09.2025 for another one year.

The EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-9 (Cement Plants) for Category 'A' by NABET vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of the List) which will be extended by NABET periodically. ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2024 with validity till 02.04.2026.

ACPL has submitted Draft EIA and Summary EIAs in English & Tamil to TNPCB for conducting the Public Consultation & Public Hearing for the Project.

1.0 Introduction

1.1 Proposal Summary

M/s. Arima Cements Private Limited (ACPL) is registered under the Companies Act, 2013 on 07.12.2021. With available resources for Cement Grinding and Marketing, ACPL is proposing to establish a Cement Grinding Unit in Thoothukudi. ACPL has identified a suitable Site for the Project to an extent of 4.05 Ha, private Patta land adjacent to SIPCOT Industrial Estate-Thoothukudi, in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu (**Fig. 1.1**). Company has also executed the Lease Deed for initial 33 years with Land Owner M/s. V V Mineral on 09.12.2021. Site is in possession of ACPL. As per DTCP, the area falls in 'Non-Planning Area'. There is no Rehabilitation & Resettlement (R&R) issue due to the Proposal. There is no Litigation/Pending Case against the Proposal.

It is proposed to grind Clinker with other Raw Materials for producing Portland Pozzolana Cement (PPC) and Ordinary Portland Cement (OPC) @ **0.2 Million Tonnes per Annum (MTPA) @ 600 Tonnes per day (TPD)**. A standby DG Set of 2,500 KVA is also proposed. The Project will give direct employment to about 50 persons and indirect employment to about 100 persons.

Main process of manufacturing of PPC involves inter-grinding of Clinker, Fly Ash and Gypsum in the ratio of 65:30:5 and OPC involves inter-grinding of Clinker and Gypsum in the ratio of 95:5. Clinker will be imported from Oman, UAE, etc. MOU has been signed with M/s. Pioneer Cement Industries, UAE on 25.01.2022 for the supply of Clinker to the Project. Other Raw materials will be sourced locally. Clinker, Fly Ash and Cement will be stored in RCC Silos. Gypsum and Wet Fly Ash will be stored in covered sheds. All the conveyors for material handling will be completely covered. All point sources and material transfer points are provided with Bag Filters to control **PM emission <30 mg/Nm³**.

The Grinding Unit requires about 2.0 MW power which will be sourced from TANGEDCO Grid. Raw Water is required for Equipment Cooling (20 Kilo Litres per day-KLD), Domestic Use (3 KLD) and Green Belt (7 KLD). The total Water Demand of 30 KLD will be met from local RO water supply agencies. There will not be any ground water drawl for the Project. There will be no trade effluent generation from the Unit. Domestic sewage to the tune of 2.5 KLD from the Unit will be biologically treated in Septic Tank of adequate size followed by a Dispersion Trench. Thus, 'Zero Effluent Discharge' will be adopted/practiced.

The proposed Site is located inbetween 08°49'07.30"-08°49'16.82" N Latitude & 78°03'52.90"-78°03'59.85" E Longitude (Survey of India Topo Sheets No. 58 H/13). There is no environmental issue about the site. Gulf of Mannar Marine National Park (GoMMNP) – Eco Sensitive Area (ESA) - is notified vide SO 08(E) dated 01.01.2020 with its Eco Sensitive Zone (ESZ).

Fig. : 1.1 Index Map



GoMMNP ESA boundary is located at a distance of 13.5 km in the east and ESZ is at 10.7 km in the east. Gulf of Mannar Marine Biosphere Reserve (GoMBR) is one of the Ramsar Sites in Tamil Nadu. There is **no National Park/Wild Life Sanctuary/Reserved Forest/Hot Spot exist** within 10 km radius area. The seasonal Korampallam Odai flows at 8.3 km (SE) and there is **no Flood Hazard** to the site. There are Small, Medium and Major Industries in the SIPCOT Complex. Meelavittan SIPCOT Complex has many major industries. V V Titanium Pigments Plant is located at 0.7 km in east. Vedanta Sterlite industry (shut down now) is located in the eastern side of the Site. Sterlite Captive Thermal Power Plant (2x80 MW) is located @ 2.2 km in east from site.

The Site is well connected by road and rail modes and is accessible from nearby National Highway **NH-38. Thoothukudi Corporation Area** is located within 5-10 km distance from the site in the east. Meelavittan is the nearest settlement with a total population of 45,863 (23,167 Males and 22,696 Females-Census-2011).

The **Project Cost is Rs.23.00 crores**. A budgetary allotment of Rs.5.00 crores has been made as Capital Cost for EMP Measures and Rs.10.00 lakhs per annum towards Operating Cost.

As per Environmental Impact Assessment (EIA) Notification 2006 [SO 1533 (E) dated 14.09.2006], all Stand Alone Grinding Units have been kept at Sl. No. 3(b) under Category 'B' for Environmental Clearance from State Level EIA Authority -Tamil Nadu (SEIAA-TN). Accordingly, online TOR Application was filed vide Proposal No. SIA/TN/IND/76000/2022 on 21.04.2022 (**File No. 9194/2022**). State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) deliberated the Proposal in its 293rd Meeting held on 08.07.2022 and recommended Terms of References (TORs) for carrying out Environmental Impact Assessment (EIA) Study. SEIAA-TN has approved the TORs in its 538th Meeting held on 02.08.2022. TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. ACPL has also applied and obtained **TOR Validity Extension** from SEIAA-TN vide TO25B1103TN5340356A dated 25.09.2025 for another one year. Baseline Data (BLD) was collected during **Apr.-Jun. 2023 (Summer Season)**. The EIA Report has been prepared and submitted in compliance with awarded TORs and also as per the generic structure proposed in EIA Notification 2006. The Draft EIA Report along with Summary EIA Reports (both in English and Tamil) are submitted for conducting the Public Consultation & Public Hearing.

EIA Consultant : The EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-9 (Cement Plants) for Category 'A' by NABET vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of the List) which will be extended by NABET periodically. ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2024 with validity till 02.04.2026.

1.2 Project Proponent

M/s. Arima Cements Private Limited (ACPL) is registered under the Companies Act, 2013 (18 of 2013) on 07.12.2021. The Corporate Identity Number of the Company is U26999TN2021PTC148417. The **Authorised Signatory is Mr.V.Subramanian, Director**. The registered & communication address is :

M/s. Arima Cements Private Limited,
1/38A, East Street,
Therkuveerapandiyapuram,
Thoothukudi-628 002.
Tel. No. : 9943796254
e-Mail : info@arimacements.com

Managing Director of ACPL will deal with the environmental issues and EC compliances. An Environmental Policy and Environmental Management Cell will be in place. Any non-compliance/violations of environmental norms and the corrective actions taken will be reported by Plant Head to Managing Director.

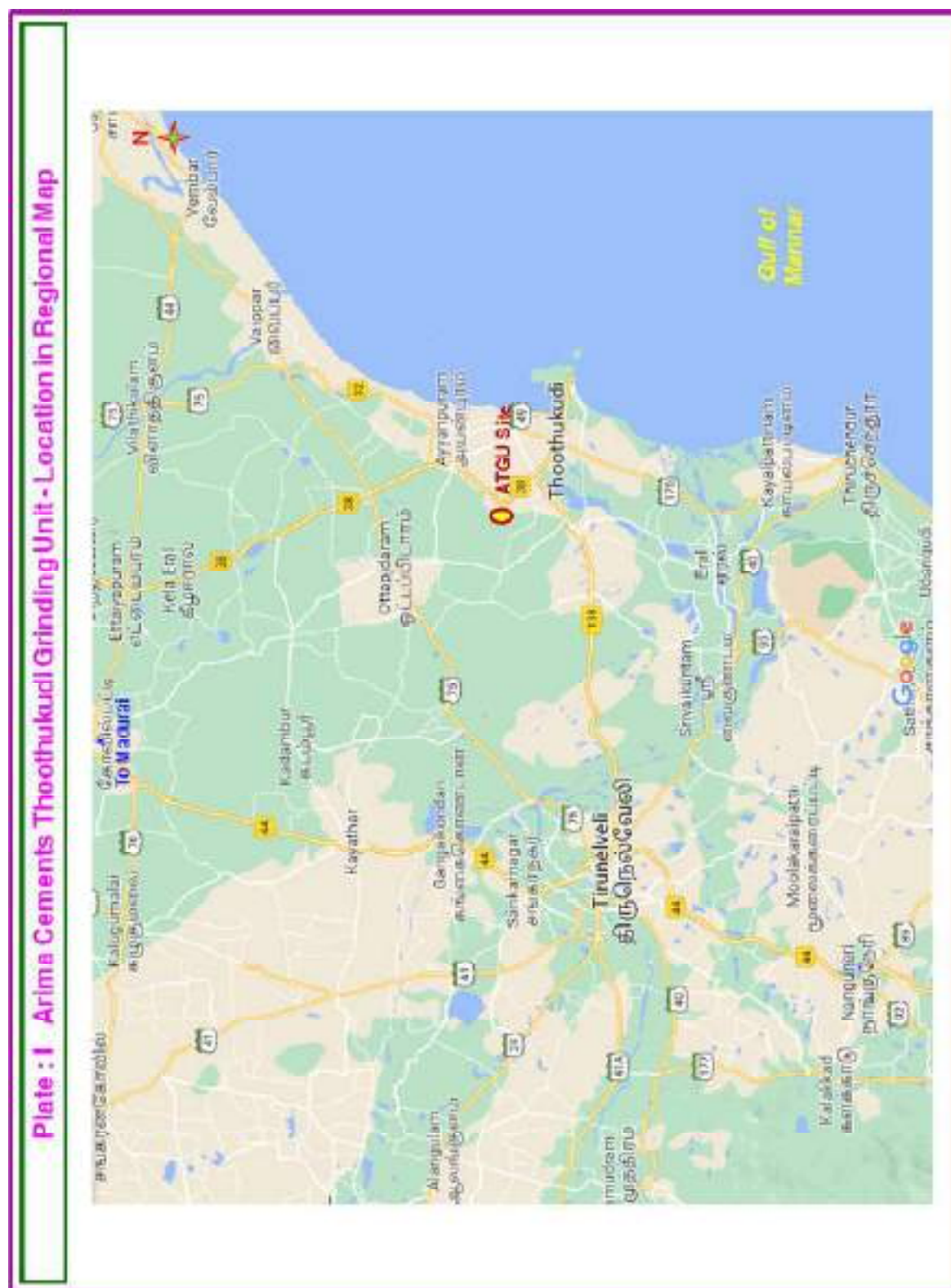
1.3 Need for the Proposal

In view of Rs.100 billion investment on infrastructures, Indian cement industry is estimated to have cement consumption of 593 MTPA by 2024-25. The execution of government development of infrastructures is observed is high and even in many sectors it is found to be touching 90% level. Therefore, there is a scope for Indian cement industry to start new capacity addition projects to get advantage of future market demand.

With available resources for Cement Grinding and Marketing, ACPL is proposing a Cement Grinding Unit near Thoothukudi with Production Capacity of 0.2 MTPA along with a standby DG Set of 2,500 KVA. Clinker will be imported from Oman, UAE and the MOU has been signed with M/s. Pioneer Cement Industries, UAE on 25.01.2022. Other Raw materials will be sourced locally.

1.4 Site & Land Use

ACPL will establish the Unit over an extent of 4.05 Ha, private Patta & dry land near SIPCOT Industrial Estate-Thoothukudi in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu. It has also executed Lease Deed for initial 33 years with Land Owner M/s.VV Mineral on 09.12.2021 (**Doc-1**). The site is shown in the Regional Map (**Plate I**) and in High Resolution Satellite Imagery (**Plate II**). The Site in FMB Sketch is shown as **Plate III**. The site and its environs are shown in **Plate IV**.









As per DTCP, the area falls in 'Non-Planning Area'. There is no Rehabilitation & Resettlement (R&R) issue due to the Proposal. There is no Litigation/Pending Case against the Proposal.

1.5 Site in Possession

With the Lease Deed, the entire Site (100%) is in possession of ACPL for establishing and operating the Grinding Unit.

1.6 Proposed Land Use

Proposed Site Land Use is given in **Table 1.1**. **Green Belt** will be developed in **1.34 Ha (33% coverage)** and maintained. No Railway Sidings, Township & Workshop are proposed.

Table : 1.1 Proposed Land Use

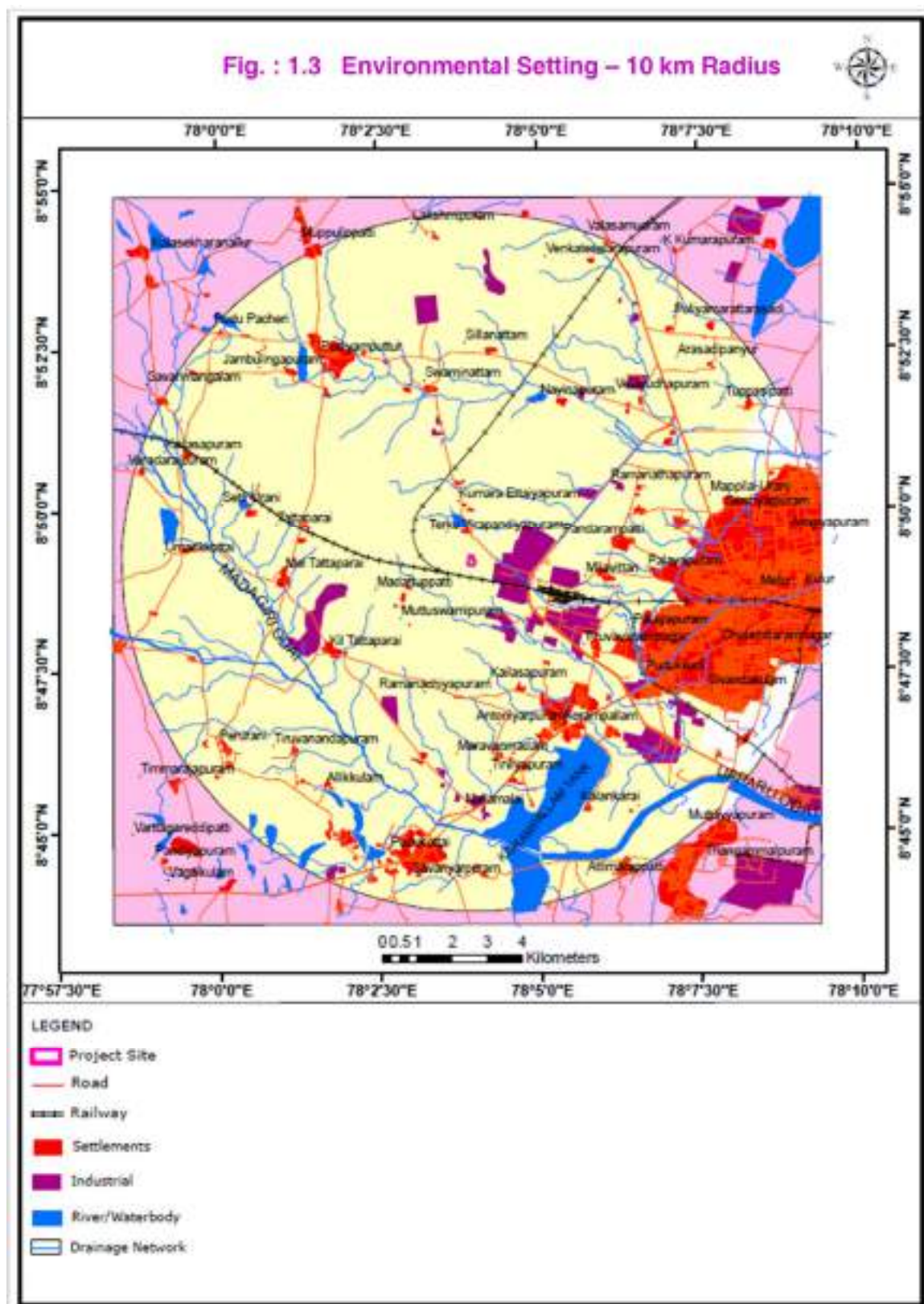
Sl. No.	Land for	Area, Ha	Coverage, %
1	Plant Area	1.22	30.00
2	Road	0.12	3.00
3	Truck Parking	0.40	10.00
4	Greenbelt	1.34	33.00
5	Vacant Area	0.97	24.00
Total		4.05	100.00

1.7 Environmental Setting

The proposed Site is located inbetween 08°49'07.30"-08°49'16.82" N Latitude & 78°03'52.90"-78°03'59.85" E Longitude (Survey of India Topo Sheets No. 58 H/13) (**Figs. 1.2-1.3**). There is no environmental issue about the site. **Gulf of Mannar Marine National Park (GoMMNP)** – Eco Sensitive Area (ESA) - is notified vide SO 08(E) dated 01.01.2020 with its Eco Sensitive Zone (ESZ). GoMMNP ESA boundary is located at a distance of 13.5 km in the east and ESZ is at 10.7 km in the east (Map as **Plate-V**). Gulf of Mannar Marine Biosphere Reserve (GoMBR) is one of the Ramsar Sites in Tamil Nadu. There is **no National Park/Wild Life Sanctuary/Reserved Forest/Hot Spot** (existing as well as proposed) within 10 km from the Site. Site is not falling in industrially polluted clusters notified by CPCB. The site falls in Seismic Zone III. Seasonal Madagiri Odai flows from northwest to southeast feeding Korampallam Tank. **Korampallam Odai** flows in southeast (8.3 km) and finally confluence into Gulf of Mannar. There is **no water course** crossing at the site and there is **no Flood Hazard** to the site.

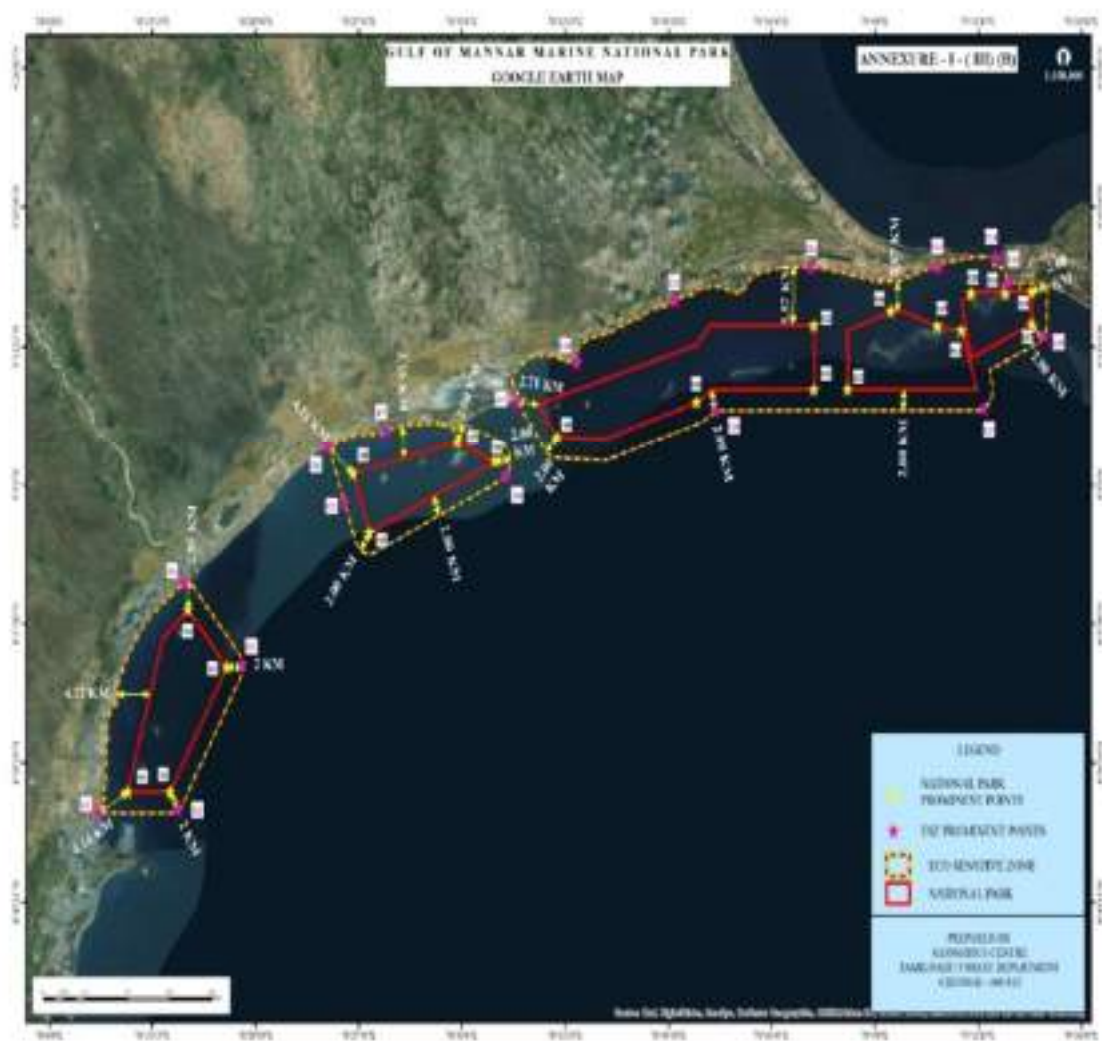
The Site is well connected by road and rail modes and is accessible from nearby National Highway **NH-38**. **Thoothukudi Corporation Area** is located within 5-10 km distance from the site in the east. Meelavittan is the nearest settlement with a total population of 45,863 (23,167 Males and 22,696 Females-Census-2011).





[PART II—SEC. 3(ii)]

GOOGLE MAP OF ECO-SENSITIVE ZONE OF GULF OF MANNAR MARINE NATIONAL PARK



There are Small, Medium and Major Industries in the SIPCOT Complex. Meelavittan SIPCOT Complex has many major industries. V V Titanium Pigments Plant is located at 0.7 km in east. Vedanta Sterlite industry (shut down now) is located in the eastern side of the Site. Sterlite Captive Thermal Power Plant (2x80 MW) is located @ 2.2 km in east from site.

1.8 Project Cost

The **Project Cost is Rs.23.00 Crores** with the following breakup:

Land Cost (on Lease)	:	Rs. 0.42 crores
Buildings & Structural	:	Rs. 3.00 crores
Plant & Machineries	:	Rs.18.00 crores
Contingencies	:	Rs. 1.58 crores

Total	:	Rs. 23.00 crores

A budgetary allotment of Rs.5.00 crores has been made as Capital Cost for EMP Measures and Rs.10.00 lakhs per annum towards Operating Cost. An amount of Rs.5.00 lakhs per annum has been earmarked for Occupational Health measures.

1.9 Employment Potential & Completion Schedule

The Project will give direct employment to about 50 persons and indirect employment to about 100 persons. Project will be completed in about 12 months on receipt of all statutory clearances.

1.10 Project Benefits

Environmental Benefits : Waste materials from other Industries like Fly Ash, Gypsum, etc. are beneficially utilised for cement manufacturing.

Social Benefits : The Grinding Unit will generate employment for about 50 people during the Construction Phase. About 150 persons get employment (50 Direct & 100 Indirect) during Operation Phase of the Project. About **2.0% of the Project Cost** will be earmarked for **Corporate Environment Responsibility (CER)** Works as well as for addressing Public Hearing issues.

Financial Benefits : The Project will bring Rs.23.00 crores investment in the Region. There will be a positive impact due to the proposal, by way of employment, better socioeconomic conditions, improved local and regional economy, etc.

1.11 EIA Report

As per Environmental Impact Assessment (EIA) Notification 2006 [SO 1533 (E) dated 14.09.2006], all Stand Alone Grinding Units have been kept at Sl. No. 3(b) under Category 'B' for Environmental Clearance from State Level EIA Authority -Tamil Nadu (SEIAA-TN). Accordingly, online TOR Application was filed vide Proposal No. SIA/TN/IND/76000/2022 on 21.04.2022 (**File No. 9194/2022**). State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) deliberated the Proposal in its 293rd Meeting held on 08.07.2022 and recommended Terms of References (TORs) for carrying out Environmental Impact Assessment (EIA) Study. SEIAA-TN has approved the TORs in its 538th Meeting held on 02.08.2022. TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. ACPL has also applied and obtained **TOR Validity Extension** from SEIAA-TN vide TO25B1103TN5340356A dated 25.09.2025 for another one year.

The EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-9 (Cement Plants) for Category 'A' by NABET vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of the List) which will be extended by NABET periodically. ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2024 with validity till 02.04.2026.

Baseline Data (BLD) was collected during **Apr.-Jun. 2023 (Summer Season)**. The EIA Report has been prepared and submitted in compliance with awarded TORs and also as per the generic structure proposed in EIA Notification 2006 with the following Chapters :

- Chapter-1 : Introduction with Need for the Project & Environmental Setting of the Project.
- Chapter-2 : Project Profile - an outline of the Project and allied activities.
- Chapter-3 : Description of Environment (Baseline Status).
- Chapter-4 : Anticipated Impacts along with Prediction of Impacts and Mitigation Measures.
- Chapter-5 : Analysis of Alternatives (Technology & Site).
- Chapter-6 : Environmental Quality Monitoring Programme.
- Chapter-7 : Additional Studies like Risk Assessment, DMP, etc.
- Chapter-8 : Project Benefits.
- Chapter-9 : Cost-Benefit Analysis, if any.
- Chapter-10 : Environmental Management Plan
- Chapter-11 : Summary EIA.
- Chapter-12 : Disclosure of Consultants engaged.

The Draft EIA Report along with Summary EIA Reports (both in English and Tamil) are submitted for conducting the Public Consultation & Public Hearing.

2.0 Project Profile

2.1 Proposed Layout & Construction

No buildings/structures in the site and no demolition works is required. The elevation of the Plant area is 21-23 m above MSL and flat terrain. No Reclamation is required. During construction, top soil of 12,150 cu.m will be excavated for civil works and will be stored and used for greenbelt development and levelling. The emphasis has been given for an optimum Layout (Fig. 2.1). There will be excavation, cut and fill during construction as per the layout.

Along with Grinding Unit installation, various other section such as Storage Facilities for goods & materials, Admin. Office, Security Office, internal roads, Packing & Despatch Section, etc. will be constructed. Underground works like mining or tunneling is not envisaged. However, subsurface work like laying of foundation, piling, electric cabling, etc. will be done as part of civil construction. Construction materials as available locally such as sand (from approved quarries), steel, cement, metal will be sourced. Estimates of major construction material are as follows:

PCC : 1500 m³
 RCC : 3500 m³
 RR structures : 7,000 m.

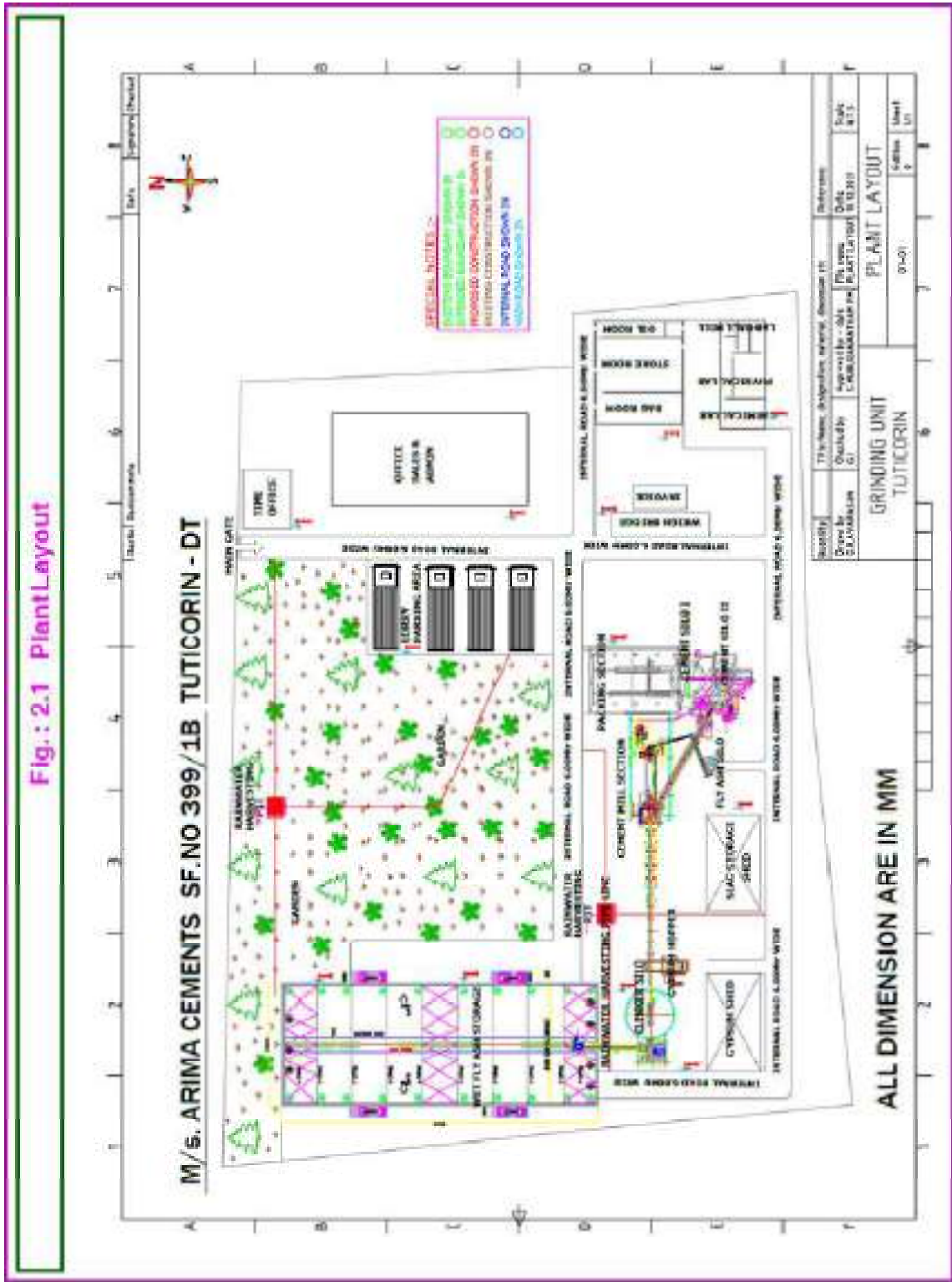
Local Labourers will be pooled for the Construction and provided with all Personal Protective Equipments (PPEs) like Mask, Gloves, etc. Hygienic conditions and all Preventive Measures will be strictly in-place/implemented.

2.2 Description of the Project

It is proposed to grind Clinker with other Raw Materials for producing Portland Pozzolana Cement (PSC) and Ordinary Portland Cement (OPC) @ 0.20 Million Tonnes per Annum (MTPA) @ 600 Tonnes per day (TPD) to cater the local Market Demand. Main process of manufacturing of PPC involves inter-grinding of Clinker, Fly Ash and Gypsum in the ratio of 65:30:5 and OPC involves inter-grinding of Clinker and Gypsum in the ratio of 95:5.

Table : 2.1 Various Cements & their Composition

Component	Proportion by Weight (%)	
	OPC	PPC
Clinker	95	65
Gypsum	5	5
Fly Ash	-	30



2.3 Raw Materials, Source & Mode of Transportation

Raw materials required, their source and mode of transportation are given in **Table 2.2**. Clinker will be imported from Oman, UAE and the MOU has been signed with M/s. Pioneer Cement Industries, UAE on 25.01.2022. Other Raw materials will be sourced locally.

Table : 2.2 Raw Materials Demand, Source & Mode of Transport

Raw Material	Source	Maximum Demand, TPD	Mode of Transport
Clinker	Imports from Oman, etc.	570	Imported to VOC Port & by 20 Tons Trucks from Port to Site
Gypsum	Local Market at Thoothukudi	30	By Trucks @ 15 Tons
Fly Ash	Agency/Power Plants in Thoothukudi	180	By Bowsers @ 20 Tons

2.4 Action Plan for developing Connecting and Internal Roads

No Railway Sidings, no Township and no Workshop are proposed. All **internal roads** are designed for minimum **6 m width and 9 m turning radius** for smooth traffic flow inside including fire tender as per NBC Norms. Road network is connecting all service areas. **Million Standard Axle (MSA)** is used for the Designing of the pavement of Connecting and Internal Roads for the transportation of materials. The design traffic computed in terms of cumulative number of standard axles (MSA) for 20 years. Clause 4.2.2, IRC -37-2018, a minimum annual growth rate of 5% should be used for commercial vehicles for estimating the design traffic. Design traffic on project corridor is estimated to be about 5 MSA for 20 years. As on IRC manual, **minimum 10 MSA of design traffic is considered** for Pavement design.

2.5 Size/Magnitude of Operation

It is proposed to grind Clinker with other Raw Materials for producing PPC and OPC @ **0.20 Million Tonnes per Annum (MTPA) @ 600 Tonnes per day (TPD)** to cater the local Market Demand.

2.6 Action Plan for Stock Piles

Clinker Storage : Clinker Silos

Gypsum Storage: Covered Shed

Fly Ash : Concrete Silos

Cement Storage : Cement Silos.

The Storage Capacities proposed are given in **Table 2.3**.

Table : 2.3 Proposed Storage Capacities

Clinker	RCC Silo of 2,000 T capacity	Dia 10.0 m & Ht. 22 m
Gypsum	200 sq.m Covered Shed	20 x 10 m : 1 No.
Fly Ash	RCC Silo of 100 T capacity	Dia 3.5 m & Ht. 7.0 m
Cement	RCC Silos of 2,000 T capacity	i. Dia 10.0 m & Ht. 22 m ii. Dia 10.0 m & Ht. 22 m

A typical Chemical composition of the Raw materials will likely to be as follows :

Clinker Chemical Composition, %

LOI	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	K ₂ O	Na ₂ O	TiO ₂	Mn ₂ O ₃	P ₂ O ₅	Cl
0.27	23.8	5.6	1.9	65.0	2.0	0.33	0.74	0.09	0.18	0.03	0.05	0.01

Fly Ash Chemical Composition, %

LOI	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	Na ₂ O	Total Chlorides
0.17	65.29	24.96	4.99	4.05	0.28	0.12	0.13	0.01

Gypsum Chemical Composition, %

LOI	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	P ₂ O ₅	Cr ₂ O ₃	Purity
18.09	1.79	1.01	0.62	30.97	0.6	44.86	0.80	0.01	94.36

There will not be any trace metal presence in the raw materials and their storages will not have any impact on surface Run-offs. Gypsum will not have any Radioactivity, as informed by the Supplier. Closed shed **will be provided with impervious floors, garland drains and catch pits** to trap run off materials from the storage areas.

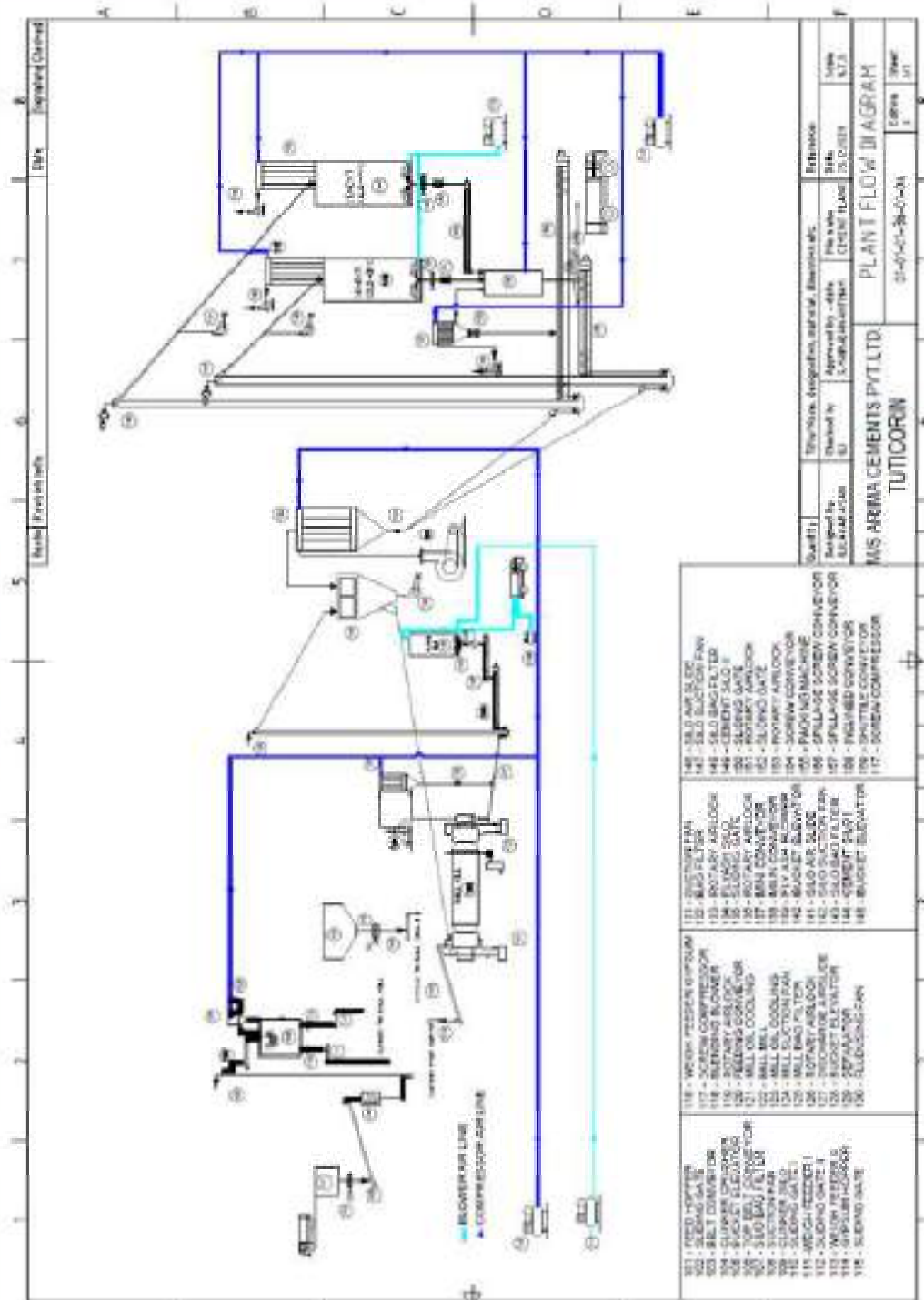
2.7 Process

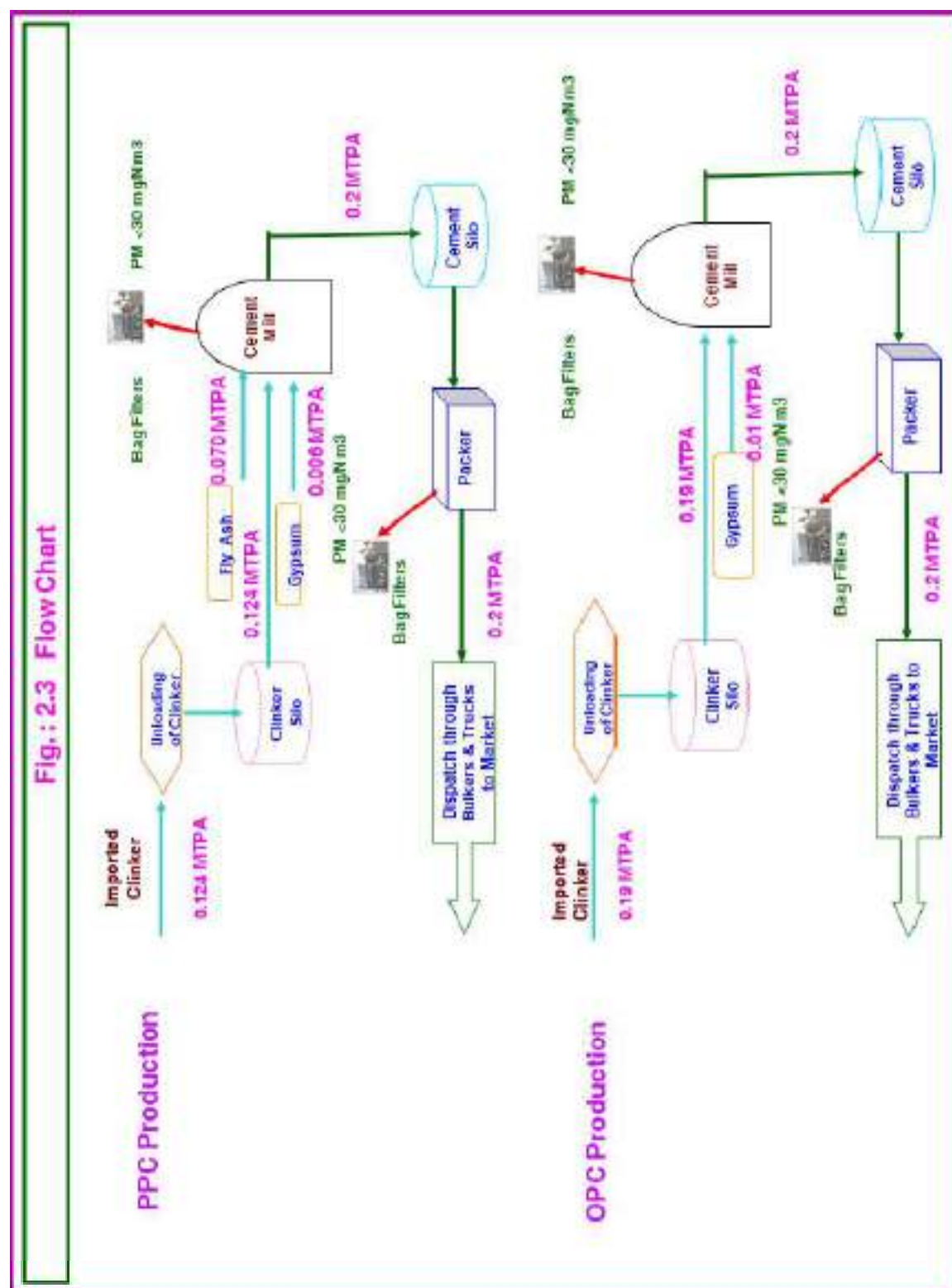
Main process of manufacturing of PPC involves inter-grinding of Clinker, Fly Ash and Gypsum in the ratio of 65:30:5 and OPC involves inter-grinding of Clinker and Gypsum in the ratio of 95:5. Process Flow Diagram and Flow Chart are shown as **Figs. 2.2-2.3**.

Ordinary Portland Cement (OPC): -OPC is manufactured by inter-grinding well-burnt ordinary Clinker with gypsum only. No other additives are mixed with the cement.

Pozzolana Portland Cement (PPC): -PPC is manufactured by inter-grinding well-burnt OPC Clinker with gypsum and pozzolanic materials like fly ash, etc.

Fig.: 2.2 Process Flow Diagram





The Ball Mill is of 9 m length x 2.2 m dia and **30 TPH capacity** along with a supporting system of Classifier. Clinker and Gypsum from storages will be transported to respective feed hoppers with the help of belt conveyors. Measured quantities of Clinker and Gypsum in desired proportion will be fed to the ball mill. While producing PPC, Fly Ash of desired dosage will be extracted from Fly Ash Silo and pneumatically transported and fed through a solid flow meter to the mill. Weigh feeders will be installed under each feed hopper to ensure accurate measurement of input quantities of materials to the mill. The ground cement will be stored in the RCC Silos.

A bucket elevator is used to carry the ball mill discharge material to classifier. Fine material of required fineness from classifier will be collected as product and the coarse material will be sent back to the mill for further grinding. The fine material collected in bag filters is the final product and it will be transported to respective product silos, where it is stored.

Cement (OPC/PPC), stored in silos, will be packed in 50 kg bags using electronic packers. Apart from the facility to pack cement in bags, there will be facility to load Cement in bulker also.

2.8 Power & Fuel Demands

The Grinding Unit requires about 2.0 MW power which will be sourced from TANGEDCO Grid. There will also be a **DG Set of 2.5 MW** for standby operations. The DG Set will have adequate Stack Height and In-built acoustic measures.

2.9 Action Plan to limit PM Emission from all Stacks below 30 mg/Nm³

The main pollutant expected from the Cement Grinding Unit is Particulate Matter, PM. The identified sources of dust/PM are : Truck unloading, Clinker hopper, Clinker storage silo, Weigh feeders for Clinker, Gypsum and solid flow meter for Fly Ash, Fly Ash storage silo, Clinker Grinding Mill, Cement Silos and Packing Machines. Emissions from these sources, other than Cement Mill & Packing Plants, would be fugitive in nature. Pulse Jet Bag Filters are proposed to control **PM emission <30 mg/Nm³**. Proposed Unit Stack details are given in **Table 2.4**.

Table : 2.4 Proposed Stack Data

Stack Attached to	Stack Height (from GL), m	Stack Dia., m	Stack Temperature, °C	Exit Velocity, m/sec	PM, mg/Nm ³
Cement Mill	20	1.5	100	15	<30
Packer	15	0.5	40	10	<30

Other gaseous Pollutants like SO₂, NO_x, etc. emission will be insignificant from the Unit.

Bag Filters proposed are with the following specifications :

Bag Filters Specifications

Designed Air Cloth Ratio, m ³ /min/m ²	1.13-1.35
DP across the Bag Filter	150 mm of wg
Efficiency (Guaranteed) :	99.9%
Outlet PM emission	<30 mg/NM³

Dust collected from the Bag Filters will be recycled in the Cement manufacturing process. DG stacks will be with acoustic enclosures and stack height as per TNPCB Norms.

2.10 Noise Levels

Cement Grinding Mill will be the main source of noise. The noise level within the plant building at a distance of one meter from the source shall be maintained at less than 85 db(A). Noise level at the nearest plant boundary will be <55 dB(A) during day times and <45 dB(A) during night times i.e. will be well within the permissible MoEF&CC Norms for Residential areas.

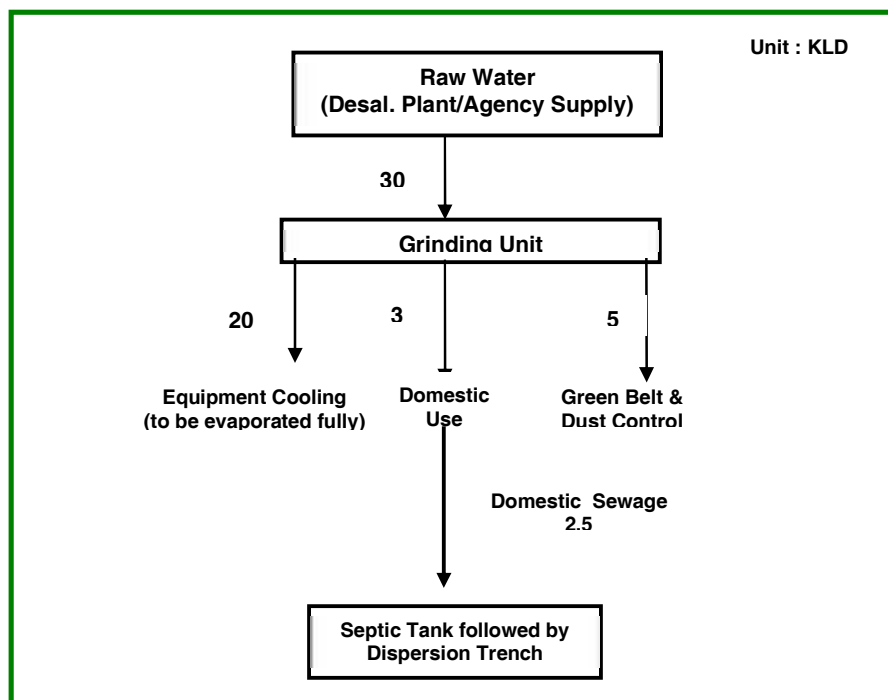
2.11 Action Plan for gradual shifting of Ground Water usage to Surface Water Source

Raw Water is required for Equipment Cooling (20 KLD), Domestic Use (3 KLD) and Green Belt (7 KLD). The total Water Demand of 30 KLD will be met from local Desalination Plant/water supply agencies. **No Ground water drawl** for the Project. Rain Water Harvesting measures will also be adopted for supplementing the water demand.

There will be no trade effluent generation from the Unit. Domestic sewage to the tune of 2.5 KLD from the Unit will be biologically treated in Septic Tank of adequate size followed by a Dispersion Trench. Thus, '**Zero Effluent Discharge**' will be adopted/practiced. Water Demand & Wastewater Generation details are given in **Table 2.5. Water Balance Diagram** is given as **Fig. 2.4**.

Table : 2.5 Water Demand & Wastewater Generation

Sl. No.	Description	Demand, KLD
1	Water for Equipment Cooling	20
2	Water for Green Belt	7
3	Water for Domestic Use	3
Total Water Demand		30
Trade Effluent Generation		0
Domestic Sewage Generation		2.5

Fig. : 2.4 Water Balance Diagram

2.12 Solid Wastes

The dust collected from the various Air Pollution Control Measures like Bag Filters, etc. will be totally recycled in the process for cement manufacturing. Thus, no solid waste is envisaged from the process. Spent/waste Oil (Cat. 5.1) will be about 100 Lits./year which will be stored and sold to TNPCB Authorised Recyclers for recovery and further use. Filter Bags Scrap (20 kg/year) will also be generated which will be sold to Vendors.

2.13 Action Plan for Green Belt Development

An effective Green Belt will be developed and maintained with **33% coverage** predominantly with native species @ **1,500 trees/Ha** (Survival Rate : 85-90%).

Table : 2.6 Green Belt Development

Year	Site	Extent, Ha	No. of Trees
I	5-10 m width along the Boundaries	0.74	1110
II	Near Storages & Process Areas	0.60	900
III Onwards	Maintenance for 85-90% Survival Rate	-	-
Total		1.34	2,010

2.14 Occupational Health

All efforts will be taken and followed to avoid the accidents and have a good 'Occupational Environment'. Entry Level and Periodical Medical Examinations of the Employees will be undertaken by the Unit. Medical Reports will be reviewed and evaluated for Occupational Health related problems.

2.15 Raw Materials & Fuel Linkages

Clinker will be imported through VOC Port. Being Cement Grinding Unit, **TOR Compliances** for Linkage Documents (Limestone/Coal), Provision of Waste Heat Recovery Boiler, Arrangement for Co-processing of Hazardous Wastes, etc. are not applicable.

2.16 CREP Compliance

A series of industry specific guidelines are formulated in the Charter on Corporate Responsibility for Environmental Protection (**CREP**) and action points are also enlisted for the Cement Industry. Plant activities will be in compliance with the CREP Guidelines (**Table 2.7**).

Table : 2.7 Compliance to CREP Guidelines

No.	Action Points in CREP	Compliance Status
1	Implementation of standards in non-complying units.	The Plant operations will be in compliance with the latest notified norms.
2	Plants in critically polluted or urban area (5 km distance outside urban boundary) will meet 100 mg/Nm ³ SPM emission and continue working to reduce the emission of particulate matter to 50 mg/ Nm ³ .	ACPL will be operating the Unit for PM emission <30 mg/Nm ³ .
3	The new cement kilns to be accorded NOC/EC for complying 50 mg/Nm ³ emission limit.	ACPL will be operating the Unit for PM emissions <30 mg/Nm ³ .
4	CPCB will evolve load based standards by June 2004.	MoEF&CC has evolved the Load Based Emission Norm of 0.125 kg/Tonne of Clinker for the Rotary Kiln Cement Plants, etc. This is a Cement Grinding Unit and no Clinker will be manufactured.
5	CPCB and NCBM will evolve SO ₂ and NOx emission standards by June 2004.	This is a Cement Grinding Unit. The Plant operations will be in compliance with the latest notified norms.
6	Control fugitive emissions from all the raw material and products storage and transfer points by December 2003. The feasibility for the control of fugitive emissions from limestone and coal storage areas will	❖ All sources of dust generation in the Plant will be well designed for producing minimum dust and provided with high efficiency Bag Filters. ❖ Providing Bag Filters for Truck Tippler Area. ❖ Fully covered sheds for Gypsum storage.

No.	Action Points in CREP	Compliance Status
	be decided by the NTF. The NTF shall submit its recommendations within three months.	❖ Silos will be provided for Clinker, Fly Ash & Cement storages. ❖ All the Material conveyors will be fully covered and provided with Bag Filters at Transfer Points.
7	CPCB, NCBM, BIS and oil refineries will jointly prepare the policy on use of pet coke as fuel by July 2003.	-
8	NTF will decide feasible unit operations/ sections for installation of continuous monitoring equipment. The industry will install the continuous monitoring systems (CMS) by December 2003.	Will be complied.
9	Tripping in Kiln ESP to be minimized by July 2003.	Not applicable.
10	Industries will submit the target date to enhance utilization of waste materials.	Waste material like fly ash, Gypsum, etc. will be utilised in the Plant.
11	NCBM will carryout a study on hazardous waste utilization in cement kiln by December 2003.	Not applicable.
12	Cement industry will carry out feasibility study and submit target date to CPCB for cogeneration of power by July 2003.	Not applicable.

3.0 Description of the Environment (Baseline Status)

3.1 Study Area

The Study Area of 10 km radius from the boundary (**Fig. 3.1**) is predominantly dry land. Major Industries like Sterlite (shut down now) & its Power Plant, VVTi, etc. exist in the SIPCOT Industrial area. The Industrial and transportation in the vicinity **cumulatively determine the baseline environmental status** of the Study Area. The area **does not fall in the Industrial Clusters notified by CPCB**. Also, Site is **not falling in the Coastal Regulation Zone (CRZ)**.

Physiography : The predominant physical feature over major part of the study area is the coastal plain with moderately undulating uplands in the western part. Elevation ranges from 0 m to 45 m above MSL (**Fig. 3.2**). The general slope is towards east and southeast.

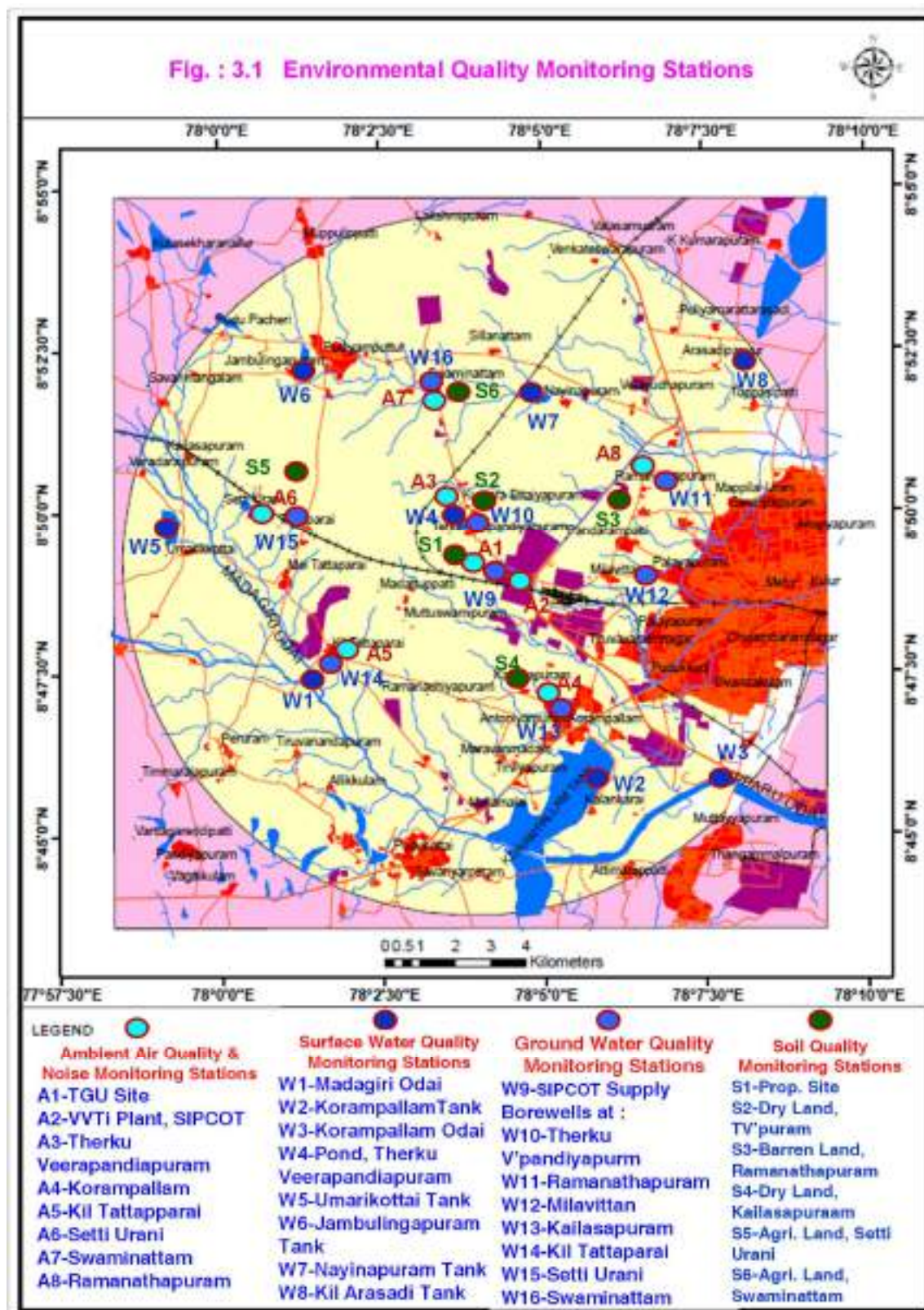
Drainage : There is **no perennial stream or river** in the region. Seasonal Madagiri Odai flows from northwest to southeast feeding Korampallam Tank. **Korampallam Odai** flows in southeast and finally confluence into Gulf of Mannar (**Fig. 3.3**). All the stream courses in study area are ephemeral in nature and the run-off is generated during heavy rainfalls only. As the rivers flow in lower elevations, there is **no flood risk** to the Site. There are irrigation tanks and ponds in the area which receive water during the monsoon periods.

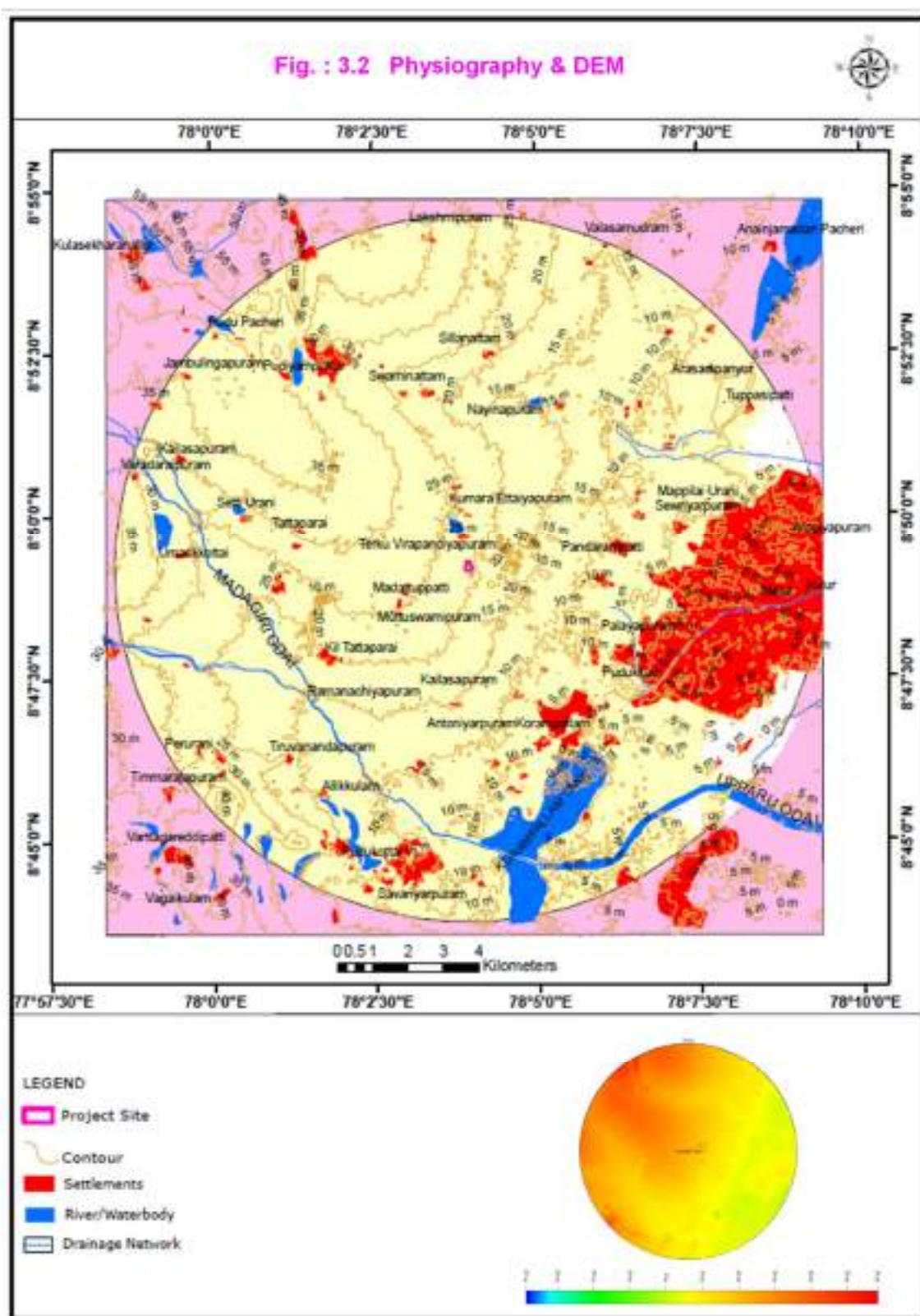
Geology : The Site is not falling in the mineral bearing area. Geology of the study area is dominated by Migmatite complex, Charnockite and Khondalite groups of rocks of Archaean Age. Quarternary sediments extending up to 6.5 km from coast trending NE-SW and running almost parallel to the coast line. Pink and grey granite/pegmatite of Proterozoic and sandstone and claystone of Tertiary occur as intrusive in a very small area.

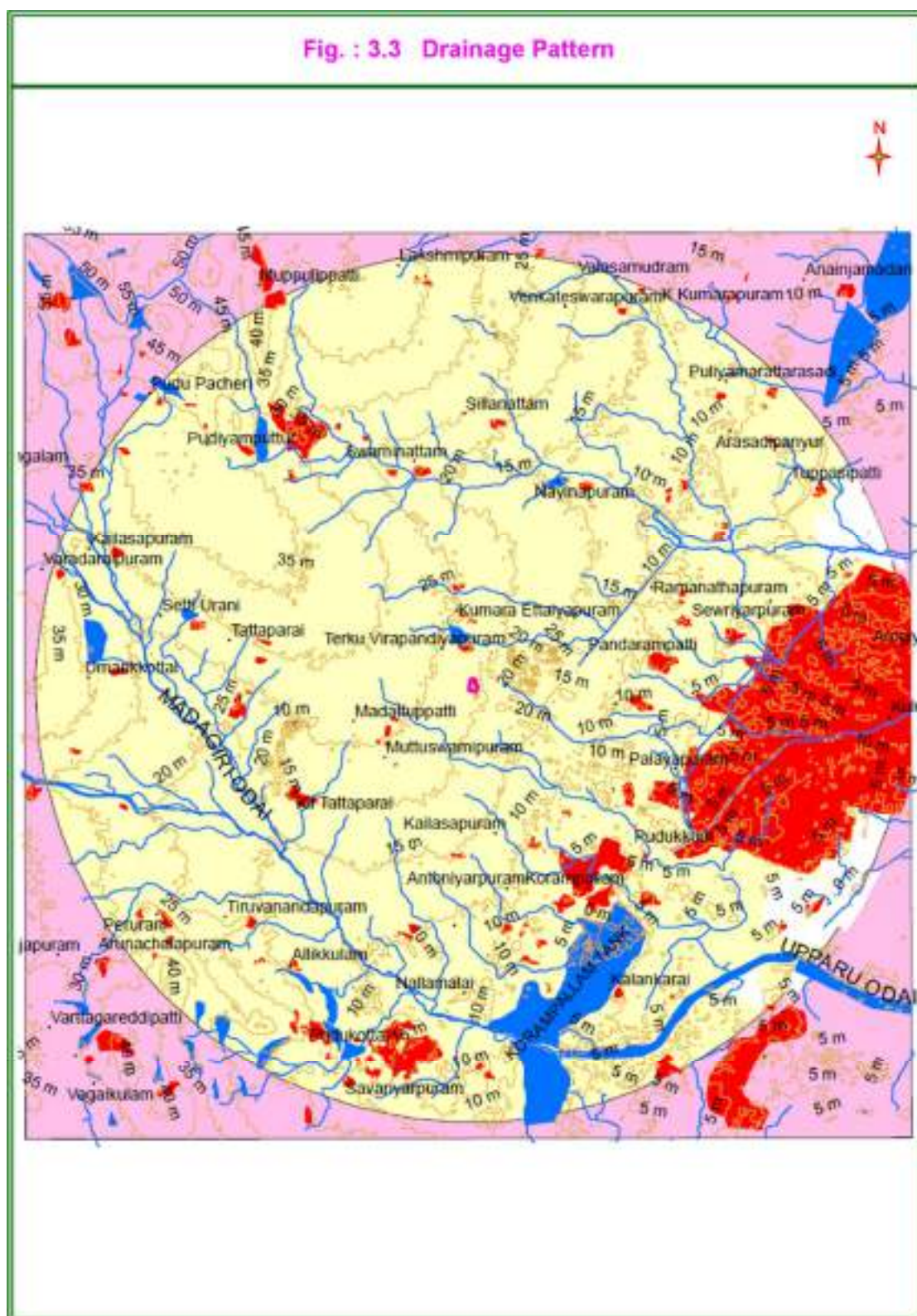
3.2 Environmental Components

Baseline data collection has been commissioned for the EIA Study during Summer Season (Apr.-Jun.) 2023 in compliance with MoEF&CC Office Memorandum No. J-11013/41/2006-IA-II(I)(Part) dated 29.08.2017. Environmental Attributes Covered : Considering the Environmental setting of the project, project activities and their interaction, environmental regulations and Standards, following Environmental Attributes have been included in EIA Study.

- ❖ Site specific Micrometeorological Data (hourly readings from the Site for a Season) on wind speed, wind direction (wind roses), temperature, humidity, cloud cover, atmospheric pressure, rainfall, etc.







- ❖ Ambient Air Quality Monitoring at 8 locations on 24-hourly basis, continuously for 2 days in a week for 4 weeks in a month for a season for all 12 parameters as per NAAQ Norms.
- ❖ Noise Level Measurements at all air quality monitoring station for Leq, Lday and Lnight values once in the season.
- ❖ Water Quality Monitoring – grab sampling once in the Season for :
Surface Waters (8 locations) as per CPCB Norms.
Ground Waters (8 Locations) as per IS:10500 Norms.
- ❖ Soil Quality Monitoring at 6 locations in the study period for :
Textural & Physical Parameters
Nutrients
- ❖ Land use pattern based on Satellite Imagery.
- ❖ Biotic Attributes for : Flora & Fauna.
- ❖ Socio-Economic Profile, based on 2011-Census, once in the study period for: Total Population / Household Size / Age, Gender Composition, SC / ST, Literacy Level, Occupational Structure.

3.3 Methodology Adopted

Micrometeorology : As a part of the study, the micrometeorology and microclimatic parameters (hourly readings) were collected from VVTi Plant at 7 m height. Data of wind velocity, wind direction, ambient temperature, relative humidity, cloud cover, solar radiation, atmospheric pressure along with rainfall are collected during the Postmonsoon period.

Ambient Air Quality : The study area represents the Industrial, Residential, Rural and other Areas with respect to Revised National Ambient Air Quality (NAAQ) Norms stipulated by CPCB. Calibrated Fine Particulate Samplers (Envirotech APM 550) & Respirable Dust Samplers (Envirotech APM 460) were used for monitoring of PM_{2.5} & PM₁₀. Gaseous samples are collected by integrated gas sampling assembly (Envirotech APM 411). A tapping provided in the hopper of the sampler is utilised for sampling of SO₂ and NO_x, etc. with proper flow controller and a flow of 1.0 l/min.

PM_{2.5} & PM₁₀ : APM 550 system is a manual method for sampling fine particles and is based on impactor designs standardized by EPA for Ambient Air Quality Monitoring. Ambient Air enters the APM 550 system through an omni-directional inlet designed to provide a clean aerodynamic cut point for particles greater than 10 microns. Particles in the air stream finer than 10 microns proceed to a second impactor that has an aerodynamic cut point at 2.5 microns. The air sample and the fine particulates existing from the PM_{2.5} impactor is passed through a 47 mm dia filter. Teflon filter membrane that retains the FPM. APM 550 system allows removal of the PM_{2.5} impactor from the sample stream so that the same system may be optionally used as a PM₁₀ sampler also.

SO₂ : Modified West & Gaeke method (spectrophotometric) was adopted. SO₂ was collected in a scrubbing solution of sodium tetrachloro mercurate (TCM) and was allowed to react with sulphamic acid, formaldehyde and then with pararosaniline hydrochloride. The absorbance of product red-violet dye was measured using UV Visible Spectrophotometer at a wavelength of 560 nm. Concentration of SO₂ was calculated by multiplying the absorbance with calibration factor and dividing by volume of air sampled.

NO_x : Jacob and Hocheiser modified method was adopted. Nitrogen oxides as nitrogen dioxide were collected by bubbling air through sodium hydroxide-sodium arsenite solution to form a stable solution of sodium nitrite. The nitrite ion produced during sampling was determined spectrophotometrically (at 540 nm) by reacting the exposed absorbing reagent with phosphoric acid, sulphanilamide and N (1-naphthyl) ethylamine dihydrochloride. Concentration of NO_x was calculated as described in SO₂ measurement.

Ozone : IS:5182 Part IX (Methods for Measurement of Air Pollution - Oxidants)/ APHA Method 410 was adopted. Micro amounts of ozone and the oxidants liberate iodine when absorbed in a 1% solution of potassium iodine buffered at pH 6.8 ±0.2. The iodine is determined spectrophotometrically by measuring the absorption of tri-oxide ion at 352 nm. Drager Multiwarn Detector was also used for real time value. **Hourly values** are reported for 8-hourly average.

Ammonia : Indophenols method (APHA Method 401, Air Sampling and Analysis, 3rd Edition) was adopted. Ammonia in the atmosphere is collected by bubbling a measured volume of air through a dilute solution of sulphuric acid to form ammonium sulphate. The ammonium sulphate formed in the sample is analysed colorimetrically by reaction with phenol and alkaline sodium hypochlorite to produce indophenols. The reaction is accelerated by the addition of Sodium nitroprusside as catalyst.

CO : Envirotech APM 850 Organic Vapour Samplers are used for CO monitoring. Standard MSA tubes are used for monitoring carbon monoxide. A measured volume of air is passed at the flow rate of 100 to 200 ml/min for 1 to 8 hours and the colour change (yellow to green) in indicating gel filled in the detector tubes and is matched with the colour chart provided with detector tubes for finding out CO concentration. Drager Multiwarn Detector was also used for real time value.

Benzene : The charcoal tubes are available in different sizes and contain varying amount of activated charcoal. The ambient air was sucked through the tube using a low flow sampler used for collection of BTX sample in a way that results in an enrichment of the relevant substances in the activated charcoal. Desorption of the adsorbed benzene was done using Carbon disulphide (CS₂). The substances desorbed in CS₂ were analyzed by capillary Gas Chromatography.

Benzo (a) Pyrene (BaP) is one of the most important constituent of PAH compounds and also one of the most potent carcinogens. This can be measured in both particulate phase and vapour phase. In the vapour phase the concentration of B(a)P is significantly less than the particulate phase. Therefore, more care to be taken for the measurement of Benzo(a) Pyrene in the particulate phase.

It is based on BIS method IS 5182 (Part XII). This method is designed to collect particulate phase PAHs in ambient air and fugitive emissions and to determine individual PAH compounds using capillary Gas Chromatography equipped with flame ionization detector.

Nickel and Arsenic : The Atomic Absorption Spectroscopy (AAS) technique makes use of absorption spectrometry to assess the concentration of an analyte in the sample. The method is based on active sampling using PM10 High Volume Sampler and then sample analysis is done by atomic absorption spectroscopy.

Particulate Lead : The exposed glass fibre filter papers were cut into small pieces and to it 100 ml distilled water and 10 ml nitric acid were added and heated on a hot plate for 4-6 hours. The clear solution obtained after digestion was filtered and made upto 25 ml and were analysed on a Analytic Jena Atomic Absorption Spectrophotometer (AAS) employing Lead Hollow Cathode Lamp. Concentration of lead was calculated by taking the result obtained from AAS analysis and dividing it with the volume of air sampled.

The **detectable range** of the Air Pollutants are as follows:

Parameter	Method	Range
Respirable Particulate Matter (less than 10 µm or PM10)	IS 5182: (Part 23) : 2006 RA: 2017	5-1000 µg/m ³
Particulate matter (less than 2.5 µm or PM2.5)	USEPA Quality Assurance Handbook Vol II Part II - Guidance Documents 2.12 issue year: Nov-1998	10-1000 µg/m ³
Sulphur Dioxide	IS 5182: (Part 2), 2001 RA: 2017	6-1000 µg/m ³
Nitrogen Dioxide	IS 5182: (Part 6), 2006 RA: 2017	6-750 µg/m ³
Carbon Monoxide	IS 5182: (Part 10), 1999 RA: 2014	1-200 mg/m ³
Ammonia	Indophenol Method (Method of Air sampling and analysis 3 rd edition method 401)	5-700 µg/m ³
Ozone	IS 5182: (Part 9), 1974, RA 2014	10-19000 µg/m ³
Benzene (C ₆ H ₆)	IS 5182 (Part 11), 2006 RA: 2017	0.01-1000 µg/m ³
Benzo (α) Pyrene Particulate Phase only	IS 5182: (Part 12): 2004, RA: 2014	0.1-10,000 ng/ m ³
Nickel	IS 5182: (Part 22), 2004, RA: 2014 /NAAQS Monitoring & Analysis Guidelines Volume-I	1.0 -50 ng/m ³
Arsenic		1.0-10 ng/ m ³
Lead		0.1-50 µg/m ³

Noise Levels : Noise levels were monitored at all air monitoring locations during day time as well as night time in a day. A totally portable measurement systems, Lutron SL 4001 with an internal calibrator and wind screen was used. The built-in internal oscillation system 1 KHz sine wave generator is used for on the spot calibration at 94.0 dB(A). The basic unit of measurement is A-weighted sound level, the most widely used scale. The measurements are taken in the fast mode and were sampled to yield statistical informations such as L_{eq} (equivalent noise level).

Water Quality : Water samples of both surface and ground waters were collected during the survey period and analysed for physico-chemical and bacteriological parameters. Parameters like pH, conductivity, temperature, DO, etc. were measured in the field itself while collecting the samples using a microprocessor based Portable Water Analysis Kit (Elico Model PE136). Samples for chemical analysis were collected as per IS:2488. Sterilised bottles were used for collection of water samples for bacteriological analysis.

Methodology Adopted for Water Analysis

Sl. No.	Parameter	Unit	Reference	Method
1	Taste & Odour	As perceived	IS:3025 (5/7)*	As perceived
2	pH	-	IS:3025 (11)	Digital pH meter
3	Colour	Hazen units	IS:3025 (4)	Comparison with Standards
4	Turbidity	NTU	IS:3025 (10)	Nephelometric
5	Total Dissolved Solids	mg/l	IS:3025 (16)	Gravimetric
6	Total Hardness	mg/l	IS:3025 (21)	Titrimetric (EDTA)
7	Iron (as Fe)	mg/l	32 of IS3025	Colorimetric (Phenanthroline)
8	Chlorides (as Cl)	mg/l	IS:3025 (32)	Titrimetric (Argentometric)
9	Residual Chlorine	mg/l	IS:3025 (26)	Titrimetric
10	Calcium (as Ca)	mg/l	IS:3025 (40)	Titrimetric (EDTA)
11	Magnesium (as Mg)	mg/l	IS:3025 (46)	Titrimetric (by difference between Total Hardness and Calcium Hardness)
12	Alkalinity (as CaCO ₃)	mg/l	IS:3025 (23)	Colour indicator titration
13	Dissolved Oxygen	mg/l	IS:3025 (38)	Winkler titrimetric-azide modification
14	Sulphate (as SO ₄)	mg/l	IS:3025 (24)	Turbidimetric/Gravimetric
15	Fluoride (as F)	mg/l	IS:2488 (II)*	Distillation followed by Colorimetric (SPADNS)
16	Nitrate (as NO ₃)	mg/l	IS:3025 (34)	Colorimetric (PDA)
17	Cyanide (as CN)	mg/l	IS:3025 (27)	Colorimetric (Pyridine-Bispyrazolone)
18	Pesticides	mg/	IS:2488 (III)	Gas chromatograph
19	Phenols (as C ₆ H ₅ OH)	mg/l	IS:3025 (43)	Distillation followed by colorimetric (4-Aminoantipyrine)
20	Manganese (as Mn)	mg/l	35 of IS3025	Colorimetric (Persulphate)
21	Chromium (as Cr ⁶⁺)	mg/l	IS:2488 (II)	Colorimetric (Diphenyl carbazide)
22	Copper (as Cu)	mg/l	IS:3025 (42)	Atomic Absorption Spectrophotometric
23	Selenium (as Se)	mg/l	IS:2488 (II)	Atomic Absorption Spectrophotometric
24	Cadmium (as Cd)	mg/l	IS:3025 (41)	Atomic Absorption Spectrophotometric
25	Arsenic (as As)	mg/l	IS:3025 (37)	Atomic Absorption Spectrophotometric
26	Boron (as B)	mg/l	IS:2488 (III)	Colorimetric (Curcumin)
27	Mercury (as Hg)	mg/l	IS:3025 (48)	Mercury analyser
28	Lead (as Pb)	mg/l	IS:3025 (47)	Atomic Absorption Spectrophotometric
29	Zinc (as Zn)	mg/l	IS:3025 (49)	Colorimetric (Dithizone)
30	Percent sodium	%	IS:2488 (V)	From Na, K, Ca & Mg values
31	BOD-3 days @ 27 °C	mg/l	IS:3025 (44)	3 days @ 27°C
32	COD	mg/l	IS:2488 (V)	Dichromate reflux
33	Oil & Grease	mg/l	IS:3025 (39)	Gravimetric
34	Coliforms	MPN/100 ml	IS:1622	Multiple tube fermentation (5 tubes)
35	Plate Counts	No. of Colonies/ml	IS:1622	Colony count in Agar-agar medium

* : IS:3025 (Parts)-Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater;

+ : IS:2488 (Parts)-Methods of Sampling and Test for Industrial Effluents.

Soil Quality : Samples at 3 depths viz. 0-30 cm, 30-60 cm and 60-90 cm were collected using sampling augers and field capacity apparatus. Soil extraction (10%) were used for analysis.

Calibration : The monitoring and analytical instruments are being calibrated periodically. The correction factors, if any, are being used in computation of the data.

Flora-Fauna : A general ecological survey covering an area of 10 km radius area were conducted and reported. Faunal survey covers the Terrestrial Fauna, Avian Fauna and Aquatic Fauna. The survey was based on personal observation, enquiry with local population and records available. This study included the identification of endangered and rare species as per Red Book

Socio-Economic Survey : Project **does not involve Resettlement/Rehabilitation**. Socio-Economic profile of population living in study area has been prepared based on Census 2011 data.

3.4 Micrometeorology

3.4.1 Regional Status

Thoothukudi Air Port is the nearest IMD Centre and VOC Port is also having its Weather Station. The district enjoys a **hot tropical climate**. The District is in the **rain shadow region** of Southwest Monsoon by Western Ghats in the west. Most of the precipitation occurs in the form of cyclonic storms caused due to the depressions in Bay of Bengal. The average annual rainfall in the district is 790.2 mm. The **normal annual rainfall of Thoothukudi is 625.8 mm**. About 69.19% of the rainfall is received during **Northeast monsoon** season which sets in the month of October and continues until December. January is the coldest month with mean daily maximum temperature at 29.6 °C and mean daily minimum temperature at 19.4 °C. During Summer season, the maximum temperature (May) was observed to be 38.3 °C with the mean minimum temperature at 21.9 °C. The high relative humidity prevail through out the year between 60%-75%.

3.4.2 Site Specific Status

The abstract of collected hourly meteorological data are presented in **Tables 3.1-3.3**. Based on the wind parameters, wind rose is drawn and presented as **Fig. 3.4**.

During the monitoring month of April 2023 : The predominant winds were from SE/E direction. Wind velocity readings were ranging from 0.6 kmph to 16.2 kmph with the mean wind speed of 5.5 kmph. The temperature values were ranging from 24.2 °C to 39.9 °C with a mean value of 32.5 °C. The relative humidity values were ranging from 43% to 88% with mean value of 65.8%. The mean atmospheric pressure value was computed as 756.0 mm of mercury. Clear sky was observed most of the times. There was no rainy day in this month.

Table : 3.1 Micrometeorological Data – April 2023

Location : VV Ti Plant

Date	Wind Velocity, kmph			Wind Direction (from)	Temperature, °C			Relative Humidity, %			Atm. Pressure, mm of Hg (mean)	Rainfall, mm
	Min.	Max.	Mean		Min.	Max.	Mean	Min.	Max.	Mean		
01-02.04.23	1.3	6.9	4.3	SE	28.1	38.8	33.3	45	83	65	756	0
02-03.04.23	1.1	8.2	4.7	ESE	27.5	39.0	32.3	52	88	76	757	0
03-04.04.23	1.6	10.7	5.2	SE	26.8	38.0	33.0	55	86	72	756	0
04-05.04.23	2.6	10.8	5.4	SE	26.7	37.7	32.7	50	80	65	757	0
05-06.04.23	2.0	8.5	4.9	SE	26.9	37.9	32.1	49	80	64	757	0
06-07.04.23	1.4	9.3	4.8	S	27.3	38.8	31.6	50	84	65	758	0
07-08.04.23	2.3	7.5	5.4	SE	25.9	37.0	31.8	54	78	62	758	0
08-09.04.23	0.9	10.4	4.3	E	26.5	37.3	30.9	52	77	66	756	0
09-10.04.23	1.3	13.0	6.7	SE	25.8	38.7	31.1	46	77	67	756	0
10-11.04.23	0.6	10.3	5.6	SE	25.3	37.1	32.7	46	75	66	756	0
11-12.04.23	0.8	9.9	4.4	E	26.3	37.7	32.7	49	77	64	755	0
12-13.04.23	0.8	11.1	4.7	E	24.6	38.4	33.1	51	78	66	756	0
13-14.04.23	1.9	12.5	4.4	SE	24.8	38.3	33.1	50	80	63	756	0
14-15.04.23	1.3	11.1	5.3	SE	25.9	38.4	33.7	53	82	65	756	0
15-16.04.23	1.9	11.0	6.3	S	25.3	39.5	33.5	53	80	64	756	0
16-17.04.23	1.7	9.8	6.4	SE	26.4	37.9	32.6	43	81	63	756	0
17-18.04.23	3.2	11.8	6.9	S	25.3	37.9	33.0	51	77	66	756	0
18-19.04.23	2.2	6.4	5.2	SE	24.2	38.3	33.7	46	79	68	756	0
19-20.04.23	1.9	7.2	4.2	SE	24.7	39.0	34.8	48	79	63	756	0
20-21.04.23	1.1	15.0	4.7	E	25.3	39.9	32.8	50	80	64	756	0
21-22.04.23	2.3	13.9	7.4	E	25.0	36.2	31.4	47	80	68	755	0
22-23.04.23	1.6	10.7	6.6	NW/E	24.6	37.6	31.9	52	79	68	753	0
23-24.04.23	1.3	14.2	6.3	WNW	25.6	38.6	31.6	51	82	63	755	0
24-25.04.23	1.7	11.4	6.8	E	26.3	37.2	31.7	52	83	67	756	0
25-26.04.23	2.2	13.0	8.1	E	26.6	38.5	32.5	51	80	68	756	0
26-27.04.23	0.9	8.0	4.5	E	25.3	38.6	33.3	49	81	66	756	0
27-28.04.23	1.5	12.3	5.1	SE	24.7	38.3	33.3	46	82	64	756	0
28-29.04.23	1.2	16.2	5.2	SE	24.4	38.9	31.1	44	81	68	756	0
29-30.04.23	3.0	10.2	6.2	W	25.1	39.2	31.8	48	82	65	756	0
30.4-1.5.23	0.8	10.3	6.0	W	25.3	39.5	32.3	49	82	64	756	0
Mon. days	0.6	16.2	5.5	SE/E	24.2	39.9	32.5	43	88	65.8	756.0	0

Note : Abstract values are taken from the hourly readings (00:00-24:00 hrs.) recorded continuously during the monitoring period.

Table : 3.2 Micrometeorological Data–May 2023

Location : VV Ti Plant

Date	Wind Velocity, kmph			Wind Direction (from)	Temperature, °C			Relative Humidity, %			Atm. Pressure, mm of Hg (mean)	Rainfall, mm
	Min.	Max.	Mean		Min.	Max.	Mean	Min.	Max.	Mean		
01-02.05.23	1.3	11.4	6.3	W	25.3	39.5	32.3	45	77	58	756	0
02-03.05.23	1.4	15.0	7.5	WSW	26.4	39.0	32.1	38	74	59	755	0
03-04.05.23	0.7	7.9	3.6	S	26.9	36.2	32.1	32	71	54	753	0
04-05.05.23	1.3	11.2	7.1	S	25.6	38.1	33.6	35	71	55	755	0
05-06.05.23	1.6	12.7	7.9	SSE	26.3	38.8	34.0	43	70	57	755	0
06-07.05.23	1.4	18.0	10.8	SE	26.9	38.4	33.5	45	73	55	754	0
07-08.05.23	6.8	20.3	13.9	S	27.1	37.9	32.5	70	73	63	754	0
08-09.05.23	5.0	17.5	13.7	S	28.8	37.1	32.6	52	78	59	755	0
09-10.05.23	4.2	20.2	13.7	SE	28.0	37.6	32.0	41	76	58	755	0
10-11.05.23	7.1	25.1	16.6	S	28.1	38.0	32.7	35	73	53	755	0
11-12.05.23	7.2	20.1	13.3	SE	29.3	38.0	33.0	36	75	54	755	0
12-13.05.23	9.6	22.3	15.2	ESE	28.2	38.8	32.1	32	73	50	754	0
13-14.05.23	8.0	16.0	11.9	SE	28.9	37.8	31.5	41	77	54	755	0
14-15.05.23	7.3	13.8	11.4	W	28.9	37.0	32.7	33	74	52	753	0
15-16.05.23	9.0	12.8	10.9	W	28.5	36.0	32.2	30	72	48	754	0
16-17.05.23	6.8	18.6	12.5	NW	28.9	36.7	32.0	29	78	54	755	0
17-18.05.23	8.7	18.6	13.2	W	29.7	37.9	32.2	32	76	55	755	0
18-19.05.23	8.2	25.6	17.1	S	29.7	38.0	31.9	30	77	58	752	0
19-20.05.23	7.4	21.8	15.5	S	29.4	38.0	31.5	28	75	58	752	0
20-21.05.23	6.9	23.2	15.6	SE	29.2	35.7	31.8	32	72	52	752	0
21-22.05.23	5.0	24.2	14.7	S	29.1	38.4	31.6	37	73	54	752	0
22-23.05.23	9.3	17.0	12.9	ESE	29.2	37.3	31.9	30	77	52	754	0
23-24.05.23	7.3	19.4	13.2	SE	28.7	38.9	31.7	33	73	57	754	0
24-25.05.23	5.7	14.8	11.1	S	28.6	37.0	32.0	40	76	58	753	0
25-26.05.23	7.5	14.6	11.1	S	27.2	38.3	31.7	39	80	53	754	0
26-27.05.23	3.5	12.4	7.3	SE	28.9	38.4	32.2	33	79	50	753	0
27-28.05.23	2.2	9.0	5.6	W	28.8	38.8	33.3	33	74	53	752	0
28-29.05.23	2.3	11.3	4.8	W	29.7	37.9	32.7	35	73	58	752	0
29-30.05.23	2.1	17.2	8.6	NW	29.5	37.9	33.0	37	73	55	754	0
30-31.05.23	1.4	14.8	7.2	NW	29.0	37.7	32.3	39	78	56	754	0
31.5-1.6.23	2.1	12.0	6.3	WSW	29.4	38.7	33.4	41	75	57	752	0
Mon. days	0.7	25.6	11.0	S/SE/W	25.3	39.5	32.4	28	80	55.1	753.8	0

Note : Abstract values are taken from the hourly readings (00:00-24:00 hrs.) recorded continuously during the monitoring period.

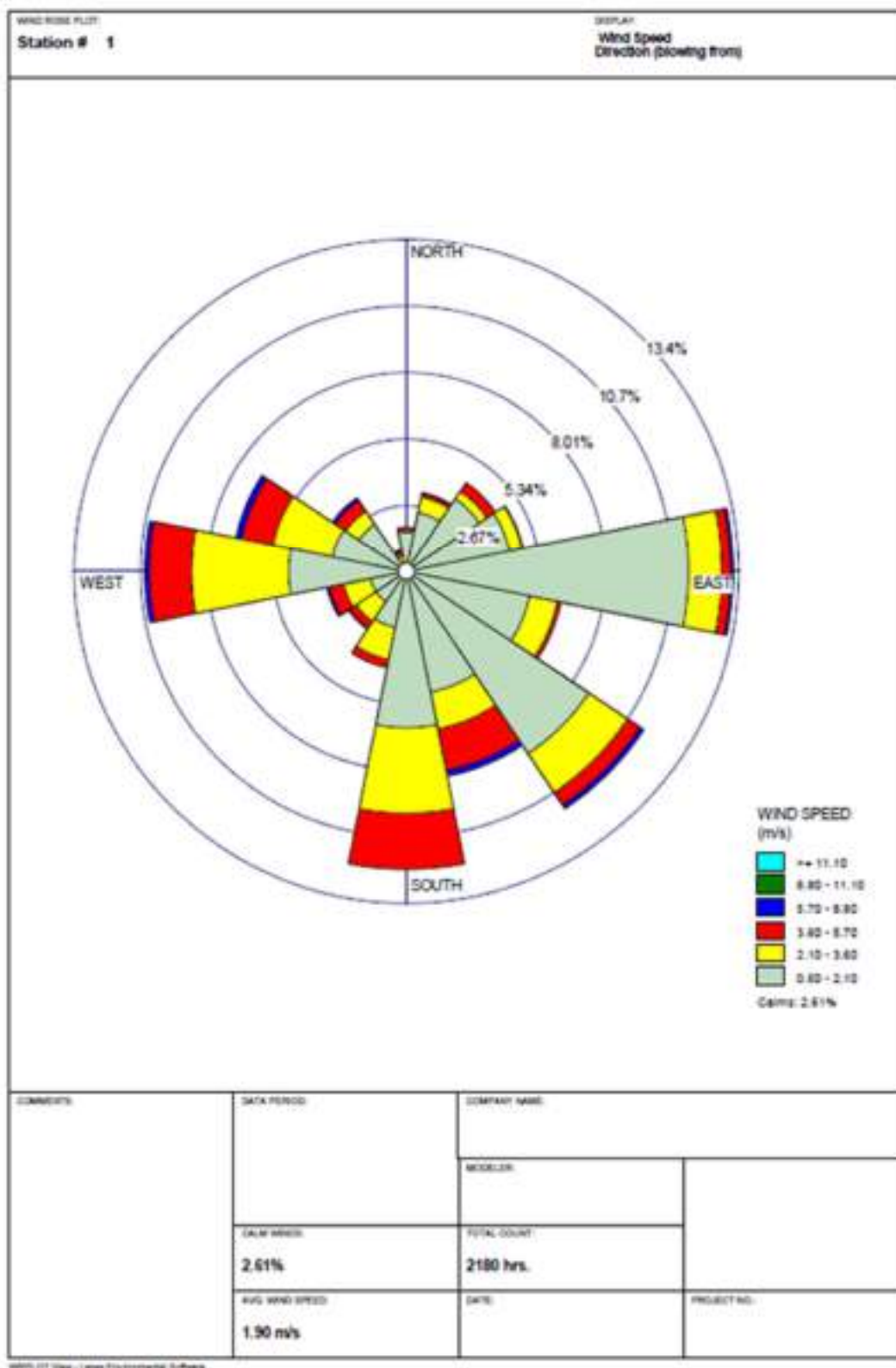
Table : 3.3 Micrometeorological Data– June 2023

Location : VV Ti Plant

Date	Wind Velocity, kmph			Wind Direction (from)	Temperature, °C			Relative Humidity, %			Atm. Pressure, mm of Hg (mean)	Rainfall, mm
	Min.	Max.	Mean		Min.	Max.	Mean	Min.	Max.	Mean		
01-02.06.23	1.4	6.4	4.1	SE	29.4	38.7	33.4	41	75	57	752	0
02-03.06.23	1.3	7.8	4.4	S	29.5	39.0	34.3	28	64	46	753	0
03-04.06.23	1.6	10.7	5.0	SE	29.8	38.0	33.0	32	71	53	753	0
04-05.06.23	2.6	10.8	5.4	S	29.7	37.7	32.7	35	71	55	754	0
05-06.06.23	2.0	8.5	4.9	SE	26.9	34.9	31.1	43	70	57	755	0
06-07.06.23	1.0	9.3	3.8	E	27.3	34.8	29.6	45	73	65	753	0
07-08.06.23	2.3	7.5	5.4	SE	25.9	30.0	27.8	70	73	73	753	0
08-09.06.23	0.9	10.4	4.3	SE	26.5	33.3	28.9	52	73	69	754	0
09-10.06.23	1.3	13.0	6.7	SE	26.8	35.7	31.1	41	73	58	756	0
10-11.06.23	0.6	10.3	5.0	SE	28.3	37.1	32.7	35	73	53	756	0
11-12.06.23	0.6	9.9	3.6	W/SE	29.3	37.7	32.7	36	73	54	755	0
12-13.06.23	0.8	11.1	4.1	W	29.6	38.4	33.1	32	73	50	753	0
13-14.06.23	1.9	12.5	4.4	W	29.8	38.3	33.1	41	71	54	753	0
14-15.06.23	1.3	11.1	5.3	W	29.9	38.4	33.7	33	71	52	754	0
15-16.06.23	1.9	11.0	6.3	SE	29.3	39.5	33.5	30	72	48	756	0
16-17.06.23	1.7	9.8	6.4	SE	28.4	37.9	32.6	29	68	44	756	0
17-18.06.23	3.2	11.8	6.9	W/SE	28.3	37.9	33.0	29	66	45	756	0
18-19.06.23	2.2	6.4	4.2	SE	29.2	38.3	33.7	28	67	48	753	0
19-20.06.23	1.9	7.2	4.2	S	30.1	39.0	34.8	28	68	48	753	0
20-21.06.23	1.1	15.0	4.7	W/SE	28.3	39.9	32.8	32	72	52	754	0
21-22.06.23	2.3	13.9	7.4	SW	28.0	36.2	31.4	37	73	54	755	0
22-23.06.23	1.6	10.7	6.6	W	27.6	37.6	31.9	30	71	52	753	0
23-24.06.23	1.3	14.2	6.3	W	26.6	38.6	31.6	33	73	57	755	0
24-25.06.23	1.7	11.4	6.8	E	27.3	37.2	31.7	40	73	58	753	0
25-26.06.23	2.1	13.0	8.1	E	27.6	36.5	32.5	39	70	53	753	0
26-27.06.23	0.9	8.0	4.5	SE	29.3	37.6	33.3	33	69	50	754	0
27-28.06.23	1.5	9.3	5.1	SE	29.3	38.3	33.3	33	64	48	756	0
28-29.06.23	1.2	16.8	5.2	SE	27.4	37.9	31.1	35	73	58	756	0
29-30.06.23	3.0	10.2	6.2	NW	27.1	36.2	31.8	37	73	55	756	0
30.6-1.7.23	0.8	10.3	6.0	NW	28.8	37.5	32.7	39	72	56	755	0
Mon. days	0.6	16.8	5.4	SE/W	25.9	39.9	32.3	28	75	54.1	754.3	0

Note : Abstract values are taken from the hourly readings (00:00-24:00 hrs.) recorded continuously during the monitoring period.

Fig. : 3.4 Seasonal Wind Rose



During the monitoring month of May 2023 : The predominant winds were from S/SE/E direction. Wind velocity readings were ranging from 0.7 kmph to 25.6 kmph with the mean wind speed of 11.0 kmph. The temperature values were ranging from 25.3 °C to 39.5 °C with a mean value of 32.4 °C. The relative humidity values were ranging from 28% to 80% with mean value of 55.1%. The mean atmospheric pressure value was computed as 753.8 mm of mercury. Clear sky was observed most of the times. There was no rainy day in this month.

During the monitoring month of June 2023 : The predominant winds were from SE/W direction. Wind velocity readings were ranging from 0.6 kmph to 16.8 kmph with the mean wind speed of 5.4 kmph. The temperature values were ranging from 25.9 °C to 39.9 °C with a mean value of 32.3 °C. The relative humidity values were ranging from 28% to 75% with mean value of 54.1%. The mean atmospheric pressure value was computed as 754.3 mm of mercury. Clear sky was observed most of the times. There was no rainy day in this month.

The monitored meteorological data were found to be **in compliance with local weather phenomena**.

3.5 Ambient Air Quality

AAQ Monitoring Stations were selected based on the Upwind & Downwind directions for the Season (Table 3.4). **Mobile Monitoring Stations were also established** for monitoring.

**Table : 3.4 Ambient Air Quality Monitoring Stations
Location & Bearing**

Sl. No.	Location	North Latitude	East Longitude	Direction from Site	Distance, km	Location Scenario
1	A1-TGU Site	08°49'12.0"	78°03'57.2"	-	-	Site Area
2	A2-VVTi Plant, SIPCOT	08°49'04.7"	78°04'29.4"	E	0.9	Upwind
3	A3-Therku Veerapandiapuram	08°49'41.5"	78°03'48.5"	NW	0.8	Downwind
4	A4-Korampallam	08°47'08.2"	78°06'06.3"	SE	5.3	Upwind near Urban Area
5	A5-Kil Tattapparai	08°47'46.2"	78°01'52.1"	SW	4.5	Downwind
6	A6-Setti Urani	08°49'56.9"	78°00'37.4"	WNW	6.3	Upwind
7	A7-Swaminattam	08°51'47.3"	78°03'19.0"	NNW	4.9	Downwind
8	A8-Ramanathapuram	08°50'58.3"	78°06'58.2"	NE	6.3	Downwind

All 12 AAQ parameters (**24/8/1 hourly basis**) were monitored in compliance with NAAQ norms. During the study, each 192 samples were collected, analysed and reported. The monitored ambient air quality data are presented in **Tables 3.5-3.12**. The abstract of those monitored data is given as **Table 3.13** and the ambient air quality status in the study area as **Table 3.14**.

Table : 3.5 Ambient Air Quality Data at A1-TGU Site

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	20	42	9	11	11.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	17	34	12	14	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	14	27	10	12	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	16	30	13	15	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	18	33	11	13	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	20	37	11	12	12.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	15	30	10	12	10.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	12	22	12	14	14.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	13	25	11	13	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	16	30	9	11	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	21	37	11	14	14.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	20	42	10	12	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	17	33	9	11	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	16	27	8	10	11.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	20	38	10	13	12.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	18	33	12	14	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	16	30	11	12	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	15	27	10	13	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	17	34	12	15	12.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	15	26	14	16	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	21	38	11	13	18.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	18	34	10	11	11.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	17	31	12	13	12.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	20	38	11	11	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		12-21	22-42	8-14	10-16	<10-18.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		17.2	32.4	10.8	12.7	12.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.
ug-microgram & ng-nanogram.

* : **NAAQ Norms**-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

Table : 3.6 Ambient Air Quality Data at A2-VVTi Plant, SIPCOT

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	26	53	12	15	15.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	31	57	14	17	14.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	28	53	17	19	15.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	24	49	13	16	16.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	33	60	15	17	17.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	28	54	12	16	15.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	23	45	14	18	16.0	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	22	43	13	15	13.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	34	62	16	20	12.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	36	60	14	17	15.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	27	51	12	16	16.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	24	50	18	21	17.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	31	63	15	18	14.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	25	54	17	19	17.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	29	60	14	16	20.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	34	63	12	13	21.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	30	57	14	15	18.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	32	63	11	12	15.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	27	55	13	15	17.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	36	68	12	14	18.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	33	64	14	16	15.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	24	45	13	16	20.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	28	54	15	16	16.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	22	45	11	12	17.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		22-36	43-68	11-18	12-21	12.8-21.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		28.6	55.3	13.8	16.2	16.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.7 Ambient Air Quality Data at A3-Therku Veerapandiapuram

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	26	43	10	13	10.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	23	40	11	13	11.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	25	42	13	15	12.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	19	38	10	14	11.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	23	41	12	14	14.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	18	33	14	18	10.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	20	37	11	12	10.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	17	35	12	16	12.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	21	38	10	11	11.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	19	35	13	14	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	21	38	9	10	10.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	15	26	10	12	10.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	18	32	11	12	11.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	16	29	12	14	10.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	14	25	10	12	10.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	17	31	13	14	12.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	16	28	10	13	13.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	16	29	12	14	14.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	19	35	9	12	12.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	20	38	11	13	12.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	16	30	13	14	11.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	18	33	10	12	12.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	14	27	11	13	11.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	20	37	13	14	10.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		14-26	25-43	9-14	10-18	12.8-21.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		18.8	34.2	11.3	13.3	16.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.8 Ambient Air Quality Data at A4-Korampallam

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	33	54	18	23	20.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	26	46	17	19	23.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	31	55	14	18	20.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	24	45	18	20	18.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	27	49	15	19	15.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	21	40	17	21	26.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	23	42	19	23	28.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	26	47	16	20	20.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	30	51	22	26	14.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	33	55	17	22	16.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	26	48	20	24	20.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	33	63	18	22	18.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	27	51	21	24	27.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	29	55	17	20	25.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	32	60	22	28	22.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	35	65	20	25	20.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	31	57	18	22	32.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	34	63	21	27	37.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	28	55	18	22	38.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	30	60	17	20	30.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	27	54	21	26	27.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	29	54	19	24	25.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	24	45	20	26	30.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	27	52	21	23	26.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		21-35	40-65	14-22	18-28	14.8-38.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		28.6	52.8	18.6	22.7	24.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.9 Ambient Air Quality Data at A5-Kil Tattapparai

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	14	27	9	11	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	18	33	9	10	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	15	27	11	12	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	16	33	10	11	11.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	21	35	11	12	10.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	23	41	8	9	11.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	18	34	10	11	10.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	20	38	11	13	12.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	17	35	9	10	19.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	20	38	10	11	14.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	16	33	9	11	12.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	13	23	8	10	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	15	28	11	13	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	12	23	9	10	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	14	26	8	13	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	11	20	10	12	11.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	13	21	9	10	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	12	21	8	10	10.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	12	21	9	11	10.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	13	25	11	13	10.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	13	21	7	9	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	16	27	9	11	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	12	20	10	12	10.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	14	26	11	12	10.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		11-23	20-41	7-11	9-13	<10-19.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		15.3	28.2	9.5	11.1	11.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.10 Ambient Air Quality Data at A6-Setti Urani

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	15	26	10	13	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	12	21	8	9	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	17	30	9	11	10.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	14	24	7	9	11.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	16	29	8	8	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	14	27	7	8	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	17	30	9	10	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	15	28	8	9	10.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	16	31	7	8	11.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	14	25	8	10	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	17	33	7	8	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	16	27	7	9	11.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	15	31	6	8	10.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	14	26	8	10	10.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	17	32	7	8	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	16	30	7	9	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	20	38	9	11	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	14	23	8	9	10.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	15	27	8	10	10.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	16	31	7	9	11.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	14	24	7	8	10.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	17	33	10	12	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	15	26	9	10	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	14	22	9	11	<10	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		12-20	21-38	6-10	8-13	<10-11.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		15.4	28.1	7.9	9.5	10.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.11 Ambient Air Quality Data at A7-Swaminattam

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	30	49	14	18	20.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	28	45	11	13	19.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	32	52	10	12	18.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	31	54	13	15	18.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	27	46	15	17	21.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	24	45	18	23	20.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	32	55	14	19	22.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	35	58	16	21	20.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	27	48	14	16	21.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	33	56	11	13	20.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	35	58	11	12	22.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	32	53	13	15	20.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	36	55	18	23	21.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	34	56	21	24	20.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	37	62	18	21	18.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	30	52	19	23	22.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	33	58	17	20	19.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	34	59	15	18	18.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	37	60	18	22	16.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	33	51	14	18	14.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	35	60	16	20	20.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	33	54	14	17	21.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	28	47	13	15	18.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	30	52	16	18	19.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		24-37	45-62	10-21	12-24	14.3-22.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		31.9	53.5	15.0	18.0	19.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.12 Ambient Air Quality Data at A8-Ramanathapuram

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NO _x	O ₃ (8-hly Avg.)	NH ₃	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
04-05.04.2023	06:00-06:00	21	37	14	16	15.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.04.2023	06:00-06:00	20	39	11	13	14.7	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.04.2023	06:00-06:00	25	44	12	13	13.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.04.2023	06:00-06:00	27	48	15	18	12.8	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.04.2023	06:00-06:00	24	43	14	15	11.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.04.2023	06:00-06:00	28	48	13	15	12.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.04.2023	06:00-06:00	32	58	11	13	14.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.04.2023	06:00-06:00	26	49	12	15	15.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.05.2023	06:00-06:00	28	52	15	18	16.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.05.2023	06:00-06:00	25	48	14	17	17.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.05.2023	06:00-06:00	32	60	16	20	18.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
13-14.05.2023	06:00-06:00	26	48	12	16	20.1	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.05.2023	06:00-06:00	30	57	16	20	17.9	<5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.05.2023	06:00-06:00	34	57	12	15	20.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.05.2023	06:00-06:00	32	61	14	18	18.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.05.2023	06:00-06:00	26	47	17	21	20.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
03-04.06.2023	06:00-06:00	28	50	15	17	19.5	<5	<1000	<0.1	<1	<1	<0.01	<0.1
04-05.06.2023	06:00-06:00	31	53	13	16	20.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.06.2023	06:00-06:00	34	58	16	18	17.0	<5	<1000	<0.1	<1	<1	<0.01	<0.1
12-13.06.2023	06:00-06:00	27	51	10	13	18.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.06.2023	06:00-06:00	28	43	14	16	18.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
20-21.06.2023	06:00-06:00	33	54	12	15	17.4	<5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.06.2023	06:00-06:00	22	40	15	18	20.6	<5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.06.2023	06:00-06:00	24	44	14	17	22.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		20-34	37-61	10-17	13-21	11.6-22.3	<5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		27.6	49.5	13.6	16.4	17.2	<5	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	100 (8 hrs.)	400 (24 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NO_x**-Oxides of Nitrogen; **O₃**-Ozone; **NH₃**-Ammonia; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase.

ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.13 Abstract of Ambient Air Quality Data

Sl. No.	Parameter	Pollutant Concentration, ug/m ³							
		PM2.5	PM10	SO ₂	NO _x	PM2.5	PM10	SO ₂	NO _x
		A1-TGU Site				A2-VVTi Plant, SIPCOT			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	12	22	8	10	22	43	11	12
3	10 th Percentile Value	14	26	9	11	23	45	12	13
4	20 th Percentile Value	15	27	10	11	24	50	12	15
5	30 th Percentile Value	16	30	10	12	26	53	13	15
6	40 th Percentile Value	16	30	10	12	27	54	13	16
7	50 th Percentile Value	17	33	11	13	28	55	14	16
8	60 th Percentile Value	18	34	11	13	30	57	14	16
9	70 th Percentile Value	18	34	11	13	31	60	14	17
10	80 th Percentile Value	20	37	12	14	33	62	15	18
11	90 th Percentile Value	20	38	12	15	34	63	17	19
12	95 th Percentile Value	21	41	13	15	36	64	17	20
13	98 th Percentile Value	21	42	14	16	36	66	18	21
14	Maximum	21	42	14	16	36	68	18	21
15	Arithmetic Mean	17.2	32.4	10.8	12.7	28.6	55.3	13.8	16.2
16	Geometric Mean	17.0	32.0	10.7	12.6	28.3	54.9	13.7	16.1
17	Standard Deviation	2.5	5.3	1.4	1.5	4.4	6.9	1.9	2.3
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0
		A3-Therku Veerapandiapuram				A4-Korampallam			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	14	25	9	10	21	40	14	18
3	10 th Percentile Value	15	27	10	12	24	45	16	19
4	20 th Percentile Value	16	29	10	12	26	47	17	20
5	30 th Percentile Value	17	31	10	12	27	49	17	21
6	40 th Percentile Value	18	33	11	13	27	51	18	22
7	50 th Percentile Value	19	35	11	13	29	54	18	23
8	60 th Percentile Value	19	37	12	14	30	55	19	23
9	70 th Percentile Value	20	38	12	14	31	55	20	24
10	80 th Percentile Value	21	38	13	14	32	58	21	25
11	90 th Percentile Value	23	41	13	15	33	62	21	26
12	95 th Percentile Value	25	42	13	16	34	63	22	27
13	98 th Percentile Value	26	43	14	17	35	64	22	28
14	Maximum	26	43	14	18	35	65	22	28
15	Arithmetic Mean	18.8	34.2	11.3	13.3	28.6	52.8	18.6	22.7
16	Geometric Mean	18.5	33.8	11.2	13.2	28.3	52.3	18.5	22.5
17	Standard Deviation	3.2	5.2	1.4	1.7	3.7	6.7	2.2	2.7
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10-Respirable Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen. ug-microgram. O₃-Ozone values are reported locationwise. NH₃-Ammonia; CO-Carbon monoxide; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C₆H₆-Benzene and BaP-Benzo (a) pyrene in particulate phase levels were monitored below respective detectable limits.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

Table : 3.13 (Contn.) Abstract of Ambient Air Quality Data

Sl. No.	Parameter	Pollutant Concentration, ug/m ³							
		PM2.5	PM10	SO ₂	NO _x	PM2.5	PM10	SO ₂	NO _x
		A5-Kil Tattapparai				A6-Setti Urani			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	11	20	7	9	12	21	6	8
3	10 th Percentile Value	12	21	8	10	14	23	7	8
4	20 th Percentile Value	13	21	9	10	14	25	7	8
5	30 th Percentile Value	13	23	9	10	14	26	7	9
6	40 th Percentile Value	14	26	9	11	15	27	7	9
7	50 th Percentile Value	15	27	9	11	15	28	8	9
8	60 th Percentile Value	16	28	10	11	16	30	8	10
9	70 th Percentile Value	16	33	10	12	16	30	8	10
10	80 th Percentile Value	18	34	11	12	17	31	9	10
11	90 th Percentile Value	20	37	11	13	17	33	9	11
12	95 th Percentile Value	21	38	11	13	17	33	10	12
13	98 th Percentile Value	22	40	11	13	19	36	10	13
14	Maximum	23	41	11	13	20	38	10	13
15	Arithmetic Mean	15.3	28.2	9.5	11.1	15.4	28.1	7.9	9.5
16	Geometric Mean	15.0	27.5	9.4	11.1	15.3	27.8	7.9	9.4
17	Standard Deviation	3.3	6.5	1.2	1.2	1.6	4.0	1.1	1.4
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0
		A7-Swaminattam				A8-Ramanathapuram			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	24	45	10	12	20	37	10	13
3	10 th Percentile Value	27	46	11	13	23	41	11	13
4	20 th Percentile Value	29	49	13	15	25	44	12	15
5	30 th Percentile Value	30	52	14	16	26	47	12	15
6	40 th Percentile Value	32	52	14	17	26	48	13	16
7	50 th Percentile Value	33	54	15	18	28	49	14	16
8	60 th Percentile Value	33	55	16	19	28	51	14	17
9	70 th Percentile Value	34	56	16	20	30	53	15	18
10	80 th Percentile Value	35	58	18	21	32	57	15	18
11	90 th Percentile Value	36	60	18	23	33	58	16	19
12	95 th Percentile Value	37	60	19	23	34	60	16	20
13	98 th Percentile Value	37	61	20	24	34	61	17	21
14	Maximum	37	62	21	24	34	61	17	21
15	Arithmetic Mean	31.9	53.5	15.0	18.0	27.6	49.5	13.6	16.4
16	Geometric Mean	31.7	53.3	14.7	17.7	27.3	49.1	13.5	16.2
17	Standard Deviation	3.4	5.0	2.8	3.7	4.0	6.8	1.8	2.3
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10-Respirable Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen. ug-microgram. O₃-Ozone values are reported locationwise.

NH₃-Ammonia; CO-Carbon monoxide; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C₆H₆-Benzene and BaP-Benzo (a) pyrene in particulate phase levels were monitored below respective detectable limits.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

Table : 3.14 Ambient Air Quality Status

Season : Summer 2023

No. of Locations : 8

Sample Size : 8/24-Hourly

Sl. No.	Parameter	Pollutant Concentration, ug/m ³			
		PM2.5	PM10	SO ₂	NO _x
1	No. of Observations	192	192	192	192
2	Minimum	11	20	6	8
3	10 th Percentile Value	14	26	8	10
4	20 th Percentile Value	16	29	9	11
5	30 th Percentile Value	17	33	10	12
6	40 th Percentile Value	20	37	11	13
7	50 th Percentile Value	22	42	12	14
8	60 th Percentile Value	26	47	13	15
9	70 th Percentile Value	28	51	14	17
10	80 th Percentile Value	31	55	16	19
11	90 th Percentile Value	33	59	18	22
12	95 th Percentile Value	34	61	19	23
13	98 th Percentile Value	36	63	21	26
14	Maximum	37	68	22	28
15	Arithmetic Mean	22.9	41.8	12.5	15.0
16	Geometric Mean	21.8	39.7	12.0	14.3
17	Standard Deviation	7.3	12.7	3.6	4.5
18	NAAQ Norms*	60	100	80	80
19	% Values exceeding NAAQ Norms	0	0	0	0

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10-Respirable Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen. ug-microgram. O₃-Ozone values are reported locationwise.

NH₃-Ammonia; CO-Carbon monoxide; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C₆H₆-Benzene and BaP-Benzo (a) pyrene in particulate phase levels were monitored below respective detectable limits.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

National Ambient Air Quality Standard : The levels of air quality with an adequate margin of safety, to protect the public health, vegetation and property. Whenever and wherever two consecutive values exceed the limit specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.

1. 24-hly./8-hly. values should be met 98% of the time in a year; however, 2% of the time it may exceed but not on two consecutive days.

2. Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval.

On the synthesized data, the following observations are made :

PM_{2.5} values (24 hours Time Weighted) were monitored in the range between 11-37 microgram/cu.m (ug/m^3) in the Study Area with mean value of **22.9 ug/m^3** against the NAAQ Norm value of **60 ug/m^3** (24 hours Time Weighted).

PM₁₀ values were monitored in the range between 20-68 ug/m^3 with the mean value of **41.8 ug/m^3** against the NAAQ Norm value of **100 ug/m^3** (24 hours Time Weighted).

SO₂ values were monitored in the range between 6-22 ug/m^3 with the mean value of **12.5 ug/m^3** against the NAAQ limit value of **80 ug/m^3** (24 hours Time Weighted).

NO_x values were monitored in the range between 8-28 ug/m^3 with the mean value of **15.0 ug/m^3** against the NAAQ limit value of **80 ug/m^3** 24 hours Time Weighted).

O₃ values (hourly samples reported for 8-hour average) were monitored between <10 ug/m^3 – 16.3 ug/m^3 , against the NAAQ limit value of 100 ug/m^3 (8 hours Time Weighted).

Ammonia (NH₃) concentrations were monitored less than 5 ug/m^3 at all the monitoring locations against the NAAQ limit value of 400 ug/m^3 (24 hours Time Weighted).

CO : The monitored CO values were less than 1000 ug/m^3 during the study period against the NAAQ limit value of 2 mg/ m^3 (2,000 ug/m^3) (8 hours Time Weighted).

Particulate Lead (Pb) concentrations were monitored less than 0.1 ug/m^3 at all the monitoring locations against the NAAQ limit value of 1.0 ug/m^3 (24 hours Time Weighted).

Arsenic (As) concentrations were monitored less than 1 nanogram/cu.m (ng/m^3) at all the monitoring locations against the NAAQ limit value of 6 ng/m^3 (annual mean).

Nickel (Ni) concentrations were monitored less than 1 ng/m^3 at all the monitoring locations against the NAAQ limit value of 20 ng/m^3 (annual mean).

Benzene (C₆H₆) concentrations were monitored less than 0.01 ug/m^3 at all the monitoring locations against the NAAQ limit value of 5 ug/m^3 (annual mean).

Benzo(a) Pyrene (BaP) concentrations were monitored less than 0.1 ng/m^3 at all the monitoring locations against the NAAQ limit value of 1.0 ng/m^3 (annual mean).

While comparing with the National Ambient Air Quality (NAAQ) Standards revised as per GSR 826(E) dated 16.11.2009, **all monitored values were found to be well within the respective limit values for 24-hourly periods** for Industrial, Residential, Rural and other Areas.

Exceedance Factor (EF) : (Monitored Avg. Value of criteria Pollutant/NAAQ Norm of the Pollutant) : Critical Pollution if EF is 1.5; High Pollution if EF is between 1.0-<1.5, Moderate Pollution if EF is between 0.5-<1.0 and Low Pollution if EF is <0.5. **Study Area is falling under Low Pollution Category** as monitored Pollutant Levels were <0.5 EF.

Pollutant	Mean Concentration	NAAQ Norm	Exceedance Factor (EF)	Pollution Category
PM _{2.5} , ug/m ³	22.9	60	0.38	Low
PM ₁₀ , ug/m ³	41.8	100	0.42	Low
SO ₂ , ug/m ³	12.5	80	0.16	Low
NO ₂ , ug/m ³	15.0	80	0.19	Low

3.6 Noise Levels

Study area represents Industrial, Commercial & Residential Areas for comparing with MoEF&CC Ambient Noise Norms. The abstract of monitored monthly noise data are presented in **Table 3.15**.

Table : 3.15 Ambient Noise Level Data (Abstract)

Monitoring Dates : 20-21.04.2023; 12-13.05.2023 & 20-21.06.2023

Sl. No.	Location	Area	Noise Levels, dB(A)					
			Day Time (06:00-22:00 hrs.)			Night Time (22:00-06:00 hrs.)		
			Lmin.	Lmax.	Leq	Lmin.	Lmax.	Leq
1	A1-TGU Site	Residential	32.2	88.7	42.5	32.0	90.5	40.4
2	A2-VVTi Plant, SIPCOT	Industrial	34.4	97.5	47.4	33.4	93.8	44.8
3	A3-Therku Veerapandiapuram	Residential	33.8	90.8	43.9	32.9	88.7	41.8
4	A4-Korampallam	Commercial	35.1	100.4	45.8	32.7	102.3	43.7
5	A5-Kil Tattapparai	Residential	32.0	87.6	42.8	31.9	80.4	39.5
6	A6-Setti Urani	Residential	32.5	88.1	42.4	32.2	82.3	40.3
7	A7-Swaminattam	Residential	32.7	90.9	43.1	32.1	88.3	41.6
8	A8-Ramanathapuram	Residential	33.8	97.7	44.6	32.7	90.2	42.3
Study Area			32.0	100.4	44.1	31.9	102.3	41.8
MoEF&CC Norms* for Residential Areas			-		55	-		45
MoEF&CC Norms for Commercial Areas			-		65	-		55
MoEF&CC Norms for Industrial Areas			-		75	-		70

Lmin.-Minimum Levels; Lmax.-Maximum Levels & Leq-Equivalent Noise Levels.

* : MoEF&CC Norms-Ministry of Environment, Forest & Climate Change Ambient Noise Norms (Leq).

Day time is reckoned inbetween 6 a.m - 10 p.m. and Night time is reckoned inbetween 10 p.m. - 6 a.m.

Ambient Noise Levels were ranging from 32.4 dB(A) to 100.4 dB(A) during day times and from 31.9 dB(A) to 102.3 dB(A) during night times on the monitoring days. Equivalent Noise (Leq) Levels were ranging from 42.4 dB(A) to 47.4 dB(A) during day times and from 39.5 dB(A) to 44.8 dB(A) during night times on the monitoring days.

Day Equivalent Noise (Leq-d) level was found to be 44.1 dB(A) and Night Equivalent Noise (Leq-n) level was 41.8 dB(A).

While comparing with the MoEF&CC Leq Norms for day and night times, the monitored **ambient noise levels were well within the limit values** for Residentail Area.

3.7 Water Environment

3.7.1 Hydrogeology

The prominent geomorphic units identified in the district are Fluvial, Marine, Fluvio-marine, Aeolian and Erosional landforms depending on the environment of formation (CGWB District Profile Report). The number of red sandy tracts formed of the sand dunes locally known as *Teri* sand complex are the important feature in the coast. Geology of the study area is dominated by Migmatite, Charnockite and Khondalite groups of rocks of Archaean age occupying 67%. Quarternary sediments extending up to 6.5 km from coast trending NE-SW and running almost parallel to the coast line occupy 32% of the study area. Pink and grey granite/pegmatite of Proterozoic and sandstone and claystone of Tertiary occur as intrusive in a very small area.

The important aquifer systems are constituted by Unconsolidated & semi-consolidated formations and weathered & fractured crystalline rocks. The porous formations include sandstones and clays of Recent to subrecent and Tertiary age (Quaternary). The Recent formations comprising mainly sands, clays and gravels are confined to major drainage courses. Ground water occurs under water table and confined conditions in these formations and is being developed by means of dug wells and filter points. The productive zones are encountered in depth range of 29.5 to 62 m bgl.

The water-bearing properties of crystalline formations which lack primary porosity depend on the extent of development of secondary intergranular porosity. The occurrence and movement of ground water in these rocks are under unconfined conditions in the joints & fissures and dependent on the nature and extent of pores and interconnection of fractures zones. These tension joints and fractures and shear fractures at deeper depth of 30 to 100 m have been acting as conduits for ground water movement. The depth of the wells in crystalline rocks ranged from 10 m to 15 m bgl. The yield of large diameter wells in the district, tapping the weathered mantle of crystalline rocks ranges from 40 lpm to 110 lpm and are able to sustain pumping for 2 - 6 hours per day. The Specific capacity of large diameter wells tested in crystalline rocks ranges from 3.0 -141 lpm/m. of drawdown. The yield characteristics of wells vary considerably depending on the topographic set-up, lithology and nature of weathering.

The Groundwater levels from the 49 number of observation wells of TWAD have been analyzed for Post-Monsoon and Pre-Monsoon. The 5 years average Ground water level in m Below Ground Level for pre and post monsoon are given in **Table 3.16**.

Table : 3.16 Ground Water Levels – TWAD Data

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years Pre-Mon. Avg.	5 Years Post-Mon. Avg.
8.2	11.3	5.6	7.9	5.5	9.8	4.7	5.1	2.3	2.4	6.5	4.8

The depth to water level varied between 2.4 – 11.3 m bgl during pre-monsoon (May) and varied between 2.3 – 8.2 m bgl during post monsoon (Jan.).

Stage of Ground Water Development : As per TWAD Data, Ottapidaram Firka is Semi-Critical (70-90%) and Thoothukudi Firka is Safe (<70%) Category.

3.7.2 Water Quality

The Central Pollution Control Board (CPCB) has identified Five **Designated Best Use of Surface Waters** viz. **Class A** (Drinking Water Source without Conventional Treatment but after Disinfection), **B** (Out Door Bathing-Organised), **C** (Drinking Water Source after Conventional Treatment and Disinfection), **D** (Propagation of Wild life and Fisheries) & **E** (Irrigation, Industrial Cooling, Controlled Waste Disposal) and stipulated the Norms for the Classes; for few Parameters (**Table 3.17**).

Table : 3.17 CPCB Criteria for Designated Best Use of Water

Parameter	Designated Best Use Class & Required Criteria				
	A	B	C	D	E
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5	6.5-8.5
EC, umhos/cm (max.)	-	-	-	-	2,250
DO, mg/l	6 or more	5 or more	4 or more	4 or more	6 or more
BOD-3 days @ 27 °C	2 or less	3 or less	3 or less	-	2 or less
Total Coliforms, MPN/100 ml	50 or less	500 or less	5000 or less	-	50 or less
Free Ammonia (as N), mg/l	-	-	-	1.2 or less	-
Boron, mg/l (max.)	-	-	-	-	2
Sodium Absorption Ratio (max.)	-	-	-	-	26

- : Not included/Not specified.

Further, Bureau of Indian Standards (BIS) had also recommended Tolerance Limits for Inland Surface Waters for the different uses (**IS 2296:1982**). Even though, IS 2296:1982 has been withdrawn, the analysed data are compared with this Standard to have better understanding about the Surface Water Quality in the Study Area.

The Ground Water Quality Parameters were compared with **BIS 10500:2012 Standards** of Acceptable and Permissible Limits for Drinking purpose with Ground Water as source.

The monitored water quality data are given in **Tables 3.18-3.19** and the abstract of those data are given in the **Table 3.20**.

As the Gulf of Mannar/Sea is at >10 km distance, **Marine water samples were not considered** for the Study. However, Koramplam Tank is experiencing the tidal influence.

The **surface waters** were monitored with neutral pH in the range 7.63-8.04, agreeable colour, taste and odour. The surface waters were having DO levels in the range 4.2-5.2 mg/l. TDS values were monitored in the range of 450-2200 mg/l. Chloride values ranging from 94 mg/l to 840 mg/l. Iron content was found to be in the range 0.06-0.14 mg/l. Oil and grease, phenolic compounds, cyanides, sulphides and insecticides were found to be absent. Total coliforms were present to a maximum of 120 MPN/100 ml.

Trace metals, except Zinc, in the Surface waters were found to be below their detectable limits. The surface water quality, except at the tidal influence water bodies, was found to be within the prescribed CPCB Norms for Surface Waters.

The pH values of the **ground waters** were ranging in between 7.63-7.88. TDS values were monitored in the range of 280-800 mg/l. Chloride values ranging from 72 mg/l to 246 mg/l. Iron content was found to be in the range 0.04-0.28 mg/l. Oil and grease, phenolic compounds, cyanides, sulphides and insecticides were found to be absent. BOD and COD values were monitored in lower levels.

Trace metals were found to be below their detectable limits. In general, the water quality of ground waters were found to be within the prescribed IS:10500-2012 Norms for Drinking in the absence of an alternative source.

Exceedance Factor (EF) : All the monitored Water Quality Parameters were found to be well within the respective Limit Values and there was no Exceedance of the Norms.

Table : 3.18 Surface Water Quality Data

Monitoring Dates : 12.05.2023 (07:00-11:00 hrs.)

(Mean & Worst case values are reported)

Sl. No.	Parameter	W1	W2	W3	W4	W5	W6	W7	W8	CPCB Norms*
1	pH	8.04	7.78	8.04	7.89	7.63	7.71	7.89	8.04	6.5-8.5
2	Colour, Hazen units	<2	<2	<2	<2	<2	<2	<2	<2	10-30
3	Temperature, °C	28.7	27.4	27.6	28.1	27.4	27.7	27.9	28.2	-
4	Turbidity, NTU	2.8	2.5	3.1	2.6	1.8	2.1	2.4	2.1	-
5	Residual Chlorine, mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	-
6	Dissolved Oxygen, mg/l	4.2	4.8	5.2	4.4	5.0	4.6	4.4	4.3	4.0-6.0
7	Total Suspended Solids, mg/l	34	24	34	30	22	24	28	24	-
8	Electrical Conductivity, umhos/cm	880	750	3100	880	680	770	890	1200	-
9	Total Dissolved Solids, mg/l	570	480	2200	570	450	490	580	780	500-2100
10	Total Hardness (as CaCO ₃), mg/l	180	200	320	250	180	210	230	260	-
11	Calcium Hardness, mg/l	100	110	150	120	80	110	130	140	-
12	Magnesium Hardness, mg/l	80	90	170	130	100	100	100	120	-
13	Calcium (as Ca), mg/l	40	44	60	48	32	44	52	56	-
14	Magnesium (as Mg), mg/l	19	22	41	31	24	24	24	29	-
15	Sodium (as Na), mg/l	58	48	460	64	42	51	72	88	-
16	Potassium (as K), mg/l	10	9	36	2	2	3	14	11	-
17	Chlorides (as Cl), mg/l	142	118	840	138	94	104	132	210	250-600
18	Sulphates (as SO ₄), mg/l	64	52	170	60	36	48	56	88	400-1000
19	Total Alkalinity (as CaCO ₃), mg/l	80	90	130	120	100	110	130	120	-
20	BOD-3 days @ 27°C, mg/l	<2	<2	2	3	<2	2	<2	<2	<3
21	COD, mg/l	10	12	36	14	4	6	12	8	-
22	Oil & Grease, mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	-
23	Iron (as Fe), mg/l	0.14	0.12	0.14	0.11	0.06	0.10	0.10	0.10	0.3-5.0
24	Fluorides (as F), mg/l	0.27	0.24	0.32	0.24	0.12	0.15	0.27	0.17	1.5
25	Nitrates (as NO ₃), mg/l	0.80	1.14	1.55	1.12	0.70	0.80	0.74	0.52	20-50
26	Phosphates (as PO ₄), mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
27	Cyanides (as CN), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
28	Pesticides (as Malathion), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
29	Phenols (as C ₆ H ₅ OH), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
30	Manganese (as Mn), mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
31	Chromium (as Cr), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
32	Copper (as Cu), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.5
33	Selenium (as Se), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
34	Aluminium (as Al), mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-
35	Cadmium (as Cd), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
36	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05-0.2
37	Boron (as B), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	2
38	Mercury (as Hg), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
39	Lead (as Pb), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.1
40	Zinc (as Zn), mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	1.5-15
41	Percent Sodium, %	39.5	33.0	73.2	35.5	33.3	34.1	38.7	41.1	-
42	Total Coliforms, MPN/100 ml	58	84	120	63	10	13	48	70	50-5000
43	Faecal Coliforms, MPN/100 ml	21	38	70	31	6	8	23	41	-
44	E. Coli, MPN/100 ml	10	21	38	12	2	4	12	26	-

Legend : W1-Madagiri Odai; W2-Korampallam Tank; W3-Korampallam Odai, W4-Pond, Therku Veerapandiapuram, W5-Umarikottai Tank; W6-Jambulingapuram Tank; W7-Nayinpuram Tank & W8-Kil Arasadi Tank.

* : CPCB Norms-Central Pollution Control Board Norms for Surface Waters. - : Not included/Not available.

Table : 3.19 Ground Water Quality Data

Monitoring Dates : 12.05.2023 (07:00-11:00 hrs.)

(Mean & Worst case values are reported)

Sl. No.	Parameter	W9	W10	W11	W12	W13	W14	W15	W16	IS:10500 Norms*
1	pH	7.73	7.80	7.83	7.88	7.74	7.67	7.63	7.84	6.5-8.5
2	Colour, Hazen units	<2	<2	<2	<2	<2	<2	<2	<2	5/15 [#]
3	Temperature, °C	27.8	27.4	27.5	27.8	27.3	26.7	26.3	27.0	-
4	Turbidity, NTU	0.9	1.3	1.6	2.4	1.4	0.8	0.6	1.3	1/5
5	Residual Chlorine, mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.2/1.0
6	Dissolved Oxygen, mg/l	4.3	4.0	4.1	3.8	4.3	4.4	4.5	4.1	-
7	Total Suspended Solids, mg/l	10	15	18	28	16	10	8	14	-
8	Electrical Conductivity, umhos/cm	440	1100	960	1230	1010	840	720	1040	-
9	Total Dissolved Solids, mg/l	280	730	620	800	640	540	460	680	500/2000
10	Total Hardness (as CaCO ₃), mg/l	110	270	260	250	220	200	180	230	200/600
11	Calcium Hardness, mg/l	60	150	140	120	100	90	100	120	-
12	Magnesium Hardness, mg/l	50	120	120	130	120	110	80	110	-
13	Calcium (as Ca), mg/l	24	60	56	48	40	36	40	48	75/200
14	Magnesium (as Mg), mg/l	12	29	29	31	29	26	19	26	30/100
15	Sodium (as Na), mg/l	24	88	72	118	78	56	44	76	-
16	Potassium (as K), mg/l	1	6	3	16	10	6	2	12	-
17	Chlorides (as Cl), mg/l	72	204	156	246	166	124	112	186	250/1000
18	Sulphates (as SO ₄), mg/l	20	81	67	94	84	80	44	78	200/400
19	Total Alkalinity (as CaCO ₃), mg/l	50	140	130	130	110	100	90	100	200/600
20	BOD-3 days @ 27°C, mg/l	<2	<2	<2	<2	<2	<2	<2	<2	-
21	COD, mg/l	2	12	8	18	7	6	4	10	-
22	Oil & Grease, mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	-
23	Iron (as Fe), mg/l	0.04	0.10	0.11	0.28	0.10	0.07	0.07	0.10	0.3
24	Fluorides (as F), mg/l	0.11	0.18	0.21	0.32	0.22	0.21	0.15	0.21	1.0/1.5
25	Nitrates (as NO ₃), mg/l	<0.50	0.55	0.76	1.24	0.55	0.60	0.50	0.78	45
26	Phosphates (as PO ₄), mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
27	Cyanides (as CN), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
28	Pesticides (as Malathion), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	Abs./0.001
29	Phenols (as C ₆ H ₅ OH), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.001/0.002
30	Manganese (as Mn), mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1/0.3
31	Chromium (as Cr), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
32	Copper (as Cu), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05/1.5
33	Selenium (as Se), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
34	Aluminium (as Al), mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03/0.2
35	Cadmium (as Cd), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.003
36	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01/0.05
37	Boron (as B), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.5/1.0
38	Mercury (as Hg), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.001
39	Lead (as Pb), mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01
40	Zinc (as Zn), mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	5/15
41	Percent Sodium, %	31.9	40.8	37.2	48.7	42.1	37.0	34.4	40.2	-
42	Total Coliforms, MPN/100 ml	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Absent
43	Faecal Coliforms, MPN/100 ml	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Absent
44	E. Coli, MPN/100 ml	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Absent

Legend : W9-SIPCOT Supply. Borewells at :- W10-Therku Veerapandiapuram; W11-Ramanathapuram; W12-Milavittan; W13-Kailasapuram; W14-Kil Tattaparai; W15-Setti Urani & W16-Swaminattam.

* : IS:10500 :2012-Drinking Water Standards; # : Requirement/Permissible Limit in the absence of alternate source.

Table : 3.20 Water Quality Status

Monitoring Dates : 12.05.2023 (07:00-11:00 hrs.)

Sl. No.	Parameter	Concentration Range & Norms			
		Surface Waters	CPCB Norms* for Surface Waters	Ground Waters	IS:10500 Norms** for Drinking Waters
1	pH	7.63-8.04	6.5-8.5	7.63-7.88	6.5-8.5
2	Dissolved Oxygen, mg/l	4.2-5.2	4-6	3.8-4.5	-
3	EC, umhos/cm	680-3100	-	440-1230	-
4	Total Dissolved Solids, mg/l	450-2200 ⁺	500/2100*	280-800	500-2000*
5	BOD (3 days @ 27 °C), mg/l	<2-3	2/3	<2	-
6	COD, mg/l	4-36	-	2-18	-
7	Oil & Grease, mg/l	Nil	-	Nil	-
8	Chlorides (as Cl), mg/l	94-840	250/600	72-246	250-1000
9	Iron (as Fe), mg/l	0.06-0.14	0.3/5.0	0.04-0.28	0.3/1.0
10	Trace Metals, mg/l	<0.001-<0.01	<0.001-<0.01	<0.001-<0.01	<0.001-<0.01
11	Total Coliforms, MPN/100 ml	10-120	50/5000	Absent	Absent

* : CPCB Norms-Central Pollution Control Board Norms; - : Not included/Not available.

** : IS:10500 :2012-Drinking Water Standards; # : Requirement/Permissible Limit in the absence of alternate source.

+:- Tidal influenced.

3.8 Land Environment

3.8.1 Soil Status

The major soil types encountered in the district are black cotton soils, red sandy to loamy soils and alluvial soils. The monitored soil quality data are given as **Table 3.21**.

Soils with medium compaction and silty loam texture are predominant in the study area. Soil pH values were found to be in alkaline range (7.82-8.12). Electrical Conductivity values were in the range 1.24-1.63 mmhos/cm. There was low moisture at all the monitoring locations. Organic carbon concentrations ranged from 0.66% to 0.94%.

Low levels of Nitrogen, Phosphorous and Potassium (NPK) values were monitored at all locations. Sodium Absorption Ratio was in the range 2.12-3.07 (desirable value being <5). There was no heavy metals intrusion/leaching into the ground strata. Wilting coefficient in significant levels would mean that these soils would support the vegetation, if amended suitably.

The soil water properties reveal that the soil will suit for salt tolerant and semisalt tolerant plants.

Table : 3.21 Soil Status

Monitoring Date : 20.05.2023

Sl. No.	Parameter	S1	S2	S3	S4	S5	S6	Desirable Range*
i	Colour	Reddish Brown	Brown	Grey	Brown	Brown	Brown	-
ii	Compaction	Medium	Medium	Medium	Medium	Medium	Medium	-
1	pH (10% Solution)	7.94	8.08	8.12	8.04	7.82	7.89	5.5-9.0
2	Electrical Conductivity, mmhos/cm	1.63	1.41	1.63	1.32	1.24	1.51	0.2-0.5
3	Natural Moisture Content, %	8.2	8.9	8.4	9.0	11.6	9.4	-
4	Organic Carbon, %	0.66	0.81	0.72	0.82	0.94	0.91	>0.75
5	Nitrogen (as N), %	0.006	0.008	0.006	0.008	0.010	0.008	0.01-0.02
6	Phosphorus (as P), %	0.010	0.006	0.007	0.006	0.008	0.008	0.002-0.004
7	Potassium (as K), %	0.014	0.007	0.012	0.006	0.004	0.01	>0.01
8	Sodium (as Na), ppm	180	160	180	130	110	130	-
9	Calcium (as Ca), ppm	110	100	120	80	70	80	-
10	Magnesium (as Mg), ppm	90	80	90	60	80	100	-
11	Chlorides (as Cl), ppm	240	200	270	200	140	180	-
12	Sulphates (as SO ₄), ppm	160	140	130	80	70	120	-
13	Cation Exchange Capacity, meq/100 g	17.8	20.6	18.9	21.1	28.2	20.4	10-30
14	Grain Size Distribution :- Sand, %	32.3	35.6	30.4	26.1	20.3	25.6	-
15	Silt	57.4	55.2	62.5	66.3	73.7	64.3	-
16	Clay	10.3	9.2	7.1	7.6	6.0	10.1	-
17	Textural Class	Silty Loam	Silty Loam	Silty Clay	Silty Loam	Silty Loam	Silty Loam	Loam
18	Bulk Density, g/cc	1.36	1.34	1.32	1.34	1.33	1.36	-
19	Infiltration Rate, cm/hr	4.0	3.8	4.0	4.1	3.6	3.7	-
20	Field Capacity, %	18.7	20.4	17.9	20.9	25.1	21.5	-
21	Wilting Coefficient, %	0.5	0.6	0.3	0.6	1.4	0.8	>0.4
22	Available Water Storage Capacity, %	18.2	19.8	17.6	20.3	23.7	20.7	-
23	Sodium Absorbing Ratio	3.07	2.88	3.01	2.66	2.12	2.28	<5

Legend : S1-Proposed Site; S2-Dry Land, Therku Veerapandiapuram; S3-Barren Land, Ramanathapuram; S4-Dry Land, Kailasapuram; S5-Agri. Land, Setti Urani & S6-Agri. Land, Swaminaattam.

* :Desirable Range for High Production Soil.

3.8.2 Land Use

For Land Use study of the Study Area, IRS P6-LIS IV- Imagery dated 28.02.2022 Satellite Digital Data of NRSA, Hyderabad was used (**Fig. 3.5**). Visual interpretation technique has been adopted for land use classification based on the interpretation keys suggested in guidelines of NNRMS, Bangalore. Level-3 Classification with 1:50,000 scale was made for the preparation of land use mapping (**Fig. 3.6**). Land Use Pattern of the Study Area is given in **Table 3.22**.

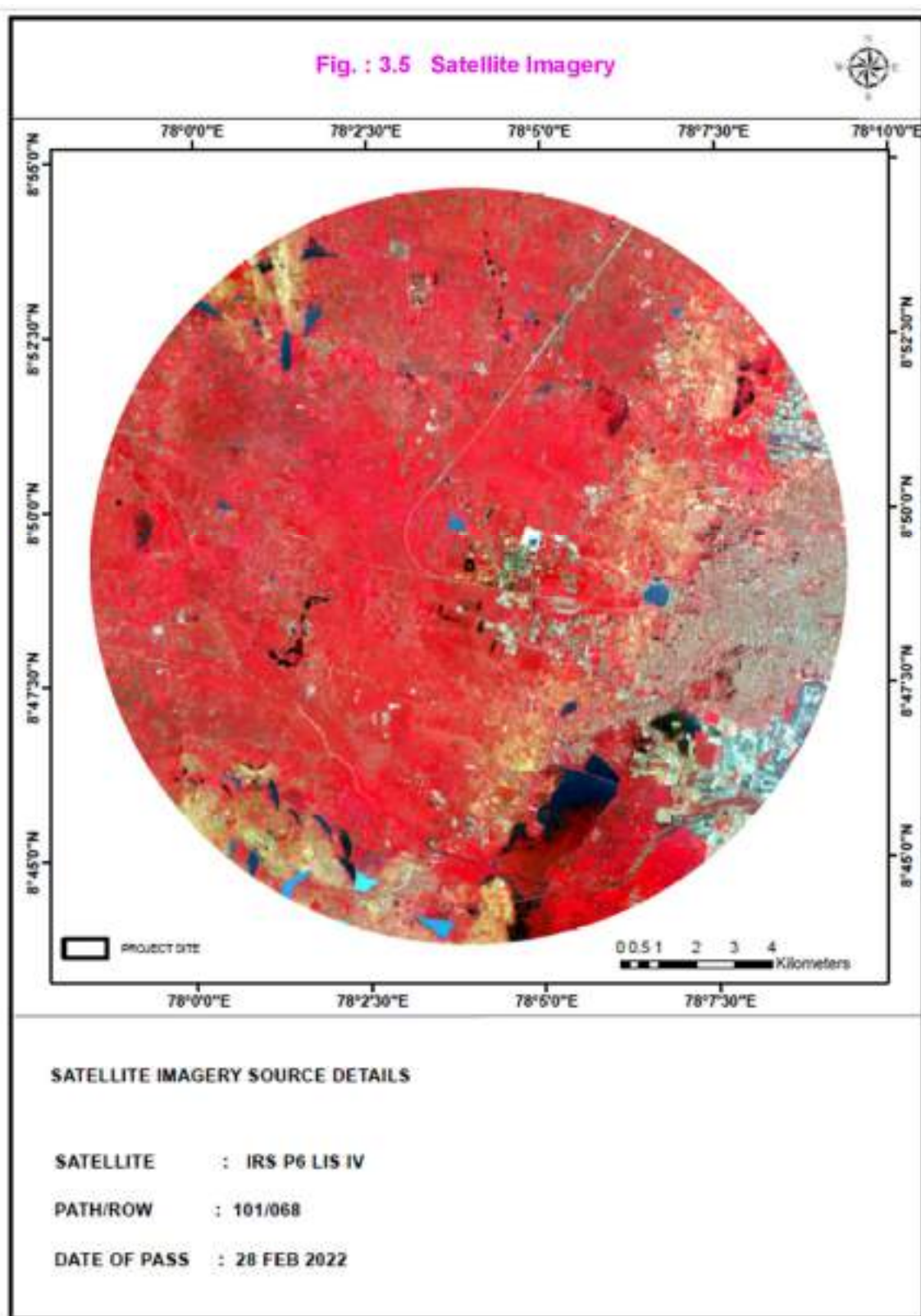
Table : 3.22 Land Use Pattern

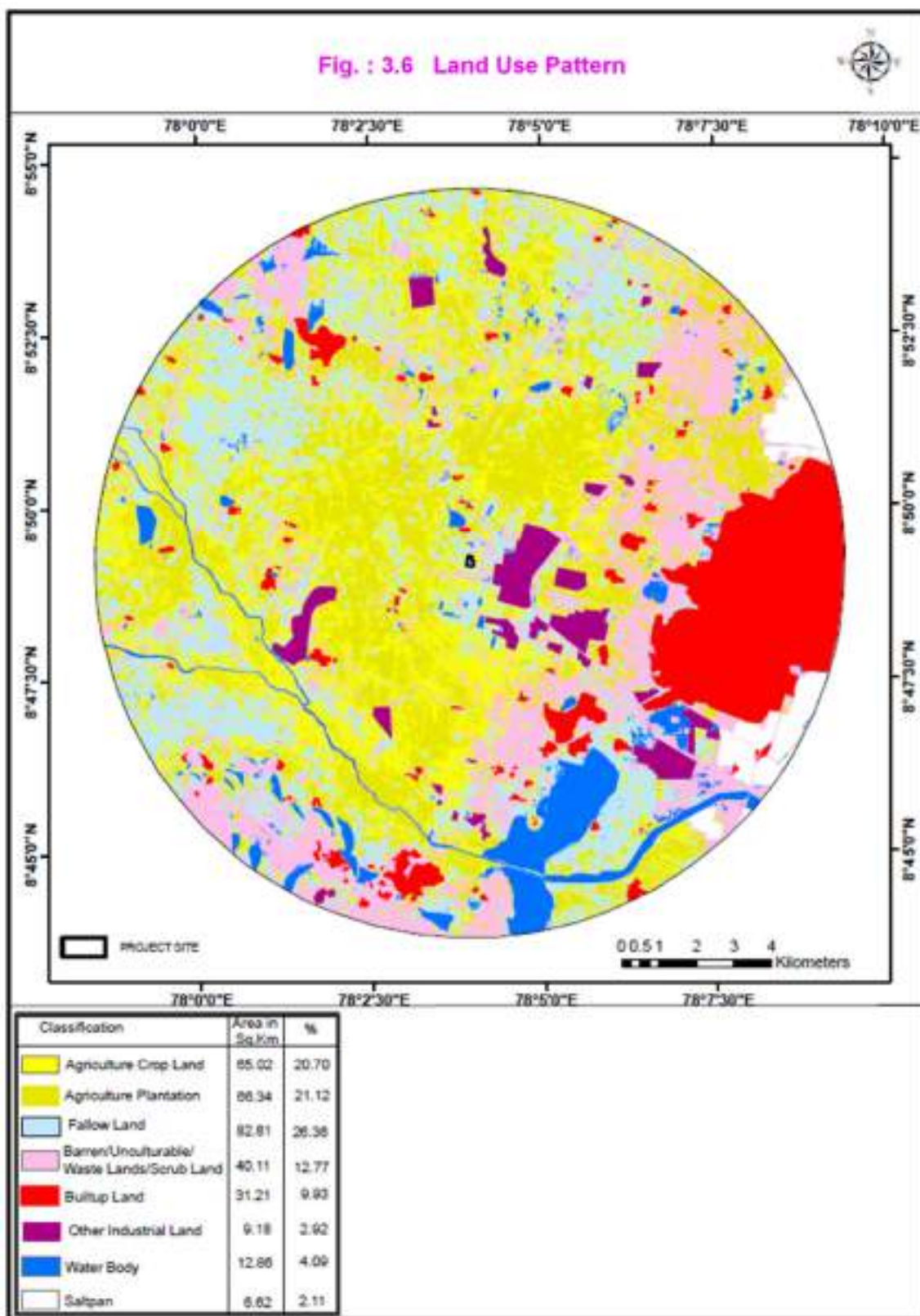
Land Use	Area, sq.km	Percentage
Agricultural Crop Land	65.02	20.70
Agricultural Plantation	66.34	21.12
Fallow Land	82.81	26.36
Barren/Unculturable/Waste/Scrub Lands	40.11	12.77
Built-up Land	31.21	9.93
Other Industrial Land	9.18	2.92
Water Body	12.86	4.09
Salt Pan	6.62	2.11
Total	314.15	100

Agricultural Crop Land & Plantation occupy majority of the study area (41.82%) followed by Fallow & Barren Waste Land/Scrub (39.13%). Salt Pan occupies 2.11%. Water body occupies about 4.09% of the study area. About 9.93% of the study area is covered by built-up land as it falls in Thoothukudi Corporation Area.

There are Small, Medium and Major Industries in the SIPCOT Complex, Meelavittan. Industrial Ware Houses/Sheds and Salt Pans are predominant in the study area.

Land Use Pattern-Site : The existing land use is private dry lands and the same **will be converted to industrial land** before setting up of the project. No Govt./Forest land is involved. The project site does not fall in any notified industrial area. Topography of the Site is generally flat.





3.9 Flora and Fauna

A general ecological survey was carried out in the entire study area of 10 km radius around the project area. The main objective of the ecological survey is to assess the existing status of ecosystem (flora and fauna components) prevailing in the study area, to compare it with past condition with the help of available primary and secondary data sources, to predict changes in the biological environment as a result of the project activities and to suggest measures for maintaining a healthy biological environment. The survey also aims to ascertain the migratory routes of fauna, presence of breeding grounds and sensitive habitats in the study area, if any.

The ecological survey of the study area was conducted particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area.

3.9.1 Flora

The primary data was generated by undertaking systematic ecological studies and preparing a general checklist of all plants encountered in the study area. The species of vegetation found were identified and listed according to their families. The plant species were classified as per the classifications of “Bentham and Hooker” and identified by using Gambles book on ‘Flora of Madras Presidency’ and K.M.Mathew’s book on “Flora of the Tamilnadu Carnatic”. The list of plant species found in the study area are presented in **Table 3.23**.

Table : 3.23 List of Flora in the Study Area

S.No.	Name of the Plant (Scientific)	Family Name	Common Name	Habit
Agricultural Crops				
1	Arachis hypogea	Fabaceae	Groundnut	Herb
2	Oryza sativa	Poaceae	Rice	Herb
3	Phaseolus mungo	Fabaceae	Black gram	Herb
4	Sorghum bicolor	Poaceae	Fox tail millet, Maize	Herb
5	Sorghum vulgare	Poaceae	Millet	Herb
6	Zea mays	Poaceae	Maize	Herb
Commercial Crops (including vegetables)				
1	Capsicum frutescens	Solanaceae	Chilli	Herb
2	Carica papaya	Caricaceae	Papaya	Tree
3	Citrus limon	Rutaceae	Lemon	Tree
4	Cocos nucifera	Arecaceae	Coconut	Tree
5	Cucurbita pepo	Cucurbitaceae	Pumpkin	Creeper
6	Cyamopsis tetragonoloba	Fabaceae	Cluster bean	Shrub
7	Hibiscus esculentus	Malvaceae	Lady's finger	Herb
8	Lagenaria vulgaris	Cucurbitaceae	Bottle gourd	Creeper
9	Lycopersicon esculentum	Solanaceae	Tomato	Herb
10	Mangifera indica	Anacardiaceae	Mango	Tree
11	Momordica charantia	Cucurbitaceae	Bittergourd	Creeper
12	Moringa oleifera	Moringaceae	Drumstick	Tree
13	Musa paradisiaca	Musaceae	Plantain	Tree
14	Psidium guajava	Myrtaceae	Guava	Tree

S.No.	Name of the Plant (Scientific)	Family Name	Common Name	Habit
15	<i>Ricinus communis</i>	Euphorbiaceae	Castor Bean Plant	Shrub
16	<i>Solanum melongena</i>	Solanaceae	Brinjal	Herb
17	<i>Solanum torvum</i>	Solanaceae	Turkey berry	Shrub
18	<i>Trichosanthes cucurmina</i>	Cucurbitaceae	Snake gourd	Creeper
19	<i>Vicia faba</i>	Fabaceae	Broad Bean	Creeper
Plantations				
1	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew	Tree
2	<i>Cocos nucifera</i>	Arecaceae	Coconut	Tree
3	<i>Casuarina equisetifolia</i>	Casuarinaceae	Casuarina, Savukku	Tree
4	<i>Musa paradisiaca</i>	Musaceae	Plantain, Vazhai	Tree
Natural Vegetation				
1	<i>Abrus precatorius</i>	Fabaceae	Coral bead vine, Rosary pea,	Climber
2	<i>Abutilon indicum</i>	Malvaceae	Country Mallow, Tutti	Herb
3	<i>Acacia leucophloea</i>	Mimosaceae	Velvelam, White babool	Tree
4	<i>Acacia nilotica</i>	Mimosaceae	Babul, Karuvelam	Tree
5	<i>Acalypha indica</i>	Euphorbiaceae	Kuppaimeni	Herb
6	<i>Acanthospermum hispidum</i>	Asteraceae	Seruppadithazhai, Kenathupoondur	Herb
7	<i>Achchyranthes aspera</i>	Amaranthaceae	Prickly Chaff flower, Nayuruvi	Herb
8	<i>Achras sapota</i>	Sapotaceae	Sapota	Tree
9	<i>Adathoda vasica</i>	Acanthaceae	Vasaca, Adathodai	Shrub
10	<i>Adina cordifolia</i>	Rubiaceae	Manjakadambu	Tree
11	<i>Aegle marmelos</i>	Rutaceae	Wood Apple, vilvam	Tree
12	<i>Aerva lanata</i>	Amaranthaceae	Sirupulai	Herb
13	<i>Agave americanum</i>	Agavaceae	Century Plant	Shrub
14	<i>Agave sisalana</i>	Agavaceae	Kathalai, Sisal	Herb
15	<i>Ageratum conyzoides</i>	Asteraceae	Goat weed, Pumppillu	Herb
16	<i>Ailanthus excelsa</i>	Simaroubaceae	Indian Tree of Heaven, Perumaram	Tree
17	<i>Albizia lebbek</i>	Mimosaceae	Siris Tree, Vagai	Tree
18	<i>Albizzia odoratissima</i>	Mimosaceae	Black Siris	Tree
19	<i>Aloe vera</i>	Liliaceae	Kathalai	Herb
20	<i>Alternanthera sessilis</i>	Amaranthaceae	Dwarf Copperleaf, Ponnanganni	Herb
21	<i>Amaranthus spinosus</i>	Amaranthaceae	Mullukkirai	Herb
22	<i>Amaranthus viridis</i>	Amaranthaceae	Kuppaikeerai	Herb
23	<i>Ammannia baccifera</i>	Lythraceae	Acrid weed, Kalluruvi	Herb
24	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew	Tree
25	<i>Argemone mexicana</i>	Papaveraceae	Prickly poppy, Kudiyotti	Shrub
26	<i>Aristida adscensionis</i>	Poaceae	Common Needle grass	Herb
27	<i>Asparagus racemosus</i>	Asparagaceae	Satawari	Herb
28	<i>Azadirachta indica</i>	Meliaceae	Neem, Vembu	Tree
29	<i>Boerhaavia diffusa</i>	Nyctaginaceae	Pig weed, Mukkarattai Keerai	Herb
30	<i>Borassus flabellifer</i>	Arecaceae	Palmyra Palm	Tree
31	<i>Bougainvillea spectabilis</i>	Nyctaginaceae	Kaakithapoo	Shrub
32	<i>Butea monosperma</i>	Fabaceae	Flame of Forest	Tree
33	<i>Caesalpinia pulcherrima</i>	Caesalpiniaceae	Peacock Flower, Mayurkondrai	Tree
34	<i>Calendula officinalis</i>	Asteraceae	Marigold	Herb
35	<i>Calophyllum inophyllum</i>	Clusiaceae	Punnai	Tree
36	<i>Calotropis gigantea</i>	Asclepiadaceae	Crown Flower, Erukku	Shrub
37	<i>Calotropis procera</i>	Asclepiadaceae	Vellerukku	Shrub
38	<i>Canna indica</i>	Cannaceae	Indian shot, Kalvalai	Shrub
39	<i>Capparis sepiaria</i>	Capparaceae	Kattukkathiri	Shrub
40	<i>Carica papaya</i>	Caricaceae	Pappaali	Tree
41	<i>Cassia auriculata</i>	Fabaceae	Aavarampoo	Shrub

S.No.	Name of the Plant (Scientific)	Family Name	Common Name	Habit
42	Cassia fistula	Fabaceae	Golden shower tree, Kondrai	Tree
43	Cassia occidentalis	Caesalpiniaceae	Coffee weed, Payaverai	Herb
44	Cassia siamea	Caesalpiniaceae	Manja konnai	Tree
45	Casuarina equisetifolia	Casuarinaceae	Whistling Pine, Savukku	Tree
46	Ceiba pentandra	Bombacaceae	Silk-Cotton Tree,	Tree
47	Chrysanthemum sp.	Asteraceae	Chrysanthemum, Samanthi	Herb
48	Cissus quadrangularis	Vitaceae	Devil's Backbone, Pirandai	Climber
49	Citrus limon	Rutaceae	Lemon	Tree
50	Cleome viscosa	Cleomaceae	Tickweed, Naikkaduku	Herb
51	Clereodendron inerme	Verbinaceae	Wild Jasmine	Shrub
52	Clitoria ternatea	Fabaceae	Sankupushpam	Climber
53	Coccinia indica	Cucurbitaceae	Kovai	Climber
54	Cocculus hirsutus	Menispermaceae	Broom Creeper, Kattukkodi	Climber
55	Cocos nucifera	Palmae	Coconut	Tree
56	Codiaeum variegatum	Euphorbiaceae	Croton	Shrub
57	Crossandra infundibuliformis	Acanthaceae	Kanakambaram	Herb
58	Crotalaria retusa	Fabaceae	Rattlepod	Herb
59	Croton sparsiflorus	Euphorbiaceae	Reilpoondu	Herb
60	Cymbopogon sp.	Poaceae	Lemon grass	Herb
61	Cynodon dactylon	Poaceae	Bermuda grass, Arugampul	Herb
62	Cyprus rotundus	Cyperaceae	Korai, Nut grass	Herb
63	Datura metel	Solanaceae	Thorn apple, Oomathai	Shrub
64	Delonix regia	Fabaceae	Gulmohar	Tree
65	Dendrophthoe falcata	Loranthaceae	Honey Suckle Mistletoe, Pulluruvi	Herb
66	Digetaria bicornis	Poaceae	Finger grass	Herb
67	Eclipta alba	Asteraceae	Bhringaraj, Karisalankanni	Herb
68	Enicostemma axillare	Gentianaceae	Vellarugu	Herb
69	Eragrostis spectabilis	Poaceae	Bunchgrass	Herb
70	Erythrina indica	Fabaceae	Mullu murungai	Tree
71	Erythrina variegata	Fabaceae	Indian coral tree, Kalyanamurungai	Tree
72	Eucalyptus globulus	Myrtaceae	Blue gum	Tree
73	Euphorbia antiquorum	Euphorbiaceae	Kalli, Triangular Spurge	Tree
74	Euphorbia heterophylla	Euphorbiaceae	Painted euphorbia	Herb
75	Euphorbia hirta	Euphorbiaceae	Asthma weed, Ammam Paccharisi	Herb
76	Euphorbia tirucalli	Euphorbiaceae	Pencil cactus, Thirukalli	Shrub
77	Ficus benghalensis	Moraceae	Banyan, Alamaram	Tree
78	Ficus religiosa	Moraceae	Peepal, Arasamaram	Tree
79	Gardenia jasminoides	Rubiaceae	Cape jasmine, Kumbai	Shrub
80	Gloriosa superba	Colchicaceae	Flame lily, Kallappai kilangu	Herb
81	Gomphrena globosa	Amaranthaceae	Globe Amaranth, Vaadamalli	Herb
82	Heliotropium indicum	Boraginaceae	Indian heliotrope, Thel kodukku	Herb
83	Heterostemma tanjorens	Asclepiadaceae	Palakeerai	Herb
84	Hibiscus cannabinus	Malvaceae	Pulichakeerai	Shrub
85	Hibiscus esculentus	Malvaceae	Lady's finger, Vendai	Herb
86	Hibiscus rosasinensis	Malvaceae	Shoeflower, Sembaruthi	Shrub
87	Hygrophila auriculata	Acanthaceae	Marsh Barbel, Neermulli	Herb
88	Impatiens balsamina	Balsaminaceae	Garden Balsam, Aivartenkittumpai	Herb
89	Ipomea carnea	Convolvulaceae	Bush Morning Glory	Shrub
90	Ixora coccinea	Rubiaceae	Ixora, Vedchi	Shrub
91	Jasminum arborescens	Oleaceae	Shrubby Jasmine, Kattumalligai	Shrub
92	Jatropha glandulifera	Euphorbiaceae	Kaatuamanakku	Shrub
93	Lannea coromandelica	Anacardiaceae	Indian Ash Tree, Othiyamaram	Tree

S.No.	Name of the Plant (Scientific)	Family Name	Common Name	Habit
94	Lantana camara	Verbenaceae	Lantana, Unnichedi	Shrub
95	Lawsonia inermis	Lythraceae	Henna, Maruthondri	Shrub
96	Lemna minor	Arecaceae	Common Duckweed	Weed
97	Leucaena leucocephala	Fabaceae	Periyatagarai, Horse Tamarind	Shrub
98	Leucas aspera	Lamiaceae	Common Leucas, Thumbai	Herb
99	Lycopersicon esculentum	Solanaceae	Thakkali	Herb
100	Mangifera indica	Anacardiaceae	Mango	Tree
101	Melia azadirachta	Meliaceae	Indian Liliac, Malaivembu	Tree
102	Millingtonia hortensis	Bignoniaceae	Tree Jasmine, Katmalli	Shrub
103	Mimosa hamata	Mimosaceae	Hooked Mimosa	Shrub
104	Mimosa pudica	Mimosaceae	Touch-me-not, Thottachurungi	Herb
105	Morinda tinctoria	Rubiaceae	Nuna	Tree
106	Moringa oleifera	Moringaceae	Drumstick, Murungai	Tree
107	Murraya koengii	Rutaceae	Curry leaf, Karuveppilai	Shrub
108	Musa paradisiaca	Musaceae	Banana	Tree
109	Nerium indicum	Apocynaceae	Sevvarali	Shrub
110	Nerium oleander	Apocynaceae	Oleander, Arali	Shrub
111	Ocimum sanctum	Lamiaceae	Holy Basil, Thulasi	Herb
112	Opuntia dillenii	Cactaceae	Prickly Pear, Chappathikkalli	Shrub
113	Opuntia vulgaris	Aizoaceae	Pricklypear	Shrub
114	Pandanus odoratissimus	Pandanaceae	Thazhai	Shrub
115	Parthenium hysterophorus	Asteraceae	Congress grass	Herb
116	Pavetta indica	Rubiaceae	Indian Pavetta, Kattukkarana	Shrub
117	Pavonia zeylanica	Malvaceae	Sittamutti, Thengai poondu	Shrub
118	Pedaliu murex	Pedaliaceae	Yanai Nerunjil	Herb
119	Pergularia daemia	Asclepiadaceae	Pergularia, Uttamani, Seendhal kodi	Climber
120	Phoenix acaulis	Arecaceae	Stemless Date Palm	Shrub
121	Phoenix sylvestris	Arecaceae	Eecham	Tree
122	Phyla nodifolia	Verbanaceae	Poduthalai	Herb
123	Phyllanthus niruri	Phyllanthaceae	Keelanelli, Seed under leaf	Herb
124	Pithecellobium dulce	Mimosaceae	Sweet tamarind, Kodukkappuli	Tree
125	Polyalthia longifolia	Annonaceae	Indian mast tree, Vansulam	Tree
126	Pongamia pinnata	Fabaceae	Indian Beech, Pungam	Tree
127	Prosopis glandulosa	Mimosodeae	Vaelikkaruvai	Tree
128	Prosopis juliflora	Fabaceae	Algaroba, Seemaikaruvel	Tree
129	Psidium gujava	Myrtaceae	Guava	Tree
130	Ricinus communis	Euphorbiaceae	Amanakku	Shrub
131	Samanea saman	Mimosodeae	Thoongumoonij maram	Tree
132	Sida acuta	Malvaceae	Common Wireweed, Palambasi	Herb
133	Solanum nigrum	Solanaceae	Black-berry night	Herb
134	Solanum surattense	Solanaceae	Kandan kattiri	Herb
135	Solanum torvum	Solanaceae	Turkey berry, Sundaikkai	Shrub
136	Solanum trilobatum	Solanaceae	Thoodhuvalai	Shrub
137	Syzygium cumini	Myrtaceae	Jamun, Navalpazham	Tree
138	Tamarindus indica	Fabaceae	Tamarind, Puliyamaram	Tree
139	Tephrosia purpurea	Fabaceae	Fish poison, Kollukkai Velai	Herb
140	Terminalia catapa	Combretaceae	Sea Almond	Tree
141	Thespesia populnea	Malvaceae	Indian Tulip Tree, Poovarasu	Tree
142	Thevetia peruviana	Apocynaceae	Yellow Oleander, Arali	Tree
143	Tinospora cordifolia	Menispermaceae	Guduchi, Shindilakodi	Climber
144	Tribulus terrestris	Zygophyllaceae	Puncture Vine, Nerunji	Herb
145	Tridax procumbens	Asteraceae	Tridax daisy, Vettukkaayapoond	Herb

S.No.	Name of the Plant (Scientific)	Family Name	Common Name	Habit
146	<i>Typha angustata</i>	Typhaceae	Cat tail reed	Herb
147	<i>Vernonia cinerea</i>	Asteraceae	Purple Fleabane, Mookuthipoondur	Herb
148	<i>Vinca rosea</i>	Apocynaceae	Nithyakalyani	Herb
149	<i>Vitex negundo</i>	Lamiaceae	Nochi	Shrub
150	<i>Xanthium strumarium</i>	Asteraceae	Common Cocklebur, Marulumattai	Shrub
151	<i>Ziziphus jujube</i>	Rhamnaceae	Jujube, Elandhai	Tree
152	<i>Ziziphus oenoplia</i>	Rhamnaceae	Jackal Jujube, Suraimullu	Shrub
Medicinal species				
1	<i>Abrus precatorius</i>	Fabaceae	Coral bead vine, Rosary pea,	Creeper
2	<i>Achchyranthes aspera</i>	Amaranthaceae	Prickly Chaff flower, Nayuruvi	Herb
3	<i>Adathoda vasica</i>	Acanthaceae	Vasaca, Adathodai	Shrub
4	<i>Aegle marmelos</i>	Rutaceae	Wood Apple, vilvam	Tree
5	<i>Aloe vera</i>	Liliaceae	Kathalai	Herb
6	<i>Alternanthera sessilis</i>	Amaranthaceae	Dwarf Copperleaf, Ponnanganni	Herb
7	<i>Amaranthus viridis</i>	Amaranthaceae	Kuppaikeerai	Herb
8	<i>Asparagus racemosus</i>	Asparagaceae	Satawari, Tannir muttan kizhangu	Herb
9	<i>Azadirachta indica</i>	Meliaceae	Neem, Vembu	Tree
10	<i>Calotropis gigantea</i>	Asclepiadaceae	Crown Flower, Erukku	Shrub
11	<i>Cassia auriculata</i>	Fabaceae	Tanners cassia, Avaram	Shrub
12	<i>Cissus quadrangularis</i>	Vitaceae	Devil's Backbone, Pirandai	Climber
13	<i>Cynodon dactylon</i>	Poaceae	Bermuda grass, Arugampul	Herb
14	<i>Eclipta alba</i>	Asteraceae	Bhringaraj, Karisalankanni	Herb
15	<i>Enicostemma axillare</i>	Gentianaceae	Vellarugu	Herb
16	<i>Euphorbia hirta</i>	Euphorbiaceae	Asthma weed, Ammam Paccharisi	Herb
17	<i>Leucas aspera</i>	Lamiaceae	Common Leucas, Thumbai	Herb
18	<i>Ocimum sanctum</i>	Lamiaceae	Holy Basil, Thulasi	Herb
19	<i>Solanum surattense</i>	Solanaceae	Yellow-berried Nightshade, Kandankattiri	Herb
20	<i>Solanum trilobatum</i>	Solanaceae	Thoodhuvalai	Shrub
21	<i>Tridax procumbens</i>	Asteraceae	Tridax daisy, Vettukkaayapoondur	Herb
22	<i>Vitex negundo</i>	Lamiaceae	Nochi	Shrub

The species composition in this region is of uneven aged dry mixed, deciduous species in natural vegetation cover. Vegetation is extremely irregular and varying considerably in condition, composition, and density of trees, shrubs and herb species.

Plant species such as *Anacardium occidentale*, *Borassus flabellifer*, *Cassia auriculata*, *Cyperus arenarius*, *Lannia coromandalica*, *Opuntia dellenii*, *Pandanus tectorius*, *Prosopis juliflora*, *Sesuvium portulacastrum*, etc. are found dominant around the project site.

The dominating herbaceous species found in the study area includes *Aerva lanata*, *Apluda mutica*, *Arthraxon castratus*, *Biophytum sensitivum*, *Boehrvia diffusa*, *Capparis gynandropis*, *Cenchrus biflorus*, *Chrysopogon fulvus*, *Crotalaria angulata*, *Cyperus compressus*, *Dopatrium nudicaule*, *Paspalum germinatum*, *Pedaliu murex*, *Pysalis peruviana*, *Rottboellia exaltata*, *Vernonia cinerea*, *Vicoa indica*, *Vigna trilobata*, etc. and the dominating shrubs are *Aloe vera*, *Abutilon indicum*, *Cassia obtuse*, *Capparis deciduas*, *Jatropha glandulifera*, *Ocimum tenuiflorum*, *Prosopis juliflora*, etc. whereas tree species includes *Albizia lebbek*, *Azadirachta indica*, *Borassus flabellifer*, *Cocos nucifera*, *Dalbergia sissoo*, *Delonix regia*, *Ficus sp.*, *Phoenix aculis*, *Psidium*

guava, Tamarindus indicus, Terminalia catapa, etc.

Major agricultural crops cultivated in the study area are Cereals & Millets like Paddy, Sorghum, Cumbu, etc., Pulses like Black gram, Green gram, etc., Fibre like cotton, Oil seeds like Groundnut, Gingelly, Sunflower, etc., fruit crops like mango, banana, Jack fruit, Papaya, Pomegranate, guava, sapota, Lemon, amla, etc., vegetables like tomato, brinjal, onion, tapioca, sweet potato, Yam, Lady's finger, Lab lab, Pumpkin, snake guord, Ribbed gourd, Greens, beans, Colacassia, Drumstick, Bottle gourd, Bitter gourd, Ash gourd, cucumber, etc. spices and condiments like chillies, tamarind, curry leaves, Coriander and turmeric, plantation crops like betel vine and cashew, flower crops like jasmine, chrysanthemum, tube rose, marigold, rose and medicinal plants like senna, coleus, lemon grass and aloe vera.

There is **no endangered or endemic floral species** recorded in the study area during the Period.

3.9.2 Fauna

Both direct and indirect observation methods were used to survey the fauna. Visual Encounter (search) Method was employed to record vertebrate species. Additionally, survey of relevant literature was also done to consolidate the list of vertebrate fauna distributed in the area. Since birds may be considered as indicators for monitoring and understanding human impacts on ecological systems, attempt was made to gather quantitative data on the group. Based on the Wildlife Protection Act, 1972 (WPA 1972), species were short-listed as **Schedule II or I** are considered as **endangered species**. The details of fauna found in the study area are given in **Table 3.24**.

Table : 3.24 List of Fauna

Sl.No.	Scientific Name	Common Name	Status	WPA Schedule
Insects				
1	Agrion sp & Petalura sp	Dragon fly	C	IV
2	Apis indica	Honey bee	C	IV
3	Aranea sp	Spider	C	IV
4	Carausius sp	Stick insect	C	IV
5	Coccinella septempunctata	Lady bird beetle	C	IV
6	Coenagrion sp & Ischnura	Damsel fly	C	IV
7	Danaus chiysippus	Plain Tiger	C	IV
8	Eumenus sp.	Wasp	C	IV
9	Hamitermes silvestri	Termite	C	IV
10	Hieroglyphus sp	Grasshopper	C	IV
11	Mantis religiosa	Praying mantis	C	IV
12	Monomorium indicum	Ant	C	IV
13	Palamnaeus swammerdam	Scorpion	C	IV
14	Scolopendra	Centipede	C	IV
Butterflies				
1	Acraea terpsicore	Tawny coster	C	IV
2	Graphium Agamemnon	Tailed jay	C	IV
3	Ixias marianne	White orange tip	C	IV
4	Juninia almanac	Peacock pansey	C	IV

Sl.No.	Scientific Name	Common Name	Status	WPA Schedule
5	Junonia atlites	Grey pansy	C	IV
6	Neptis hylas	Common sailor	C	IV
7	Pachiopta hector	Crimson rose	C	IV
8	Papilio demoleus	Lime butterfly	C	IV
9	Papilio polytes	Common mormon	C	IV
10	Papilio polymnstor	Blue mormon	C	IV
11	Precis hierta	Yellow Pansy	C	IV
12	Terias hecabe	Grass yellow	C	IV
Fish				
1	Amblypharyngodon sp	Carplet	C	IV
2	Catla catla	Catla	C	IV
3	Chela sp	Trout	C	IV
4	Cirrhinus mrigala	Mrigal	C	IV
5	Cyprinus carpio	Common Carp	C	IV
6	Labeo rohita	Rohu	C	IV
7	Ophiocephalus punctatus	Kuravai	C	IV
8	Oreochromis mossambicus	Tilapia	C	IV
Amphibians				
1	Bufo melanostictus	Common Indian Toad	C,R	IV
2	Euphyctis cyanophlyctis	Skittering frog	C,R	IV
3	Microhyla ornata	Ornatic microhybrid	C, R	IV
4	Rana hexadactylus	Indian Pond frog	C,R	IV
5	Rana tigrina	Common frog	C	IV
Aquatic Fauna				
1	Ariophanta shell	Ariophanta shell	C	IV
2	Helix shell	Helix shell	C	IV
3	Limnaea shell	Pond snail shell	C	IV
4	Planorbis shell	Freshwater Snail shell	C	IV
5	Pila globosa	Apple snail	C	IV
Reptiles				
1	Ahaetulla nasuta	Common Green Whip Snake	C, R	IV
2	Calotes versicolor	Common Garden lizard	C,R	IV
3	Hemidactylus flaviviridis	House gecko	C,R	IV
4	Lissemys punctata	Indian mud turtle	C,R	IV
5	Naja naja	Indian Cobra	C, R	IV
6	Passerita mycterizaris	Common Green Snake	C, R	IV
7	Ptyas mucosus	Common rat snake	C, R	IV
Birds				
1	Acridotheres tristis	Common myna	C	IV
2	Alcedo atthis	Common kingfisher	C	IV
3	Anas acuta	Common teal	C,R	IV
4	Ardeola grayii	Pond Heron or Paddy Bird	C,R	IV
5	Bubo bubo	Indian great horned owl	C	IV
6	Bubulcus ibis	Cattle egret	C	IV
7	Cinnyris asiatica	Purple sunbird	C	IV
8	Columbus livibus	Pigeon	C	IV
9	Corvus splendens	House Crow	C,R	V
10	Coryllis vaeralis	Lorikeet	C	V
11	Cuculus varius	Common-Hawk Cuckoo	C,R	IV
12	Dendrocitta vagabunda	Indian Tree pie	C,R	IV
13	Dicrurus macrocerus	Black Drongo	C,R	IV

Sl.No.	Scientific Name	Common Name	Status	WPA Schedule
14	<i>Egretta garzetta</i>	Little egret	C	IV
15	<i>Eudynamys scolopacea</i>	Koel	C, R	V
16	<i>Francolinus pondicerianus</i>	Grey Partridge	C, R	IV
17	<i>Megalaima merulinus</i>	Indian cuckoo	C	IV
18	<i>Milyus migrans</i>	Common kite	C	IV
19	<i>Passer domesticus</i>	House Sparrow	C.R	IV
20	<i>Psittacula krameri</i>	RoseRinged Parakeet	C, R	IV
21	<i>Quills contronix</i>	Grey quail	C	IV
22	<i>Saxicoloides fulicata</i>	Indian Robin	C.R	IV
23	<i>Tchitrea paradisi</i>	Paradise Flycatcher	C	IV
24	<i>Temenuchus pagodarum</i>	Brahmny myna	C	IV
25	<i>Tephrodomis pondiceraianus</i>	Common wood shrike	C	IV
Mammals				
1	<i>Bandicota indica</i>	Bandicoot	C.R	IV
2	<i>Bos indicus</i>	Cow	C	IV
3	<i>Bubalus bubalis</i>	Buffalo	C	IV
4	<i>Canis familiaris</i>	Dog	C	-
5	<i>Capra hircus</i>	Goat	C	-
6	<i>Funambulus palmarum</i>	Indian Palm squirrel	C.R	IV
7	<i>Herpates edwardii</i>	Indian grey mongoose	C.R	IV
8	<i>Mus booduga</i>	Indian Field Mouse	C	V
9	<i>Ovis aries</i>	Sheep	C	-
10	<i>Rattus norvegicus</i>	Field mouse	C.R	IV
11	<i>Rattus rattus</i>	House Rat	C	IV

Legend : C- Common, M- Migratory, R- Resident, T- Threatened

Endangered Species: Among the fauna recorded, **most of them are common resident population and no endangered species encountered** in the study area.

3.10 Socio-economic Environment

Population : In the study area of 10 km radius, there are **4,60,192 persons** (2,29,636 males-49.9% and 2,30,556 females-50.1%) in 1,17,715 Households (HHs) in the 35 villages. The Demographic Profile details are given in **Tables 3.25-3.31**. As far as the population of Scheduled Castes and Scheduled Tribes are concerned, there were 67700 (14.71%) Scheduled Castes Population and 908 (0.19%) Scheduled Tribes. In the total population, the **Literate population was 3,70,007 (80.40%)** whereas the illiterate population was 90,185 (19.59)%.

Occupational Structure : The occupational structure of residents of work participation rate in the study area is studied with reference to main workers, marginal workers and non- workers. The main workers include 10 categories of workers defined by the Census Department consisting of cultivators, agricultural laborers, those engaged in live-stock, forestry, fishing, mining and quarrying; manufacturing, processing and repairs in household industry; and other than household industry, construction, trade and commerce, transport and communication and other services. The marginal workers are those workers engaged in some work for a period of less than six months during the reference year prior to the census survey.

Table : 3.25 Demographic Profile- 2011 Census

Sl. No.	Name of the Village	No. of House holds	Population			Scheduled Castes			Scheduled Tribes			Literates			Illiterates		
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Milavittan (CT)	11811	45863	23167	22696	10445	5279	5166	90	46	44	36165	19031	17134	9698	4136	5562
2	Sankaraperi (CT)	5057	19844	10001	9843	3086	1534	1552	51	27	24	16194	8504	7690	3650	1497	2153
3	Therkuveerapandiyapuram	406	1567	785	782	360	189	171	0	0	0	1176	648	528	391	137	254
4	Vadakkusilukkanpatti	123	473	247	226	140	65	75	0	0	0	341	196	145	132	51	81
5	Ayyanadaippu	1168	4693	2380	2313	2661	1346	1315	21	10	11	3416	1820	1596	1277	560	717
6	Keelathattapparai	368	1382	688	694	918	459	459	0	0	0	744	424	320	638	264	374
7	Korampallam (Part)	1276	4912	2486	2426	1611	854	757	0	0	0	3773	1978	1795	1139	508	631
8	Mappilaiurani (CT)	10116	40035	19853	20182	7990	4004	3986	345	176	169	30441	15701	14740	9594	4152	5442
9	Maravanmatam	661	2664	1312	1352	136	68	68	0	0	0	1985	1021	964	679	291	388
10	Mela Arasadi	485	1841	908	933	790	407	383	0	0	0	1289	678	611	552	230	322
11	Mela Thattapparai	617	2154	1066	1088	493	245	248	0	0	0	1595	858	737	559	208	351
12	Muthuswamipuram	244	886	421	465	377	180	197	0	0	0	615	325	290	271	96	175
13	Pudiyamputhur (CT)	2043	8012	4117	3895	1056	536	520	24	11	13	6067	3269	2798	1945	848	1097
14	Pudiyamputhur (Part)	223	825	419	406	39	22	17	0	0	0	697	362	335	128	57	71
15	Pudur pandiyapuram	431	1764	900	864	1591	814	777	0	0	0	1168	659	509	596	241	355
16	Sendilampannai	30	103	53	50	12	5	7	0	0	0	81	45	36	22	8	14
17	Sillanatham	424	1594	795	799	116	60	56	0	0	0	1180	649	531	414	146	268
18	Swaminatham	651	2598	1349	1249	1195	607	588	0	0	0	1901	1072	829	697	277	420
19	Terkusilukkanpatti	187	681	327	354	397	189	208	0	0	0	489	252	237	192	75	117
20	Thoothukkudi (M Corp.)	60714	237830	118298	119532	17649	8898	8751	249	128	121	199432	101161	98271	38398	17137	21261
21	Valasamuthram	134	455	225	230	42	24	18	0	0	0	317	179	138	138	46	92
22	Allikkulam	371	1468	737	731	1076	534	542	0	0	0	1154	599	555	314	138	176
23	Athimarapatti (CT)	5613	22218	11081	11137	5206	2630	2576	41	23	18	16943	8870	8073	5275	2211	3064
24	Cherakulam	1285	4837	2370	2467	314	151	163	15	6	9	3568	1857	1711	1269	513	756

Table : 3.25 (Contn.) Demographic Profile- 2011 Census

Sl. No.	Name of the Village	No. of House holds	Population			Scheduled Castes			Scheduled Tribes			Literates			Illiterates		
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
25	Karungulam	1742	6449	3128	3321	1858	900	958	3	2	1	4768	2514	2254	1681	614	1067
26	Kumaragiri (CT)	3428	13344	6735	6609	1443	695	748	20	11	9	10815	5643	5172	2529	1092	1437
27	Kuttudankadu	1334	5065	2528	2537	1515	762	753	16	10	6	3930	2088	1842	1135	440	695
28	Malavarayanatham	241	984	483	501	342	170	172	0	0	0	764	398	366	220	85	135
29	Perur	354	1419	713	706	170	90	80	0	0	0	1156	601	555	263	112	151
30	Perurani	469	1764	887	877	500	250	250	0	0	0	1418	743	675	346	144	202
31	Ramaswamipuram	71	234	112	122	4	3	1	0	0	0	212	102	110	22	10	12
32	Sethukkuvaithan	751	2924	1446	1478	739	368	371	20	9	11	2247	1159	1088	677	287	390
33	Thoothukudi	3516	14159	7145	7014	2289	1174	1115	6	2	4	10303	5357	4946	3856	1788	2068
34	Umarikottai	506	1838	904	934	607	275	332	0	0	0	1279	700	579	559	204	355
35	Vallakulam	865	3313	1570	1743	533	241	292	7	3	4	2384	1246	1138	929	324	605
Total		117715	460192	229636	230556	67700	34028	33672	908	464	444	370007	190709	179298	90185	38927	51258
Percentage to Total		-	-	49.9	50.1	14.71	7.39	7.31	0.19	0.10	0.09	80.40	41.44	38.96	19.59	8.45	11.13

Table : 3.26 Occupation of Population and Work Forces

Sl. No	Name of the Census Village	Total Population	Workers			Non-Workers			Main Workers				Marginal Workers			
			Total	Male	Female	Total	Male	Female	Cultivators	Agricultural Labourers	Household Industrial Workers	Other Workers	Cultivators	Agricultural Labourers	Household Industrial Workers	Other Workers
1	Milavittan (CT)	45863	17172	13230	3942	28691	9937	18754	30	200	236	15300	10	16	75	1305
2	Sankaraperi (CT)	19844	7282	5851	1431	12562	4150	8412	18	39	105	6543	1	6	22	548
3	Therkuveerapandiyapuram	1567	635	467	168	932	365	567	86	92	52	79	80	95	61	90
4	Vadakkusilukkanpatti	473	211	128	83	262	119	143	7	6	1	60	8	83	0	46
5	Ayyanadaippu	4693	1752	1344	408	2941	1036	1905	8	3	15	1390	18	14	5	299
6	Keelathattapparai	1382	689	383	306	693	305	388	73	99	6	509	0	0	0	2
7	Korampallam (Part)	4912	1895	1389	506	3017	1097	1920	54	431	45	1330	2	14	4	15
8	Mappilaiurani (CT)	40035	14307	11306	3001	25728	8547	17181	94	250	227	12736	12	28	20	940
9	Maravanmatam	2664	1133	782	351	1531	530	1001	6	7	17	1061	6	0	0	36
10	Mela Arasadi	1841	804	537	267	1037	371	666	322	11	3	453	3	1	2	9
11	Mela Thattaparai	2154	1068	664	404	1086	402	684	6	21	0	139	40	164	5	693
12	Muthuswamipuram	886	408	242	166	478	179	299	35	42	7	262	14	33	0	15
13	Pudiyamputhur (CT)	8012	3514	2398	1116	4498	1719	2779	23	774	50	2415	11	60	3	178
14	Pudiyamputhur (Part)	825	276	230	46	549	189	360	13	60	1	194	3	4	0	1
15	Pudur pandiyapuram	1764	911	515	396	853	385	468	72	401	27	391	2	2	2	14
16	Sendilampannai	103	50	34	16	53	19	34	1	2	2	38	0	0	2	5
17	Sillanatham	1594	847	507	340	747	288	459	16	572	5	251	1	0	0	2
18	Swaminatham	2598	1274	795	479	1324	554	770	19	8	28	487	113	301	99	219
19	Terkusilukkanpatti	681	304	191	113	377	136	241	5	7	2	272	1	0	0	17
20	Thoothukkudi (M Corp.)	237830	83669	68338	15331	154161	49960	104201	114	154	1498	77420	69	25	280	4109
21	Valasamuthram	455	253	141	112	202	84	118	64	108	2	77	0	1	0	1
22	Allikkulam	1468	639	417	222	829	320	509	49	218	3	106	0	6	1	256

Table : 3.26 (Contn.) Occupation of Population and Work Forces

Sl. No	Name of the Census Village	Total Population	Workers			Non-Workers			Main Workers				Marginal Workers			
			Total	Male	Female	Total	Male	Female	Cultivators	Agricultural Labourers	Household Industrial Workers	Other Workers	Cultivators	Agricultural Labourers	Household Industrial Workers	Other Workers
23	Athimarapatti (CT)	22218	8600	6337	2263	13618	4744	8874	113	512	106	7236	16	139	33	445
24	Cherakulam	4837	2360	1374	986	2477	996	1481	670	1169	191	313	1	7	2	7
25	Karungulam	6449	2714	1775	939	3735	1353	2382	388	657	103	998	27	205	122	214
26	Kumaragiri (CT)	13344	4835	3705	1130	8509	3030	5479	90	279	44	3681	8	137	53	543
27	Kuttudankadu	5065	1801	1316	485	3264	1212	2052	35	269	15	1186	10	10	1	275
28	Malavarayanatham	984	525	295	230	459	188	271	98	276	2	105	1	41	0	2
29	Perur	1419	784	438	346	635	275	360	129	242	3	89	7	297	5	12
30	Perurani	1764	938	522	416	826	365	461	178	240	150	203	119	6	14	28
31	Ramaswamipuram	234	74	48	26	160	64	96	0	69	0	1	1	3	0	0
32	Sethukkuvaithan	2924	1245	841	404	1679	605	1074	63	407	49	639	5	60	5	17
33	Thoothukudi	14159	4991	4008	983	9168	3137	6031	31	19	64	4252	15	1	23	586
34	Umarikottai	1838	1025	521	504	813	383	430	213	450	5	234	5	90	1	27
35	Vallakulam	3313	1653	970	683	1660	600	1060	307	603	173	552	0	6	3	9
Grand Total		460192	170638	132039	38599	289554	97644	191910	3430	8697	3237	141002	609	1855	843	10965
Percentage to Total		-	37.07	28.69	8.38	62.92	21.21	41.7	0.74	1.88	0.70	30.63	0.13	0.40	0.18	2.38

Note : Others category includes Constructions, Trade & Commerce, Transport Storage & Communications, Other Services, etc.

Table : 3.27 Educational Facilities

Sl. No.	Name of the Village	PP*	P	M	S	SS	DC	EC	MC	MI	Pt	VC	SSD
1	Therkuveerapandiyapuram	1	1	1	b	b	b	b	b	b	b	b	b
2	Vadakkusilukkanpatti	1	1	a	c	c	b	c	c	c	c	b	c
3	Ayyanadaippu	1	1	1	1	b	a	c	b	b	c	1	b
4	Keelathattapparai	1	1	a	b	b	c	c	c	c	c	c	c
5	Korampallam (Part)	1	1	1	b	b	b	b	b	b	b	1	b
6	Maravanmatam	1	1	1	a	a	1	b	b	b	b	a	b
7	Mela Arasadi	1	1	1	b	b	b	b	b	b	b	b	b
8	Mela Thattapparai	1	1	1	a	a	b	c	c	c	c	b	c
9	Muthuswamipuram	1	1	a	c	c	b	c	c	c	c	b	c
10	Pudiyamputhur (Part)	1	1	1	1	1	c	c	c	c	c	c	a
11	Pudur pandiyapuram	1	1	1	a	a	b	b	b	b	b	b	b
12	Sendilampannai	a	a	a	a	a	a	b	c	c	b	b	c
13	Sillanatham	1	1	b	b	b	c	c	c	c	c	c	c
14	Swaminatham	1	1	1	a	a	c	c	c	c	c	c	b
15	Terkusilukkanpatti	1	1	a	a	a	a	b	c	c	b	b	c
16	Valasamuthram	1	1	a	a	a	c	c	c	c	c	c	c
17	Allikkulam	1	1	1	b	b	b	b	c	c	c	c	c
18	Cherakulam	1	1	1	1	1	c	c	c	c	c	c	c
19	Karungulam	1	1	1	1	1	c	c	c	c	a	c	c
20	Kuttudankadu	1	1	a	a	a	b	c	c	c	c	b	c
21	Malavarayanatham	1	1	a	a	a	b	b	c	c	b	b	c
22	Perur	1	1	1	a	b	b	c	c	c	c	c	c
23	Perurani	1	1	1	b	b	b	b	c	c	c	c	c
24	Ramaswamipuram	1	1	a	b	b	c	c	c	c	c	c	c
25	Sethukkuvaithan	1	1	1	a	a	c	c	c	c	c	c	c
26	Thoothukudi	1	1	1	a	a	b	c	b	b	b	c	b
27	Umarikottai	1	1	1	b	b	c	c	c	c	c	c	c
28	Vallakulam	1	1	a	a	b	b	c	c	c	c	c	c

PP-Pre-Primary School, P- Primary School, M-Middle School, S-Secondary School, SS-Senior Secondary School, DC-Degree College, EC-Engineering College, MC-Medical College, MI-Management College/Institute, Pt-Polytechnic, VC-Vocational School / ITI & SSD-Special School for Disabled. a-Facility available at <5 km; b-Facility available at 5-10 km; c-Facility available at >10 km. 1-Available & 2-Not Available.

Table : 3.28 Medical Facilities

Sl. No.	Name of the Village	CHC*	PHC	PHS C	MCW	TBC	HA	HAM	D	VH	FWC
1	Therkuveerapandiyapuram	c	b	1	1	b	c	c	b	b	b
2	Vadakkusilukkanpatti	c	c	a	c	c	c	c	c	b	c
3	Ayyanadaippu	b	b	1	b	b	b	b	b	a	b
4	Keelathattapparai	c	b	a	b	c	c	c	b	b	b
5	Korampallam (Part)	b	b	1	b	b	b	b	b	1	b
6	Maravanmatam	b	a	a	b	b	b	b	a	a	a
7	Mela Arasadi	c	b	1	1	b	c	c	b	b	b
8	Mela Thattapparai	c	c	1	c	c	c	c	c	1	c
9	Muthuswamipuram	c	c	1	c	c	c	c	c	b	c
10	Pudiyamputhur (Part)	c	b	1	1	b	b	b	b	a	b
11	Pudur pandiyapuram	c	a	a	a	b	c	c	a	b	a
12	Sendilampennai	a	a	a	a	c	c	c	a	a	a
13	Sillanatham	c	b	1	1	b	b	b	b	b	b
14	Swaminatham	c	b	b	a	c	b	b	b	a	b
15	Terkusilukkanpatti	a	a	a	a	c	c	c	a	a	a
16	Valasamuthram	c	c	b	c	c	a	a	c	a	c
17	Allikkulam	b	b	b	b	c	c	c	b	a	b
18	Cherakulam	b	b	1	1	b	c	c	b	b	b
19	Karungulam	1	1	1	1	1	b	b	1	1	1
20	Kuttudankadu	a	a	1	c	c	c	c	a	a	a
21	Malavarayanatham	a	a	1	a	c	c	c	a	a	a
22	Perur	b	a	1	1	a	b	b	a	b	a
23	Perurani	c	b	b	b	c	c	c	b	1	b
24	Ramaswamipuram	c	b	b	b	c	c	c	b	a	b
25	Sethukkuvaithan	a	b	a	b	b	c	c	b	b	b

CHC-Community Health Centre
 PHC-Primary Health Centre
 PHSC- Primary Health Sub Centre
 MCW -Maternity and Child Welfare Centre

TBC-TB Clinic
 HA-Allopathic Hospital
 HAM-Alternative Medicine Hospital
 D-Dispensary

VH-Veterinary Hospital
 FWC Centre - Family Welfare

1-Available
 2-Not Available

* - Numbers

a-Facility available at <5 Kms
 b-Facility available at 5-10 Kms
 c-Facility available at >10 Kms
 - : Data Not Available

Table : 3.29 Communication & Transport Facilities

Sl. No.	Name of the Village	PO*	SPO	T	PCO	MP	IC	PCF	BS	PBS	RS	NH	SH	MDR	BTR	GR	AWR
1	Therkuveerapandiyapuram	b	1	1	b	1	b	b	1	1	a	b	1	1	1	1	1
2	Vadakkusilukkanpatti	a	b	1	1	1	b	b	1	b	a	b	b	1	1	1	1
3	Ayyanadaippu	1	b	1	b	1	b	1	1	1	b	1	1	1	1	1	1
4	Keelathattapparai	b	1	1	1	1	b	b	1	1	a	b	b	1	1	1	1
5	Korampallam (Part)	a	b	1	1	1	1	b	1	1	b	1	1	a	1	1	1
6	Maravanmatam	a	1	1	1	1	a	a	1	1	b	1	1	1	1	1	1
7	Mela Arasadi	b	1	1	2	1	b	b	1	1	b	1	1	1	1	1	1
8	Mela Thattapparai	1	1	1	1	1	1	c	1	1	1	b	1	1	1	1	1
9	Muthuswamipuram	b	b	1	1	1	b	b	1	1	b	b	b	1	1	1	1
10	Pudiyamputhur (Part)	a	a	1	a	1	a	a	1	1	a	a	a	1	1	1	1
11	Pudur pandiyapuram	b	b	1	b	1	b	b	1	1	b	1	1	1	1	1	1
12	Sendilampennai	a	a	a	a	1	c	1	1	1	c	a	1	1	1	1	1
13	Sillanatham	b	1	1	1	1	b	b	1	1	c	a	2	1	1	1	1
14	Swaminatham	1	1	1	a	1	c	c	1	1	c	a	1	a	1	1	1
15	Terkusilukkanpatti	a	1	1	1	1	c	a	1	1	c	a	1	1	1	1	1
16	Valasamuthram	a	a	1	a	1	c	c	1	1	c	1	1	1	1	1	1
17	Allikkulam	b	a	1	1	1	b	b	1	b	b	b	b	1	1	1	1
18	Cherakulam	b	1	1	1	1	c	c	1	b	b	1	1	1	1	1	1
19	Karungulam	b	1	1	1	1	b	a	1	1	1	1	c	1	1	1	1
20	Kuttudankadu	a	1	1	1	1	a	a	1	a	c	1	1	1	1	1	1
21	Malavarayanatham	a	a	1	a	1	a	a	1	a	a	c	1	1	1	1	1
22	Perur	b	1	1	1	1	b	a	1	1	b	1	c	1	1	1	1
23	Perurani	b	a	1	1	1	b	b	1	1	b	b	1	1	1	1	1
24	Ramaswamipuram	b	b	1	a	1	c	c	1	1	c	b	b	1	1	1	1
25	Sethukkuvaithan	a	1	1	1	1	a	a	1	1	a	c	a	1	1	1	1

PO-Post Office

SPO-Sub Post Office

T-Telephones (landlines)

PCO- Public Call Office/Mobile PCO)

MP- Mobile Phone Coverage

IC-Internet Cafes / Common Service Centre (CSC)

PCF-Private Courier Facility

BS-Public Bus Service

PBS-Private Bus Service

RS-Railway Station

NH-National Highways

SH-State Highways

MDR-Main District Road

BTR-Black Topped (Pucca) Roads

GR-Gravel (kuchha) Roads

AWR-All Weather Road

a-Facility available at <5 Kms

b-Facility available at 5-10 Kms

c-Facility available at >10 Kms

*-Status

1-Avalable & 2-Not Available

Table : 3.30 Water & Drainage Facilities

Sl. No.	Name of the Village	T(T)*	CW*	UCW*	HP*	TW/BH*	S*	R/C*	T/P/L*	CD*	OD*	CTC*
1	Therkuveerapandiyapuram	1	2	2	1	1	2	1	2	2	1	2
2	Vadakkusilukkanpatti	1	2	2	2	2	2	2	2	1	1	1
3	Ayyanadaippu	1	1	1	2	1	2	2	2	1	1	1
4	Keelathattapparai	1	2	2	2	2	2	2	2	1	1	1
5	Korampallam (Part)	1	2	1	2	2	2	2	2	1	1	2
6	Maravanmatam	1	2	2	1	1	2	2	2	1	1	1
7	Mela Arasadi	1	1	1	2	1	2	2	2	1	1	2
8	Mela Thattapparai	1	2	2	2	2	1	2	2	1	1	2
9	Muthuswamipuram	2	1	2	2	2	2	2	2	2	2	2
10	Pudiyamputhur (Part)	1	2	2	2	2	2	2	2	1	1	2
11	Pudur pandiyapuram	1	2	2	2	2	2	2	2	1	1	1
12	Sendilampennai	2	2	2	2	1	2	2	2	1	2	2
13	Sillanatham	1	2	2	2	2	2	2	2	1	1	2
14	Swaminatham	1	2	2	2	2	2	2	2	1	1	2
15	Terkusilukkanpatti	2	2	2	2	2	2	2	2	1	1	2
16	Valasamuthram	1	2	2	1	1	2	1	2	1	1	1
17	Allikkulam	1	2	2	1	1	2	2	2	2	1	1
18	Cherakulam	1	1	1	1	1	1	1	2	1	1	1
19	Karungulam	1	1	2	1	1	2	2	2	1	1	1
20	Kuttudankadu	1	1	2	1	1	2	2	2	1	1	1
21	Malavarayanatham	1	1	2	1	1	2	2	2	1	1	2
22	Perur	1	2	2	2	2	2	2	2	1	1	2
23	Perurani	1	1	2	2	1	2	2	2	1	1	1
24	Ramaswamipuram	1	2	2	2	2	2	2	2	1	1	2
25	Sethukkuvaithan	1	2	1	2	1	2	1	2	1	1	1

T(T)-Tap Water Treated

CW-Covered Well

UCW-Uncovered Well

HP-Hand Pump

TW/BH-Tube Well/Bore Hole

S-Spring

R/C-River/Canal

T/P/L-Tank/Pond/Lake

CD-Covered Drainage

OD-Open Drainage

CTC - Community Toilet Complex for General Public

*-Status

1-Availabe

2-Not Available

- : Data Not Available

Table : 3.31 Other Facilities in the Study Area

Sl. No.	Name of the Village	ATM*	CB*	Co-op B*	ACS*	SHG*	PDS*	RM*	AMS*	NC*	NC-AC*	CC*	SF*	PL*	NP*	APS*	BDRO*	PS*
1	Therkuveerapandiyapuram	b	b	a	a	1	1	b	b	1	1	b	1	1	1	1	1	1
2	Vadakkusilukkanpatti	b	c	a	a	1	1	c	c	1	1	1	1	a	1	1	1	1
3	Ayyanadaippu	b	b	a	b	1	1	b	b	1	1	1	1	1	1	1	1	1
4	Keelathattapparai	b	b	b	a	1	1	c	c	1	1	1	1	1	1	1	1	1
5	Korampallam (Part)	a	a	1	b	1	1	b	b	1	1	1	1	1	1	1	1	1
6	Maravanmatam	b	b	a	a	1	1	b	a	1	1	a	1	1	1	1	1	1
7	Mela Arasadi	b	b	a	a	1	1	b	b	1	1	1	1	1	1	1	1	1
8	Mela Thattaparai	c	c	1	1	1	1	b	b	1	1	1	1	1	1	1	1	1
9	Muthuswamipuram	b	c	a	a	1	a	c	c	1	1	a	1	1	1	a	a	1
10	Pudiyamputhur (Part)	a	a	a	a	1	1	1	a	1	1	a	a	1	1	1	1	1
11	Pudur pandiyapuram	b	b	b	b	1	1	b	b	1	1	1	1	b	1	1	1	1
12	Sendilampannai	a	a	a	a	1	a	c	c	a	2	a	a	a	1	b	a	1
13	Sillanatham	b	b	1	1	1	1	c	b	1	1	1	1	b	1	1	1	1
14	Swaminatham	c	c	a	1	1	1	c	c	1	1	1	1	b	1	1	1	1
15	Terkusilukkanpatti	a	a	a	a	1	1	c	b	1	1	a	1	1	1	1	1	1
16	Valasamuthram	c	c	c	1	1	1	c	c	1	1	b	1	1	1	1	1	1
17	Allikkulam	b	b	b	b	1	1	c	b	1	1	a	1	1	1	1	1	1
18	Cherakulam	c	1	b	c	1	1	c	c	1	1	1	1	a	1	1	1	1
19	Karungulam	a	1	1	b	1	1	c	b	1	1	1	1	1	1	1	1	1
20	Kuttudankadu	a	b	a	a	1	1	c	c	1	1	a	1	1	1	1	1	1
21	Malavarayanatham	a	a	a	a	1	1	a	a	1	1	a	1	a	1	1	1	1
22	Perur	b	b	b	a	1	1	b	a	1	1	b	1	b	1	1	1	1
23	Perurani	b	b	b	a	1	1	c	b	1	1	1	1	1	1	1	a	1
24	Ramaswamipuram	c	c	b	b	1	1	c	c	1	1	a	1	a	1	a	a	1
25	Sethukkuvaithan	a	a	1	a	1	1	a	c	1	1	1	1	b	1	1	1	1

CB-Commercial Bank

Co-Op B-Cooperative Bank

ACS-Agricultural Credit Societies

SHG-Self - Help Group

PDS-Public Distribution System (PDS) Shop

RM-Mandis/Regular Market

AMS-Agricultural Marketing Society

NC-Nutritional Centres-ICDS

NC-AC-Nutritional Centres-Anganwadi Centre

CC-Community Centre with/without TV

SF-Sports Field

PL-Public Library

NP-Daily Newspaper Supply

APS-Assembly Polling Station

BDRO-Birth and Death Registration Office

PS-Power Supply

-: Data Not Available

*-Status

1-Availabe

2-Not Available

a-Facility available at <5 Kms

b-Facility available at 5-10 Kms

c-Facility available at >10 Kms

The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beggars, vagrants etc.; institutional inmates or all other non-workers who do not fall under the above categories. According to the 2011 census, Total Workers in the total population were about 1,70,638 (37.07%). About 2,89,554 (62.92%) persons were non-workers. About 33.89% of the people were engaged in tertiary activities which included different services. The workers in the primary activities (Cultivators) and the secondary activities (Agricultural Labourers) were 0.87% and 2.28% respectively.

Educational, Medical & Infrastructural Facilities : Primary and Middle Schools are available in almost all villages whereas Senior secondary schools, are available in some of the villages. Thanks to Tamil Nadu Government's constant encouragement, almost all villages are having one or more Self Help Groups through which the people earn various sources of livelihood and are financially secured. Primary Health Sub Centres, Primary Health Centers, Maternity & Child Welfare Centre are available in most of the villages. Most of the villages in the study area have well established Communication and Transport facilities. Drinking water facilities are available almost in all villages in the study area. Wells and hand pumps are the major source of drinking water. Public water supply and Power supply are available in most of the villages.

Health : The major complaints were on the respiratory system and ENT. Also, Musculo Skeletal in the form of aches & pains with gastro intestinal diseases and seasonal diseases were reported.

3.11 Summary of Baseline Status

The findings of baseline environmental status of the study area are summarized below :

- ❖ Collected meteorological data during this season represented the local weather phenomena.
- ❖ Monitored ambient air quality in the study area was found to be in compliance with National Ambient Air Quality (NAAQ) 24-hourly Norms for Industrial, Residential, Rural & other areas.
- ❖ Ambient noise levels (Leq) during day & night times were found to be well within MoEF&CC Norms.
- ❖ The water quality of surface waters were found to be in compliance with CPCB Norms.
- ❖ The ground water quality was found to be in compliance with the IS:10500 Norms.
- ❖ The soil in the study area would very well support vegetation after amending it suitably.
- ❖ There is no eco sensitive area exists in the study area and only domesticated animals exist.
- ❖ The area is thinly populated and basic amenities are available almost in all villages.

Thus, there is **adequate buffer** for the proposed Project in the physical, biological and edaphic environments of the study area.

4.0 Anticipated Impacts and Mitigating Measures

4.1 Identification of Impacts

Environmental Impacts are categorized as Primary and Secondary Impacts. **Primary Impacts** are those which are attributed directly to the project and **Secondary Impacts** are those which are indirectly induced by the Project. Any Project would create impact on the environment in two distinct phases viz. Construction Phase which may be regarded as temporary & short term and Operation Phase which would have long term effects. Identification of all potential environmental impacts due to the Proposal are critically examined and major impacts (both **Beneficial & Adverse**) are studied.

4.2 Construction Phase

Land Use : The patta land of 4.05 Ha will be used for the Grinding Unit. Dry barren land will be changed to industrial use. Along with Grinding Unit installation, various other section such as Storage Facilities for goods & materials, Admin. Office, Security Office, internal roads, Packing & Despatch Section etc. will be constructed. Subsurface work like laying of foundation, piling, electric cabling, etc. will be done as part of civil construction.

Top Soil : There will be excavation, cut and fill during construction as per the Layout. About **12500 cu.m** will be excavated earth. It will be stored, preserved and fully utilised for Green Belt development. Construction wastes, if any, will be utilised for levelling low lying areas in the Site.

Construction materials as available locally such as sand (from approved quarries), steel, cement, metal will be sourced.

Facilities to Construction Labours : Local Labours will be pooled for the Construction and provided with all Personal Protective Equipments (PPEs) like Mask, Gloves, etc. Water, toilet facilities, etc. will be provided to Construction Labours during the Construction Phase.

Transportation : On an average, 2 Truck loads/day (for transporting all construction materials) will be visiting the site during the construction period which will not have any adverse impact to the existing traffic volume.

Ambient Air Quality : The main sources of emission during the construction period are the movement of construction materials and equipments at site and dust emitted during the construction related activities. However, the impact will be for short duration, confined locally and is expected to be negligible outside plant boundaries. Fugitive emission control measure like water sprinkling will be carried out regularly during the construction period.

Noise Levels : There will be very less impact on the existing noise levels due to construction, traffic for loading and unloading, fabrication and handling of equipments and materials, etc. The likely increase of about 1-2 dB(A) in Leq Noise Levels which will be confined locally.

Water Quality : The construction water requirement of about **0.5 KLD** will be met from local water supply networks. Impact on water quality during construction phase may be due to non-point discharges of solids and sewage generated from the construction workforce. As the local work force will be pooled for the construction, the water requirement and wastewater generation during the construction period will be negligible or insignificant.

Biological Environment : Project does not warrant any cutting of trees, etc. It is barren land and requires minimum site preparatory works. Thus, there will not be any significant impact on the existing flora-fauna of the study area.

Socioeconomic Environment : There is no rehabilitation and resettlement involved in the project. The proposed Grinding Unit will generate employment for about 50 people (Direct & Indirect) during the Construction Phase. This is a positive impact due to the Proposal.

Thus, the Construction Phase activities will not cause any significant adverse impact on the surrounding areas.

4.3 Operation Phase

The impacts have been divided into two categories, viz. **Localised and Cumulative**. Localised Impact is confined to the area of influence of the Project and is not transmitted beyond its area. On the other hand, Cumulative Impact is aggregate impact of a number of projects on any component. Cumulative impacts can result from individually minor but collectively significant over a period of time. The following activities related to the Operational Phase of the Project will have varying impacts on the environment and are considered for the impact assessment :

- ❖ Traffic Volume.
 - ❖ Air Quality.
 - ❖ Noise Levels.
 - ❖ Water Environment.
 - ❖ Land Environment.
 - ❖ Biological Environment.
 - ❖ Socio-economics.
-

4.3.1 Traffic Volume

Road transportation will be through National Highway-38 and SIPCOT Road to V V Ti Plant. The No. of Trucks to be visited the Plant for transporting the Raw Materials as well as finished goods Cement is **160Trucks/day** in two ways (Table 4.1).

Table : 4.1 Traffic Volume due to the Unit

Material	Max. Quantity, TPD	Mode of Transport	No. of Trucks/day	
			One Way	2-Ways
Clinker	570	Covered Trucks (20 Tons)	29	58
Gypsum	30	Covered Trucks (15 Tons)	2	4
Fly Ash	180	Bowsers (20 Tons)	9	18
Cement	600	Covered Trucks (15 Tons)	40	80
Total			80	160

For assessing the baseline status, the Traffic Survey based on Indian Road Congress-IRC: 64/106 Norms were carried out at Site-SIPCOT Road Junction during a Week Day (03.05.2023-Wednesday) and also during the Week end (07.05.2023-Sunday). Based on the Survey, the existing Traffic Volumes at the Junction is computed in **Passenger Car Units (PCUs)** and given in Table 4.2.

Table : 4.2 Existing Traffic Volume - Baseline Status

Type of Vehicle	No. of Vehicles/day		Avg. Traffic per day, No. of Vehicles/day	PCU Factor as per IRC:106	No. of vehicles in PCU/day
	Week Day (03.05.2023-Wednesday)	Week End (07.05.2023-Sunday)			
2-wheelers	164	153	162.4	0.5	81.2
Autos	14	12	13.7	1.2	16.5
Vans/Tempo	10	6	9.4	1.4	13.2
Cars	22	8	20.0	1	20.0
Buses	12	10	11.7	2.2	25.8
Trucks	46	37	44.7	2.2	98.4
Tippers	8	6	7.7	4.0	30.9
Total	276	232	269.7	-	285.9

The existing traffic volume in the Project vicinity was found to be **286 PCU/day**. In the Post-Project Scenario, there will be an addition of **160 Vehicles (352 PCU/day)** (in 2 ways) to the existing traffic. Cumulatively, the traffic volume in the Project vicinity will be **638 PCU/day**. The existing Road & NH-38 is adequate to handle the proposed traffic volume due to the Project.

Level of Service (LOS) : Capacity Standards of Roads are fixed in relation with the LOS which is commonly designated from A (best operating condition) to F (forced or breakdown flow). Normally LOS-C will be adopted for smooth traffic flow in Urban/Rural Areas. At this Level, traffic volume will be 0.7 times of the maximum capacity. Capacity/Design Service Volume is the maximum hourly volume at which a vehicle can be expected to transfer a point/section of a road at a given time period. Ratio of existing Volume of PCU on road (V) and its Capacity (C) with corresponding LOS and their performance are given in **Tables 4.3-4.4**.

Table : 4.3 Level of Service & Performance of a Road (IRC:64-1990 Norms)

Volume/Capacity Ratio	Level of Service	Performance of the Road
0-0.2	A	Excellent
0.2-0.4	B	Very Good
0.4-0.6	C	Good/Average/Fair
0.6-0.8	D	Poor
0.8-1.0	E	Very Poor

Table : 4.4 Predicted Traffic Scenario at NH 44 Junction

Road	Volume, PCU/hr.	Capacity of the Road, PCU/hr.	V/C Ratio	Level of Service	Performance of the Road
Existing:-					
SIPCOT Road	11.92	1500	0.008	A	Excellent
With Project					
SIPCOT Road	26.58	1500	0.018	A	Excellent

The V/C Ratio will be 0.018 and the LOS will be 'A'. Thus, **there will not be any significant impact on the existing baseline traffic volume during Operation Period.**

Mitigating Measures : Adequate parking will be provided in the Plant. Facilities for **drivers (rest room, toilet, etc.)** will also be provided. Other Measures are :

- ❖ Security Guards will be there at the Plant-Road Junction to handle the inward and outward vehicles from the Plant.
- ❖ All Trucks will be fully covered with Tarpaulin to avoid any spillage on transportation.
- ❖ Restriction of over loading of Trucks/Tippers will be implemented.
- ❖ Truck parking in the Highway and Public Roads will be restricted.
- ❖ Regular and preventive maintenance of transport vehicles will be ensured.
- ❖ Compliance to 'Pollution under Control' Certification will be ensured and will be checked periodically.

4.3.2 Air Quality

The main pollutant expected from the Cement Grinding Unit will be Particulate Matter (PM). Emission from Cement Mill will be controlled by Bag Filters for **PM emission <30 mg/Nm³**. Other stack emissions will not have significant contribution. Other gaseous Pollutants like SO₂ and NO_x emission will also be insignificant from the Unit. Standby DG sets will be with in-built acoustic enclosures and required stack height as per TNPCB Norms. The emissions from the Unit will be as below :

PM10 Emission - Total	:	0.141 g/sec
PM Emission – Total	:	0.703 g/sec
Pollution Load-PM	:	60.70 kg/day
Load based Pollution Load	:	0.10 kg/Tonne of Cement

Prediction Modelling : AERMOD View is used for the Prediction Modelling. As site specific mixing heights were not available, mixing heights based on CPCB publication, “Spatial Distribution of Hourly Mixing Depth over Indian Region”, PROBES/88/2002-03 has been considered (appended below).

Maximum Mixing Height (meter) with Standard Deviation over Indian Region

Name of Station	Seasons					
	Winter		Pre-monsoon		Post-monsoon	
	Mixing Ht.	Std. Dev.	Mixing Ht.	Std. Dev.	Mixing Ht.	Std. Dev.
Chennai	1063.75	153.92	1274.45	111.79	1010.5	109.39

The Model Inputs and Outputs are appended. The **maximum incremental GLC** for PM10 is **0.23 ug/m³** (Table 4.54). The predicted values were spatially distributed and given as Fig. 4.1.

Table : 4.5 Predicted GLC – PM10

Pollutant	Background Concentration (24-hly.), ug/m ³	Max. Predicted Ground Level Concentration, ug/m ³	Total Concentration, ug/m ³	Distance, km	Revised NAAQ Norms, ug/m ³	Buffer Available in the Atmosphere, %
PM10	41.80	0.23	42.03	0.1	100	57.97

The maximum impact is found to be confined locally i.e. within 0.1 km radius from the boundaries. Also, **adequate Buffer Level exists** in the Air Environment for the proposed activities.

The maximum impact is found to be confined locally i.e. within 0.1 km radius from the boundaries. Also, **adequate Buffer Level exists (57.97%)** in the Air Environment for the proposed Project.

Model Inputs

Source Pathway - Source Inputs

AERMOD

Point Sources

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Size (microns) (Optional)	Release Height [m]	Emission Rate (g/s)	Gas Exit Temp. [K]	Gas Exit Velocity [m/s]	Stack Inside Diameter [m]
POINT	1	177156.94 Cement Mill	976154.90	23.00	20.00	3.13000	373.15	15.00	1.53
POINT	BTCK2	177214.28 Pulver	976143.07	23.00	15.00	0.21100	333.15	10.00	0.93

Model Outputs

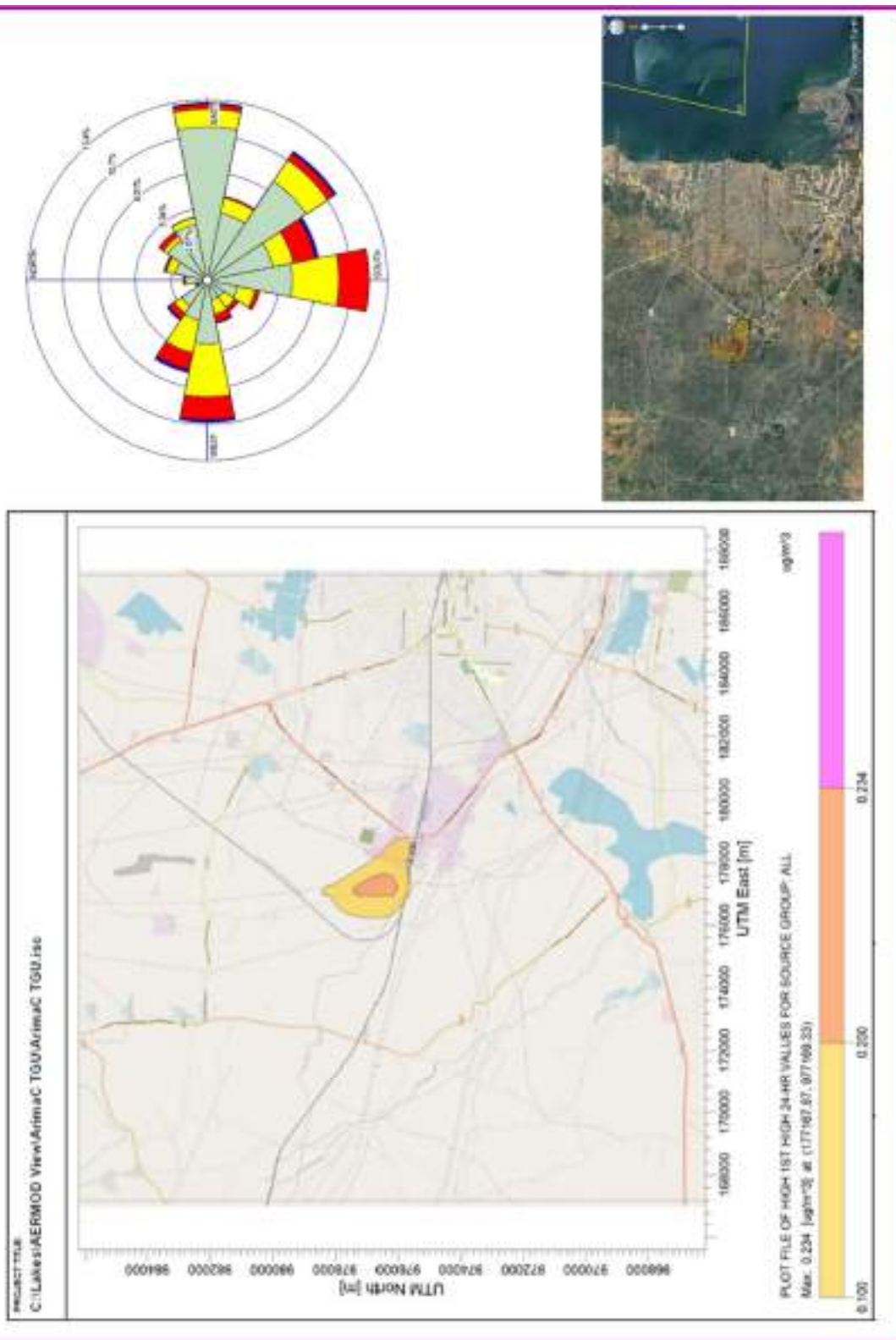
Results Summary

C:\Lakes\AERMOD View\Arima\CGU\Arima\CGU.rpt

PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	0.23423	ug/m ³	177157.87	977189.33	10.00	0.00	10.00	22-06-2022, 24
24-HR	2ND	0.22795	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	10-04-2022, 24
24-HR	3RD	0.21910	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	09-04-2022, 24
24-HR	4TH	0.21487	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	31-05-2022, 24
24-HR	5TH	0.20895	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	29-04-2022, 24
24-HR	6TH	0.20667	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	02-05-2022, 24
24-HR	7TH	0.20327	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	13-05-2022, 24
24-HR	8TH	0.20315	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	01-05-2022, 24
24-HR	9TH	0.19683	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	12-05-2022, 24
24-HR	10TH	0.19377	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	04-05-2022, 24
PERIOD		0.08967	ug/m ³	177157.87	976186.95	10.00	0.00	10.00	

Fig. : 4.1 Predicted GLC – PM10



Mitigating Measures : To control the Air Pollution, the following measures will be implemented:

- ❖ Stacks with adequate APC Measures.
- ❖ Periodical maintenance of APC Equipments like Bag Filters, etc.

Action Plan for Fugitive Emission Control :

For achieving effective prevention and control of Fugitive Emissions, the following measures will be implemented :

- ❖ **Charter on Corporate Responsibility for Environmental Protection (CREP) Guidelines** for Fugitive Emission Control in Cement Industries will be fully complied.
- ❖ Fully covered sheds for Gypsum & Coal storages.
- ❖ Silos will be provided for Clinker, Fly Ash & Cement storages.
- ❖ All Material conveyors will be fully covered and provided with Bag Filters at Transfer Points.
- ❖ Suction arrangements with suitably designed Bag Filters shall be provided at Silos to arrest the fugitive emissions.
- ❖ Dense Phase Pneumatic Handling System for receiving and conveying Fly Ash.
- ❖ All the roads in the Plant will be paved/concreted.
- ❖ Good House Keeping will reduce the Fugitive Emissions from the Plant.
- ❖ Dedicated Truck Parking Area which will be fully concreted.
- ❖ Fugitive emissions due to storage of Raw Materials will be continuously monitored.

4.3.3 Noise Levels

Grinding Mill be the main source of noise. The noise level within the plant building at a distance of one meter from the source shall be maintained at <85 db(A) for 8-hours exposure. Noise level at nearest plant boundary will be <55 dB(A) during day times and <45 dB(A) during night times. Thus, the noise levels will be well within the permissible MoEF&CC Norms for Residential Areas.

Mitigating Measures :

- ❖ Provision of silencers to modulate the noise generated by the machines.
- ❖ Provision of ear muffs/ear plugs to the Workers in higher noise zones.
- ❖ Standby DG Sets shall be with in-built mechanism for reducing noise.
- ❖ Green Belt with thick foliage along the boundaries.

4.3.4 Water

As this is only a grinding unit, water is mainly required for equipment cooling, domestic consumption, etc. Raw Water is required for Equipment Cooling (20 KLD), Domestic Use (3 KLD) and Green Belt (7 KLD). The total Water Demand of 30 KLD will be met from local Desalination Plant/water supply agencies and no ground water drawl will be there.

There will be no trade effluent generation from the Unit. Domestic sewage to the tune of 2.5 KLD from the Unit will be biologically treated in Septic Tank of adequate size followed by a Dispersion Trench. Thus, '**Zero Effluent Discharge-ZLD**' will be adopted/practiced.

Action Plan for Rain Water Harvesting : Sub-tropical climate prevails over the study area. The nearest rain gauge station is located at Thoothukudi Airport. The **Normal Rainfall of the Site is 625.8 mm**. Pre-Project and Post Project Surface Runoffs from the Plant Area is estimated as per Manual of Artificial Recharge of Ground Water (CGWB, 2007) (**Table 4.6**).

Table : 4.6 Estimation of Quantum of Runoff Available

Sl. No.	Land Use	Area, sq.m	Rainfall, m	Runoff Coefficient*	Quantum of Runoff Available, KL/Annum
1	Pre-Project Runoff	40500	0.6258	0.20	5068.98
2	Post-Project Runoff				
i	Roof Top of building/Shed/	4400	0.6258	0.85	2340.492
ii	Road/Paved area	13000	0.6258	0.65	5288.01
iii	Open Land	9700	0.6258	0.20	1214.052
iv	Green Belt	13400	0.6258	0.15	1257.858
Total Post-Project Runoff					10,100.412

* Ref: Manual of Artificial Recharge of Ground Water (CGWB, 2007).

Pre-Project Runoff : 5068.98 KL/Year
 Post Project Runoff : 10,100.412 KL/Year

The entire Roof Top Collection (RTC) of 2340.492 KL/Annum will be harvested and stored in **1 No. 100 KL** (7x5x3 m) capacity sumps and will be fully utilised for Raw Water demand. Balance 7,759.92 KL/Annum Surface Runoffs will be sent to the natural drains as it is. Thus, **natural drain from the Site will be maintained** after the effective Rain Water Harvesting (RWH) measures and there will not be any significant impact on the receiving water bodies in the vicinity.

4.3.5 Land - Solid Wastes

The dust collected from the various Air Pollution Control Measures like Bag Filters, etc. will be totally recycled in the process for cement manufacturing. Thus, no solid waste is envisaged from the process. Spent/waste Oil (Cat. 5.1) will be about 100 Lits./year which will be stored and sold to TNPCCB Authorised Recyclers for recovery and further use. Filter Bags Scrap (20 kg/year) will also be generated which will be sold to Vendors.

4.3.6 Biological Environment

The plant will not have any significant impact on surrounding ecology and biodiversity as pollution control equipments with adequate efficiency, adequate stack height and 33% green belt in and around the plant boundary are proposed.

Carbon Emission & Climate Change:

Greenhouse gases include carbon dioxide, methane, nitrous oxides, and water vapour. In an average, HSD for standby DG & transportation of Plant vehicles will be 1,60,000 Litres/Annum. By considering the Transport Emission Factors for Medium & Heavy Duty Trucks viz. 0.997 kg CO₂/km, 0.012 g CH₄/km and 0.008 g N₂O/km [as per US EPA 2014 emission factors for Green House Gases (GHGs) Inventories],

CO ₂ Emissions	:	478.560 Tons/Annum
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Considering Global Warming Potential Factor of 25 for CH₄ and 298 for N₂O, equivalent CO₂ Emission for CH₄ and N₂O emissions will be :

CO _{2-e} for CH ₄ Emissions	:	0.144 Tons/Annum
CO _{2-e} for N ₂ O Emissions	:	1.144 Tons/Annum

Thus, total CO₂ Emission due to the Proposal will be 479.848 Tons/Annum.

Carbon sequestration is the long-term storage of carbon in oceans, soils, vegetation (especially forests) and geologic formations. Adequate Green Belt shall be developed around the project for carbon sequestration. As trees grow, they store carbon in woody tissues and soil organic matter. Through the process of photosynthesis, plants assimilate carbon and return some of it to the atmosphere through respiration. The carbon that remains as plant tissue is then consumed by animals or added to the soil as litter when plants die and decompose. The primary way that carbon is stored in the soil is as *soil organic matter (SOM)*. SOM is a complex mixture of carbon compounds, consisting of decomposing plant and animal tissue, microbes (protozoa, nematodes, fungi, and bacteria), and carbon associated with soil minerals. It will be ensured that Plant operations do not result in loss of soil biological properties and nutrients. Soil amendments as required will be carried out to improve **soil health**. **Bio remediation** using micro organisms will be carried out to restore the soil environment to enable carbon sequestration.

An effective Green Belt over an extent of 1.34 Ha with 2,010 Trees of native species @ **1,500 trees/Ha** (Survival Rate @ 85-90%) will be developed and maintained. A tree absorbs anywhere between 10 - 40 kg of CO₂ per year and in an average 25 kg/year. Thus, about 50.25 Tons CO₂/Annum will be captured by these trees and control the Climate change locally.

It will be ensured that Plant activity does not disturb the biodiversity, flora & fauna and the ecosystem of the Area. Native species shall be preferred for Green Belt development. Fruit bearing trees may also be preferred. Actions will be taken to promote agro forestry, mixed plants to support **biodiversity conservation**. It will be ensured that no invasion by invasive alien species in the area.

4.3.7 Socioeconomics

The projects would help in generation of direct and indirect employment for the local people. This would be a positive long term impact due to the Project. There will be a general upliftment of standard of living in the region. As part of our corporate social responsibility initiatives, ACPL will be carrying out various social welfare activities such as providing drinking water, financial assistance to poor and needy, medical camps, water supply to neighbouring villages, etc.

- ❖ As per the Companies Act 2013, Companies should spend at least 2% of the Profit after Tax of the previous year for CSR activities but not lower than 2% of average of previous three years Profit after Tax.
- ❖ ACPL shall carry out various Social Measures for the local as well as regional populations as per CSR Norms.
- ❖ As per OM dated 30th Sept., 2020, & OM dated 20th Oct., 2020 Socio-Economic Developmental activities will be formulated on the basis of the issues raised during Public hearing which will be addressed in EMP and implemented in a time bound manner with the start of the industrial activities.

Occupational Health : An industrial worker may be exposed to five types of hazards, depending upon his occupation : Physical, Chemical, Biological, Mechanical and Psychosocial hazards. All efforts will be taken and followed to avoid the accidents and have a good 'Occupational Environment'. Entry Level and Periodical Medical Examinations of the Employees will be undertaken by the Unit. The Medical Reports will be reviewed and evaluated for Occupational Health related problems.

5.0 Analysis of Alternatives (Technology & Site)

5.1 Technology

Various cleaner production practices are initiated to control air emissions as well as fugitive emissions from various sources. These practices are:

- ❖ Adequate Bag Filters for Cement Mill, Packing Plant, Materials handling & storage areas, Materials transportation conveyors, etc.
- ❖ Bag Filters for truck tippler area to reduce the fugitive emission.
- ❖ Internal roads will be paved with concrete to arrest fugitive dusts.
- ❖ Road sweepers / water sprinklers shall be in operation to maintain clean environment in the Plant.

Energy Conservation:

- ❖ LED bulbs will be preferred for ordinary electrical bulbs in the Plant.
- ❖ Energy Management System will be implemented.

5.2 Alternative Sites Considered

Alternate Sites of 3 Locations were considered and Site-3 has been selected (**Table 5.1**).



Table : 5.1 Alternate Site Analysis

Parameters	Site-1 (Option-1)	Site-2 (Option-2)	Site-3 (Option-3) (Selected Site)
Location Name	Muthiahpuram	Site near VOC Port	Therku Veerapandiyapuram (adj. to SIPCOT)
Geographical Coordinates	8°43'18.29"N Latitude & 78° 6'39.40"E Longitude	08°44'50" N Latitude & 78°08'04" E Longitude	08°49'07.30" N Latitude & 78°03'52.90" E Longitude
Area (Ha)	3.00	10.8	4.05
Lead distance from VOC Port	14	11	18
Accessibility :-			
Road -Ease of Approach to a highway	Site is on SH-176 & to Port NH 138	SH-176 & to Port NH 138	Site is about 2.0 km from NH 38 (Bypass) & to Port NH 138
Rail -from the nearest Railhead to connect with railway siding	Railway siding not possible	Railway siding not possible	Southern Railway BG Line (Maniyachi- Thoothukudi) runs parallel to the Site at 0.35 km in South and Meelavittan RS is adjacent
Airport	Thoothukudi Airport-8.0 km in West (in Approach way)	Thoothukudi Airport-11.5 km in WSW	Thoothukudi Airport-11.2 km in SSW
Environmental Sensitivity :-			
Forest Land	No forest land involved	No forest land involved	No forest land involved
Areas protected / ESAs/ ESZs	Vallanadu Black buck Sanctuary-21 km (W) & Gulf of Mannar Marine National Park-15 km (NE)	Gulf of Mannar Marine National Park-11 km (NE) Sea coast: 2.4 km (E) CRZ III: 1.5 km (E)	Gulf of Mannar Marine National Park-12 km (NE)
Thoothukudi Town Settlements	7.0	3.0	5.0

6.0 Environmental Monitoring Programme

6.1 Environment Cell and Compliances

For effective implementations of Environmental Management Plan, ACPL will have the Environment Monitoring Cell headed by the Unit Head. The quality of air, noise, water, soil, etc. will be monitored at the identified locations as per MoEF&CC/TNPCB Norms by appointing an accredited external agency. The status reports will be submitted to MoEF&CC RO Monitoring Cell, SEIAA-TN and TNPCB periodically.

6.2 Post Project Monitoring

The frequency of monitoring is given in Table 6.1.

Table : 6.1 Post-Project Monitoring

Air	Fugitive Emissions	Stack Emission	Noise	Water	Soil
PM _{2.5} PM ₁₀ SO ₂ NO _x CO, etc. as per NAAQ Norms 24-hourly continuously for 2 days/week for whole year Met. Abstracts Monthly	PM as per CREP Guidelines At Raw Material Storage Areas Upwind & Downwind Directions Once a month	PM at Main Stacks Once a month Evaluation for the efficiency performance of Bag Filters shall be carried out once in six months	Day & Night Leq Noise levels dB(A) Once in a month	pH TSS DO COD BOD Sulphides Phenols Oil & Grease Total Ammoniacal Nitrogen (NH ₂ -N) Heavy Metals Mn Cu Zn Pb Hg Both surface and ground water sources Quarterly	Bulk Density Porosity pH EC Na Cl Na ₂ CO ₃ K ₂ O Heavy Metals Mn Cu Zn Pb Hg Once in Six Month

7.0 Additional Studies

7.1 Hazards Identification & Risk Assessment

Hazards Identification & Risk Assessment (**HIRA**) is the tool to identify the potential Hazards due to the industrial activities and assessment of the Risks to propose an Emergency Preparedness Plan (EPP). The major elements of the Risk Assessment include :

- ❖ **Hazard & Operability (HAZOP) Studies** for identification of hazards and vulnerable sections of the storage.
- ❖ **Consequence Analysis** for various release scenarios.
- ❖ Presentation of **Damage Contour** for worst damage from fire or explosion.
- ❖ Risk Assessment and
- ❖ Provision of guidelines for **Emergency Preparedness Plan** based on the findings.

The study includes :

1. Hazard Identification and Visualisation of Credible Accident Scenarios :

- ❖ Study of Plant Layout and Process involved in the Hazardous Materials storage and handling.
- ❖ The inventory of stored materials.
- ❖ Identification of hazards.
- ❖ Analysis of past accident data to develop the credibility of worst accident scenarios and
- ❖ Visualization of Credible Accident scenarios (CAS).

2. Analysis of CAS

Analysis of identified CAS and quantification of effects pertaining to the cases of :

- ❖ Outflow and releases
- ❖ Heat radiation
- ❖ Explosion
- ❖ Application of damage criteria for heat radiation and explosion.
- ❖ Presentation of damage contours for worst damages from fire or explosion.
- ❖ Effect of the proposed project on neighboring areas (including cascade effects if any).

3. Risk Assessment based on the individual Risk Contour Plots and

4. Emergency Preparedness Plan and other safety recommendations based on the studies.

7.1.1 Plant Configuration

The optimum Layout has been proposed with Fire Fighting Facilities and Emergency Assembly Area.

7.1.2 Fuel Storages

There will be no handling of any hazardous chemicals in the Plant other than Fuel Storage viz. High Speed Diesel @ 0.5 KLD (**Table 7.1**). The Fuels sourced from market will be reaching the Plant by Road. There will be dedicated Storage Facilities in the Plant.

Table : 7.1 Fuel Storages

Fuel	Storage	Capacity	Threshold Quantity for MAH
HSD	Steel Tank	1x1 KL	2500 Tonnes

* : MAH-Major accident hazards Installations which is defined as the isolated storage and industrial activity at a site handling (including transport through carrier or pipeline) of hazardous chemicals equal to or, in excess of the threshold quantities specified in Column 3 of Schedule 2 and 3 respectively.

The storage quantity of Highly Flammable Liquid viz. Diesel (Density-850 kg/m³) is 1 KL and the storage quantity is very well within the Threshold Quantity of 2,500 Tonnes for application of Rules 5, 7-9 & 13-15 as under Column 3 of Part II of Schedule 3 of Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 (as amended). Hence, Onsite/Off-site Emergency Plan is not warranted for the fuel storage tank. However, an On-site Emergency Plan will be in place in compliance with Sec. 41 'B' of Factories Act 1948.

In case of fuel released in the area catching fire, a steady state fire will occur. Failures in pipeline may occur due to corrosion and mechanical defect. Failure of pipeline due to external interference is not considered and all the work within this area is closely supervised with trained personnel.

7.1.3 PHA Technique

Hazard is present in any system, plant or process that handles flammable materials. Screening and ranking methodologies based on **Preliminary Hazard Analysis (PHA)** technique is adopted before risk can be evaluated. The storages have been assessed for its potential to initiate and propagate an unintentional event or sequence of events that can lead to an accident or emergency.

The study has covered the following sections :

- ❖ Storage Tank.
- ❖ Unloading and loading points and
- ❖ Road tanker transportation system.

7.1.4 Hazard Classification

Diesel is a petroleum product and is a highly flammable liquid having flash point at 51 °C. Fuel Oil is of similar characteristics having flash point above 66 °C. An inventory of the chemical stored is made and the chemical properties, including flammability and explosion characteristics, have been considered for hazard classification. The hazardous properties of HSD are :

CAS No. : 68476-30-2	UN No. 1202	
Chemical Name	Diesel Oil (Trade Name : HSD)	
Formula Range	C13-C18	
Specific Gravity	0.86-0.90 at 20 °C	
Specific Heat, kJ/kg. K	0.48	
Boiling point (°C)	215-376	
Flash point (°C)	32	
Heat of Evaporation, kJ/kg	244	
Heat of Combustion, kJ/kg	45586	
NFPA rating*	NH	1
	NF	2
	NR	0
	MF	10
Fire Explosion Index	74.00	(Medium)
Toxicity Index	2.52	(Low)
Threshold Quantity	2500 Tons	20000 Tons
	(Rules 5, 7-15)	(Rules 10-12)

*NFPA classification for Health, Flammability & Reactivity of a chemical on a scale of 0-4 least to worst.

7.1.5 Hazard Identification

The extent of the consequences of an accident in a hydrocarbon installation depends on type and quantity of the product stored and handled, mode of containment and external factors like location, density of population in the surrounding area, etc. In many cases realisation of hazard and its potential also depend on prevailing meteorological conditions and availability of ignition source. Thus, the most serious consequence would arise from a large inventory of petroleum products located in a densely populated area.

Any petroleum product such as HSD requires interaction with air or oxygen and an ignition source for the hazard to be realised. Under certain circumstances vapours of the product when mixed with air may be explosive, especially in confined spaces. A scientific analysis of past chemical accidents has been made to establish the credibility of accident scenarios.

Based on Fire & Explosion Index : The hazard identification involves the estimation of Fire & Explosion Index (F&EI) for the unit in the facility to give the relative severity of the Unit from the fire angle. These are evaluated from the knowledge of the Material Factor, General Process Hazard (GPH) and Special Process Hazard (SPH) factors. Material Factor (MF) is the measure

of the energy potential of a particular chemical or its mixture with other chemicals. GPH and SPH are evaluated by taking into account the exotherm or endotherm of a reaction, material handling and transfer hazards, accessibility, severity of process conditions and possibilities, dust and other explosions, inventory level of flammable material, etc. The F&EI value is then calculated as the product of MF, GPH and SPH.

$$FEI = MF \times GPH \times SPH$$

The Toxicity Index (TI) is calculated using the Nh, Ts, GPH and SPH. TI is calculated by the following formula:

$$TI = \frac{(Nh + Ts) \times (1 + GPH + SPH)}{100}$$

7.1.6 MCA Analysis

Major Hazard from oil storage is fire. **Maximum Credible Accident (MCA)** from oil storage tank can be :

- ❖ Tank Fire and
- ❖ Pool / Dyke fire.

Tank Fire: Oil is stored in tank. Leak or accumulation of vapour is a source of fire. Lighting can be a source of ignition and can cause tank fire. Overflow from tank leading to spillage may cause vapour cloud formation. This can catch fire and it can flash back to the tank to cause tank fire.

Pool / Dyke Fire: If there is outflow from the tank due to any leakage from tank or any failure of connecting pipes or valves, oil will flow outside and form a pool. Where the tank is surrounded by a dyke, the pool of oil will be restricted within that dyke. After sometime, the vapour from the pool can catch fire and can cause pool or dyke fire.

Heat Radiation and Thermal Damage Criteria: The level of damage caused by heat radiation due to fire is a function of duration of exposure as well as heat flux (i.e. radiation energy onto the object of concern). This is true both for the effect on building and plant equipment and for the effect on personnel. However, the variation of likely exposures times is more marked with personnel, due to possibility of finding shelter coupled with protection of the skin tissue (clothed or naked body). Further, it is assumed that everyone inside the area by the pool fire will be burned to death (100% lethality) or will asphyxiate. Radiation at various heat flux levels which are critical in risk analysis, are given in **Table 7.2**.

Table : 7.2 Effect of Heat Radiation

Sl. No.	Incident Radiation (kW/m ²)	Type of Damage Intensity	
		Damage to equipment	Damage to People
1	37.5	Damage to process equipment	100 % lethality in 1 min. 1% lethality in 10 sec.
2	25.0	Minimum energy required to ignite wood at indefinitely long exposure without a flame	100 % lethality in 1 min. Significant injury in 10 sec.
3	12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing	1% lethality in 1 min. First degree burns in 10 sec.
4	4.5	-	Causes pain if duration is longer than 20 sec, however blistering is un-likely (first degree burns).
5	1.6	-	Causes no discomfort on long exposures.

Effect of Heat Radiation : The damage and fatality (percentage of the exposed people to be killed) due to the exposure time is very important in determining the degree of fatality and corresponding effect distance. It is observed that the exposed persons normally find shelter or protection from the heat radiation (e.g. against a wall) within 10 seconds. However, exposure time of 30 seconds is normally assumed for pessimistic calculation which applies if people do not run away immediately or when no protection is available. The variation of the effects on humans due to heat flux and duration of exposure have been developed in the form of a Probit Equation which gives following values for human fatality levels (Table 7.3).

Table : 7.3 Radiation Exposure and Lethality

Radiation Intensity (KW/m ²)	Exposure Time (Seconds)	Lethality (%)	Degree of Burns
1.6	-	0	No discomfort even after long exposures
4.5	20	0	1 st
4.5	50	0	1 st
8.0	20	0	1 st
8.0	50	<1	3 rd
8.0	60	<1	3 rd
12.0	20	<1	2 nd
12.0	50	8	3 rd
12.5	Inst	10	-
25.0	Inst	50	-
37.5	Inst	100	-

The results of MCA analysis indicate that the maximum damage distances for 4.5 kw/m² thermal radiations extends upto 1.8 m in the case of one full tank is on fire during worst meteorological conditions. As the fire resistant dyke walls are created, no cumulative effect to create fire on other Storage is envisaged.

Probability of Occurrence : The overall probability of occurrence is found to be extremely low (10^{-7}).

7.1.7 Fire Protection System in the Plant

Adequate and reliable arrangement will be done for fighting the fire with water such as:

- ❖ Source of water equipped with diesel driven pumps.
- ❖ Arrangement of pipe lines along and around vulnerable areas.
- ❖ Alternative water supply arrangements.
- ❖ Provision of valves at appropriate points to enable supply of water at the required place/area or divert the same to another direction/pipe line.

Source of Water : Raw water Reservoir. Water source will be equipped with one standby diesel driven pump to serve in case of power failure.

Fire Extinguishers : Adequate numbers of 'Fire Stations' will be established which would house and keep in readiness the following type of equipment and arrangements:

- ❖ Dry Powder Chemical Extinguishers.
- ❖ CO₂ Extinguishers.
- ❖ Water spray hoses.
- ❖ Foam Extinguishers

Appropriate types of fire extinguishers will be provided at conveyor drive heads, control room, in machines, electrical yard, sub-station and other infrastructural facilities within the premises. In the transformer yard, automatic fire detecting and quenching system will be provided for each transformer. This system will come into operation whenever the temperature of surrounding air exceeds 80 °C and spray water over the transformer to prevent spreading of fire and quench the same.

7.2 Disaster Management Plan (DMP)

Disasters are off natural as well as man-made. **Natural Disasters** include Earthquakes, Floods, River Erosion, Cyclones, Tsunami, Landslides, Fires, etc. and the **Man Made Disasters** include Nuclear, Chemical, Mines, Biological, Cyber Terrorism, Environmental Disasters, etc. In order to better protect the Factory from any hazards, proactive approach has been applied in all operations of disaster preparedness, prevention and mitigation. To deal with an emergency, the arrangement for immediate deployment or appointment of key personnel and their specific duties are brought out.

Objectives : The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in the same order of priorities. In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy. For effective implementation of the DMP, it should be widely circulated and personnel training through rehearsals/drills.

The objective of the Industrial DMP is to make use of the combined resources of the Plant and the outside Services to achieve the following:

- ❖ Effect the rescue and medical treatment of casualties
- ❖ Safeguard other people
- ❖ Minimize damage to property and the environment
- ❖ Initially contain and ultimately bring the incident under control
- ❖ Identify any dead
- ❖ Provide for the needs of relatives
- ❖ Provide authoritative information to the news media
- ❖ Secure the safe rehabilitation of affected area
- ❖ Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

7.2.1 Onsite Emergency Plan

The most possible hazardous conditions those might generate an emergency situation are as follows :

- ❖ Medical Emergency
- ❖ Natural disasters such as the Earthquake, Flood, Lightning, Tsunami etc.
- ❖ Major Fire hazards.
- ❖ Leakage or Blast of producer Gas, boiler, compressor
- ❖ Heavy quantity Leakage of Sulfuric Acid
- ❖ Electrocution or arc flash hazards

Causes of Industrial Fires :

- ❖ Leaving the workplace without switching off the machineries
 - ❖ Keeping the combustible materials near the spark producing areas.
 - ❖ Leakages and spillage of flammable/combustible materials.
 - ❖ Electrical short circuiting/over loading.
 - ❖ Welding, cutting, soldering and other hot work.
 - ❖ Equipment failure.
 - ❖ Smoking in prohibited areas.
-

-
- ❖ Chemical reaction/runaway action.
 - ❖ Frictional heat / spark.
 - ❖ Spontaneous combustion.
 - ❖ Static spark/combustion spark/lightning.
 - ❖ Poor house keeping.

Safe Preventive Measures :

- ❖ Ensure high housekeeping.
- ❖ Cover all spark producing m/c's / equipments.
- ❖ Segregate flammable materials from source of ignition.
- ❖ Strictly adhere to work permit instruction for welding/cutting/and other hot working areas where flammable are present.
- ❖ Store incompatible chemicals separately.
- ❖ Where flammable are stored and used, ensure adequate ventilation, prohibit smoking, and use flameproof electrical equipment.
- ❖ Use fuses and circuit breakers for correct capacity.
- ❖ Keep fuses and control panels are cleaned and closed.
- ❖ Avoid multi socket connection.
- ❖ Electrical repairs should be carried out by qualified personnel.
- ❖ Do not use damaged cords and avoid temporary connections.
- ❖ Lubricate, maintain and align all machines/equipments to prevent generation of heat.

Action during Emergency.: A **Medical Emergency** may appear at plant due to several reasons like :

- ❖ Fall from height.
- ❖ Electric shock & Burn.
- ❖ Snake bite

Action Required:

- ❖ The emergency control team should rush to the location as soon as possible after getting the information.
 - ❖ Avoid unnecessary gathering of people at the spot.
 - ❖ If the emergency is associated with live electric line then quick action should be taken to cut the power supply.
 - ❖ The victim(s) should be rescued from the hazardous area and shifted to a safer place.
 - ❖ Provide First Aid to all injured employees regardless of severity.
 - ❖ Follow appropriate first aid methods as per nature of injury.
 - ❖ Give artificial respiration if the victim is unconscious.
-

- ❖ Call ambulance service if the injury is major and beyond control under first aid.
- ❖ Immediately shift the victim(s) to hospital if the injury is serious and needs immediate medical treatment.

Natural Disaster like Earth Quake & Cyclone :

In case of having prior information regarding the possibility of such calamities all work should be stopped for the period of these exist. In case of sudden arrival of such disasters the following measures can be taken to minimize the destructive effect of the same.

On event of Earthquake following actions needs to be taken on top priority:

- ❖ Immediately stop all activities at site.
- ❖ Ensure all personnel are relocated to a safe destination.
- ❖ Keep all cylinder in upright position and well tight with chain or other material to restrict from falling.
- ❖ Close all product supply from the source.
- ❖ First Aid Treatment to be provided to affected personnel wherever required.
- ❖ Contact External emergency services for help if required.

Cyclonic Winds : On event of Cyclonic Wind following actions needs to be taken on top priority:

- ❖ Switch "Off" power and utilities so that damages to property & life can be restricted.
- ❖ Stop all height works and outdoor works.
- ❖ Ensure all personnel are relocated to a safe destination.
- ❖ Contact External emergency services for help if required.

Major Fire Hazards:

An emergency situation can occur in the event of major fire at different locations inside the plant. The fire may be a result of electric fault or spark from hot works like welding, gas cutting.

On event of Fire following actions needs to be taken on top priority:

- ❖ Isolate the area.
 - ❖ Switch off supply.
 - ❖ Evacuate all personnel to safe assembly point.
 - ❖ Assembly point should be chosen considering wind direction
 - ❖ Try & Shut off the source of Fire
 - ❖ Operate Fire Extinguishers if it's a small fire.
 - ❖ Call for Emergency services if needed.
-

- ❖ Start Rescue operation if any personal are trapped in the fire.
- ❖ Ensure that affected personal (if any) are moved to a safe & well- Ventilated place.
- ❖ First Aid Treatment to be provided to affected personnel (if any)
- ❖ Move affected to hospital if needed (if any).

On event of Electrical Fire or short circuit:

- ❖ Immediately isolate the supply between two junction points or as directed by site coordinator
- ❖ Use CO₂. Extinguisher to put off the fire if it's small
- ❖ Call Fire service department, in case of major fire

Maintenance of Fire Fighting Pump :

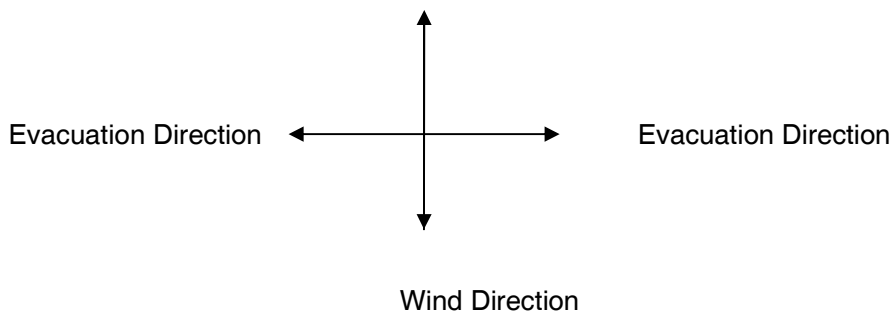
- ❖ Fire water pump Diesel engine maintenance carried out at every quarterly (Refer PM Schedule)
- ❖ Fire water pump are checked and tested every week on Sunday.
- ❖ Intimation will be given to section in-charges and Security dept. before Checking and test conducted.
- ❖ Fire siren will be switched ON.
- ❖ Fire water pump is started, one of the fire hydrant is opened and checked with fixing hose and jet nozzle.
- ❖ All Parameters will be noted and recorded in Check list and signed.

Steps to be taken To Control The Fumes / Vapour Release :

Immediately evacuate all personnel from danger area.

Personnel to be evacuated to safer area by seeing the Wind sock.

Personnel to be moved side ward to wind direction (i.e. perpendicular direction)



Site Main Controller : Unit Head.

Emergency Control Centre : In case of an emergency, Admin. Office will function as the Emergency Control Centre. Also, Security Office is acting as alternate emergency control room.

The following **Emergency facilities** will be available :

- ❖ P & T Telephones
- ❖ Fax
- ❖ Intercoms
- ❖ Local Area Plan (Topographical Plan)
- ❖ Site Plan
- ❖ Predominant Wind Direction and Speed Charts
- ❖ Fire Extinguishers
- ❖ List of Key Personnel and their Telephone Number
- ❖ List of neighboring factories with the contact personnel and the telephone number
- ❖ List of Government Agencies and their contact telephone number
- ❖ Fire Suit
- ❖ Breathing Apparatus Set
- ❖ Face Masks
- ❖ Emergency Lights
- ❖ First Aid Items
- ❖ White Board with Marker Pens
- ❖ Sufficient numbers of Emergency Plan copies and
- ❖ Public Address System

Main Stages of Emergency

Major Emergency goes through the following main stages :

- I. Communication during Emergency
- II. Declaration of Emergency by raising the Alarm
- III. Implementation of the Emergency Combat Procedure and
- IV. Rescue.

7.2.2 Off - Site Emergency Preparedness Plan

The task of preparing the Off-Site Emergency Plan lies with the District Collector. However, the Off-Site Plan is prepared with the help of the local District Authorities. Off-site emergency plan follows the on-site emergency plan. When the consequences of an emergency situation go beyond the plant boundaries, it becomes an off-site emergency. Off-site emergency is essentially

the responsibility of the public administration. However, the factory management will provide the public administration with the technical information relating to the nature, quantum and probable consequences on the neighbouring population. The off-site plan in detail will be based on those events, which are most likely to occur, but other less likely events, which have severe consequence, will also be considered. Incidents which have very severe consequences yet have a small probability of occurrence should also be considered during the preparation of the plan. However, the key feature of a good off-site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

In the event of an accident, local arrangements regarding the role of the factory inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations in case involvement in advising on operations. In cases where toxic gases may have been released, the factory inspectorate may be the only external agency with equipment and resources to carry out tests.

Important Phone Nos.

Name of the Officer	Phone/Mobile No.	EMail-ID
District Collector, Thoothukudi	0461-2340600	collrtut@nic.in
DRO, Thoothukudi	0461-2340400	dro.tntut@nic.in
Tahsildhar, Thoothukudi	0461-2321448	
DEE, TNPCB, Thoothukudi	0461 - 2341298	
SP, Thoothukudi	0461-2340200	
Muthiapuram Police Station	0461-2355311	
Police Control Room	100	
Jt. Director of Health Services	0461-2332234	thoothukudi.jdhs@rediffmail.com
Govt. Hospital, Thoothukudi	0461-2392698	
Fire Control Room	101/108	
SIPCOT Fire Brigade	0461-2340091	
Sterlite Industries Fire Brigade	0461-4242202	
Thoothukudi Fire Brigade	0461-2326501 & 101	
District Industries Department	0461-2340053	dictuti@gmail.com
Ambulance Service	108/102	
AVM Ambulance Service	0461-2321784/9363306983	

Nearby Hospitals

Hospital Name	Location	Phone No.
Government Hospital	Near South Police Station, Thoothukudi	0461 - 2392698
ESI Dispensary	Therespuram, Thoothukudi	0461 – 2321582
AVM Hospital	Thoothukudi	0461-2325461/2
ABI Hospital, Thoothukudi	Anna Nagar, Thoothukudi	0461 – 2591418 / 8754024233

8.0 Project Benefits

Environmental Benefits : Grinding Unit shall be utilizing process waste generated by other industries i.e. fly ash from Power plants and help them in getting rid of voluminous waste in most sustainable manner by converting into useful product i.e. Cement. Waste materials from other Industries like Fly Ash, Gypsum, etc. are beneficially utilised for cement manufacturing.

Social Benefits : The Grinding Unit will generate employment for about 50 people during the Construction Phase. About 150 persons get employment (50 Direct & 100 Indirect) during Operation Phase of the Project. About 2.5% of the Project Cost will be earmarked for Corporate Environment Responsibility (CER) Works as well as for addressing Public Hearing issues. Socio-Economic Developmental activities will be formulated on the basis of the issues raised during Public hearing which will be addressed in EMP and implemented in a time bound manner.

Financial Benefits : The Project will bring Rs.23.00 crores investment in the Region. There will be a positive impact due to the proposal, by way of employment, better socioeconomic conditions, improved local and regional economy, etc.

Proposed GU will contribute Revenue to the State and Centre Govt. in terms of taxes etc. Apart from generating direct employment, proposed project will also contribute to various indirect employment & business opportunities for local community like transport of cement to market, material transport, maintenance & housekeeping contract work etc.

9.0 Environmental Cost Benefit Analysis

Environmental Cost Benefit Analysis is not applicable for the proposal as there is no forest land envisaged and also not considered during Scoping Process.

10.0 Environmental Management Plan

An Environmental Management Plan (EMP) is formulated for mitigation of adverse impacts and is based on present environmental status and impact appraisal. It is mandatory to comply with the various regulatory Norms for Prevention and Control of Pollution. The following environmental management plans are proposed for mitigation of impacts on the environment :

10.1 Construction Phase

- ❖ It shall be ensured that no change due to the constructions to the hydrology/natural drainage of the area.
- ❖ All the topsoil excavated shall be stored and maintained for use for Green Belt development.
- ❖ Construction materials like sand, stone chips, etc. shall be obtained only from approved quarries.
- ❖ Proper placement of construction machineries shall be ensured to eliminate vibrations & noise.
- ❖ All construction machinery items shall be well lubricated to reduce noise.
- ❖ High Speed Diesel with low sulphur content shall be used for running the construction machineries.
- ❖ Cement handling shall be supervised properly to check fugitive emissions.
- ❖ Carrying of plastic and other nutrient locking materials shall be banned totally.
- ❖ Empty cement bags, debris, etc. shall not be disposed off at the site. They shall be collected and disposed off properly in scientific manner as per Norms/Guidelines.
- ❖ The labours for the construction works shall be pooled from the local public.
- ❖ Adequate drinking water and sanitary facilities shall be provided for construction workers.
- ❖ PPEs shall be provided to the construction workers. Protection devices viz. ear plugs/ear muffs shall be provided to the workers during welding works.
- ❖ The safe disposal of wastewater and solid wastes generated during Construction Phase shall be ensured.
- ❖ On completion of construction, all debris and extraneous materials shall be cleared off and no residuals should be left at the site.
- ❖ Adequate measures shall be taken to avoid any traffic congestion near entry and exit points.
- ❖ Periodical monitoring of environmental parameters shall be carried out during the Construction Phase as per TNPCB Norms to have a cross check and a data base.

10.2 Operation Phase

10.2.1 Traffic Volume

- ❖ Dedicated Truck Parking Area shall be earmarked and shall be fully concreted.
- ❖ No overloading of transport vehicles with materials shall be permitted.
- ❖ Loaded trucks shall be covered with tarpaulin.

-
- ❖ Vehicles with valid 'Pollution under Control' Certificates shall be allowed.

10.2.2 Air Quality

- ❖ Adequate air pollution control systems viz. Bag Filters, etc. shall be installed in the Cement Mills & Packers to control PM emissions <30 mg/Nm³.
- ❖ Inside the Plant, all materials transfer shall be through closed conveyor belts.
- ❖ Adequate dust extraction systems shall be installed at various transfer points.
- ❖ The dust collected from all APC Equipments shall be totally recycled in the process.
- ❖ Fully covered sheds shall be provided for Gypsum storage.
- ❖ Silos shall be provided for Clinker, Fly Ash & Cement storages.
- ❖ Suction arrangements with suitably designed Bag Filters shall be provided at Silos to arrest the fugitive emissions.
- ❖ Dense Phase Pneumatic Handling System for receiving and conveying Fly Ash.
- ❖ All the roads in the Plant shall be paved/concreted.
- ❖ Good House Keeping will reduce the Fugitive Emissions from the Plant.
- ❖ The periodical evaluation for the efficiency performance of Bag Filters shall be carried out.
- ❖ Fugitive emissions due to storage, transportation, etc. and the leakages and spillages shall be continuously monitored and controlled.
- ❖ Periodical Ambient Air Quality and Stack Emissions shall be undertaken and the Status Reports shall be submitted to the Authorities as required.
- ❖ Charter on Corporate Responsibility for Environmental Protection (CREP) Guidelines for Fugitive Emission Control in Cement Industries shall be fully complied.

10.2.3 Noise Levels

- ❖ The design features of machineries shall ensure low noise levels in the working areas.
- ❖ Noise generating sources would be maintained properly to minimise noise and vibrations.
- ❖ All rotating items shall be well lubricated.
- ❖ For all fans, compressors etc. vibration isolators shall be provided to reduce noise.
- ❖ Provision of silencers shall be made wherever possible.
- ❖ The operators shall be provided with necessary safety and protection equipment like ear plugs, ear muffs etc.
- ❖ Periodical Noise monitoring shall be undertaken and the Status Reports shall be submitted to the Authorities.

10.2.4 Water Environment

- ❖ No ground water shall be drawn for the Project.
 - ❖ Source of water shall be RO Plant supply as proposed.
 - ❖ Treated sewage from Corporation, if available, will be used for equipment cooling.
 - ❖ No trade effluent shall be discharged from the Plant.
-

- ❖ The domestic sewage from the Plant shall be treated effectively so as to meet the TNPCB Discharge Norms.
- ❖ 'Zero Effluent Discharge' shall be practiced.
- ❖ Periodical monitoring for specific parameters shall be done regularly.
- ❖ Effective Rain Water Harvesting Systems shall be adopted and harvested water shall be utilized for the industrial needs.

10.2.5 Land Environment

- ❖ There shall be no industrial solid waste from the Plant.
- ❖ Waste Oil shall be collected and sold to the CPCB/TNPCB Authorised Agency for further treatment & disposal.
- ❖ The municipal wastes shall be collected, transported, treated in a landfill (composting) within the Plant vicinity to make use of it as manure for Green Belt.

10.2.6 Biological Environment

- ❖ Green Belt (33% Coverage) shall be developed and maintained effectively.

10.2.7 Social Measures

- ❖ As per the Companies Act 2013, Companies should spend at least 2% of the Profit after Tax of the previous year for CSR activities but not lower than 2% of average of previous three years Profit after Tax.
- ❖ ACPL shall carry out various Social Measures for the local as well as regional populations as per CSR Norms.
- ❖ As per OM dated 30th Sept., 2020, & OM dated 20th Oct., 2020 Socio-Economic Developmental activities will be formulated on the basis of the issues raised during Public hearing which will be addressed in EMP and implemented in a time bound manner with the start of the industrial activities.

10.2.8 Occupational Health Measures

- ❖ ACPL shall provide a safety & healthy working conditions and continually improve the occupational health and safety performance.
 - ❖ Its objectives shall be to achieve zero accident and safe work environment, to improve moral and health of all employees.
 - ❖ To maintain the emission levels below the norms.
-

10.2.9 Plastic Waste Management

There will be ban on one time use and throw away Plastic usage in the Plant in compliance with Tamil Nadu, Environment and Forests (EC-2) Department, G.O.(D) No. 84 dated 25.06.2018. ACPL will encourage the use of eco friendly alternative such as banana leaf, areca nut palm plate, stainless steel glass, porcelain plates / cups, cloth bag, jute bag etc.

10.3 EMP Budget

The **Project Cost is Rs.23.00 crores**. A budgetary allotment of Rs.5.00 crores has been made as Capital Cost for EMP Measures and Rs.10.00 lakhs per annum towards Operating Cost (**Table 10.1**).

Table : 10.1 EMP Budget

Sl. No.	Description of Item	EMP Budget	
		Capital Cost, Rs. in Crores	Recurring Cost, Rs.Lakhs/Annum
1	Air Pollution Control & Noise Control	4.50	5.00
2	Water Pollution Control	0.25	-
3	Greenbelt Development	0.25	0.50
4	Periodical Monitoring of Environmental Parameters		4.50
Total		5.00	10.00

CER Budget :-

As proposed in TOR, about **Rs.57.50 Lakhs (2.5% of Project Cost)** will be allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018 and for addressing Public Hearing issues.

11.0 Summary Environmental Impact Assessment

1.0 Introduction

1.1 Project Proponent

M/s. Arima Cements Private Limited (ACPL) is registered under the Companies Act, 2013 (18 of 2013) on 07.12.2021. The Corporate Identity Number of the Company is U26999TN2021PTC148417. The **Authorised Signatory is Mr.V.Subramanian, Director**. The registered & communication address is :

M/s. Arima Cements Private Limited,
1/38A, East Street,
Therkuveerapandiyapuram,
Thoothukudi-628 002.
Mobile No. : 9943796254
e-Mail : info@arimacements.com

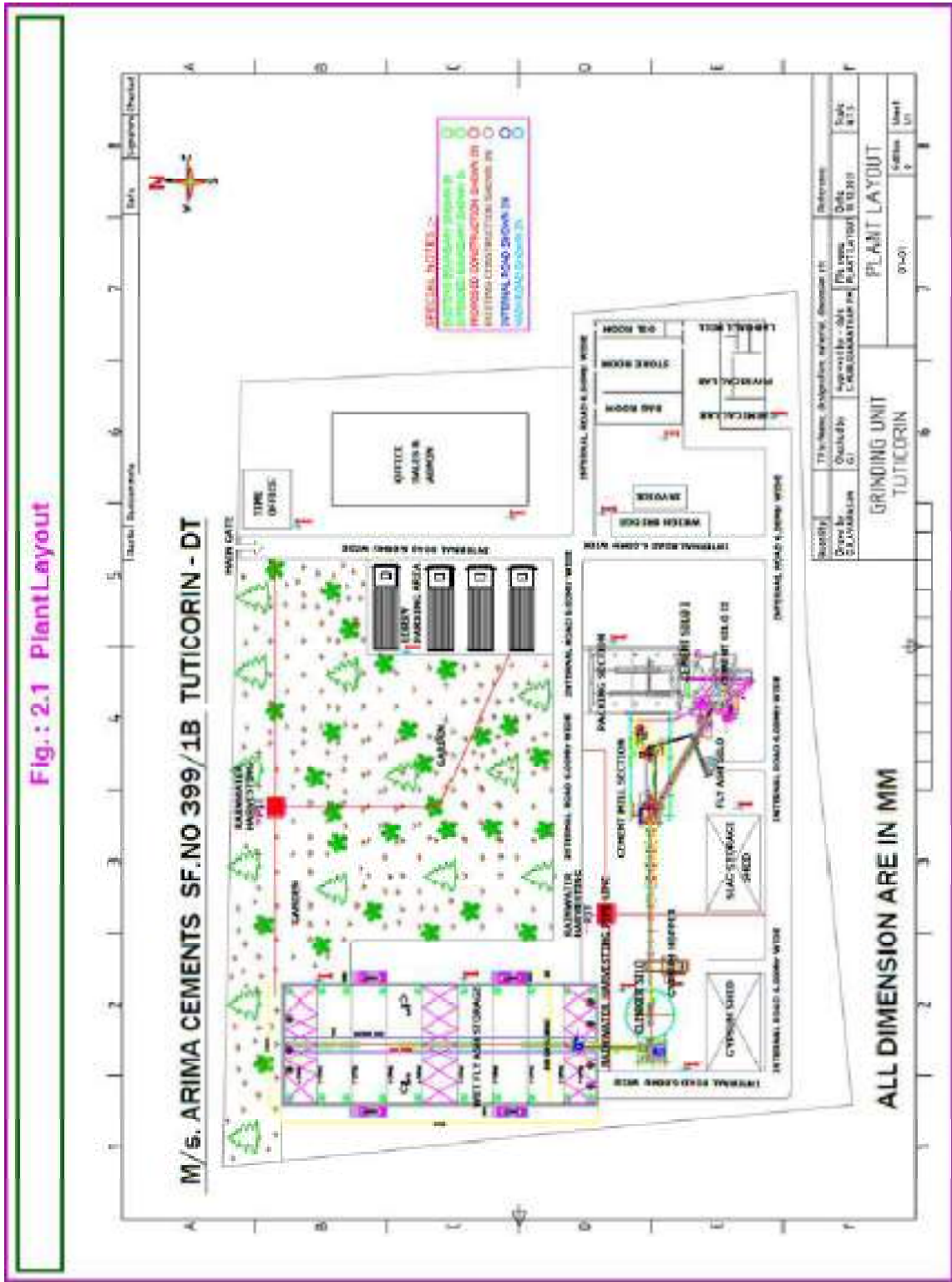
1.2 Project Profile

With available resources for Cement Grinding and Marketing, ACPL is proposing to establish a Cement Grinding Unit in Thoothukudi. ACPL has identified a suitable Site for the Project to an extent of 4.05 Ha, private Patta land adjacent to SIPCOT Industrial Estate-Thoothukudi, in Survey No. 399/1B Part, Therku Veerapandiyapuram Village, Ottapidaram Taluk, Thoothukudi District, Tamil Nadu (**Fig. 1.1**). Company has also executed the Lease Deed for initial 33 years with Land Owner M/s. V V Mineral on 09.12.2021. Site is in possession of ACPL. As per DTCP, the area falls in 'Non-Planning Area'. There is no Rehabilitation & Resettlement (R&R) issue due to the Proposal. There is no Litigation/Pending Case against the Proposal.

It is proposed to grind Clinker with other Raw Materials for producing Portland Pozzolana Cement (PPC) and Ordinary Portland Cement (OPC) @ **0.2 Million Tonnes per Annum (MTPA) @ 600 Tonnes per day (TPD)**. A standby DG Set of 2,500 KVA is also proposed. Along with Grinding Unit installation, various other section such as Storage Facilities for goods & materials, Admin. Office, Security Office, internal roads, Packing & Despatch Section, etc. will be constructed (**Fig. 2.1**). The Project will give direct employment to about 50 persons and indirect employment to about 100 persons.

Main process of manufacturing of PPC involves inter-grinding of Clinker, Fly Ash and Gypsum in the ratio of 65:30:5 and OPC involves inter-grinding of Clinker and Gypsum in the ratio of 95:5. Clinker will be imported from Oman, UAE, etc. MOU has been signed with M/s. Pioneer Cement Industries, UAE on 25.01.2022 for the supply of Clinker to the Project. Other Raw materials will be sourced locally.

[illegible]



A Ball Mill is of 9 m length x 2.2 m dia and **30 TPH capacity** along with a supporting system of Classifier. Clinker and Gypsum from storages will be transported to respective feed hoppers with the help of belt conveyors. Measured quantities of Clinker and Gypsum in desired proportion will be fed to the ball mill. While producing PPC, Fly Ash of desired dosage will be extracted from Fly Ash Silo and pneumatically transported and fed through a solid flow meter to the mill. Weigh feeders will be installed under each feed hopper to ensure accurate measurement of input quantities of materials to the mill. The ground cement will be stored in the RCC Silos.

A bucket elevator is used to carry the ball mill discharge material to classifier. Fine material of required fineness from classifier will be collected as product and the coarse material will be sent back to the mill for further grinding. The fine material collected in bag filters is the final product and it will be transported to respective product silos, where it is stored. Cement (OPC/PPC), stored in silos, will be packed in 50 kg bags using electronic packers. Apart from the facility to pack cement in bags, there will be facility to load Cement in bulker also. The Grinding Unit requires about 2.0 MW power which will be sourced from TANGEDCO Grid.

Clinker, Fly Ash and Cement will be stored in RCC Silos. Gypsum & Wet Fly Ash will be stored in covered sheds. All the conveyors for material handling will be completely covered. All point sources and material transfer points are provided with Bag Filters to control PM emission <30 mg/Nm³. The dust collected from the Bag Filters will be recycled in the Cement manufacturing process. The DG Set will have adequate Stack Height and In-built acoustic measures.

As this is only a grinding unit, water is mainly required for equipment cooling, domestic consumption, etc. Raw Water is required for Equipment Cooling (20 KLD), Domestic Use (3 KLD) and Green Belt (7 KLD). The total Water Demand of 30 KLD will be met from local Desalination Plant/water supply agencies and no ground water drawl will be there. There will be no trade effluent generation from the Unit. Domestic sewage to the tune of 2.5 KLD from the Unit will be biologically treated in Septic Tank of adequate size followed by a Dispersion Trench. Thus, '**Zero Effluent Discharge-ZLD**' will be adopted/practiced.

No solid waste is envisaged from the process. Spent/waste Oil (Cat. 5.1) will be about 100 Lits./year which will be stored and sold to TNPCB Authorised Recyclers for recovery and further use. Filter Bags Scrap (20 kg/year) will also be generated which will be sold to Vendors.

As per Environmental Impact Assessment (EIA) Notification 2006 [SO 1533 (E) dated 14.09.2006], all Stand Alone Grinding Units have been kept at Sl. No. 3(b) under Category 'B' for Environmental Clearance from State Level EIA Authority -Tamil Nadu (SEIAA-TN). Accordingly, online TOR Application was filed vide Proposal No. SIA/TN/IND/76000/2022 on 21.04.2022 (File No. 9194/2022). State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) deliberated the Proposal in its 293rd Meeting held on 08.07.2022 and recommended Terms of References (TORs) for carrying out Environmental Impact Assessment (EIA) Study. SEIAA-

TN has approved the TORs in its 538th Meeting held on 02.08.2022. TOR has been awarded for EIA Study vide Letter No. SEIAA-TN/F.No.9194/3(b)/ToR-1216/2022 dated 02.08.2022. ACPL has also applied and obtained **TOR Validity Extension** from SEIAA-TN vide TO25B1103TN5340356A dated 25.09.2025 for another one year. Baseline Data (BLD) was collected during **Apr.-Jun. 2023 (Summer Season)**. The EIA Report has been prepared and submitted in compliance with awarded TORs and also as per the generic structure proposed in EIA Notification 2006. The Draft EIA Report along with Summary EIA Reports (both in English and Tamil) are submitted for conducting the Public Consultation & Public Hearing.

The EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-9 (Cement Plants) for Category 'A' by NABET vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of the List) which will be extended by NABET periodically. ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2024 with validity till 02.04.2026.

2.0 Description of the Environment

2.1 Environmental Setting

The proposed Site is located inbetween 08°49'07.30"-08°49'16.82" N Latitude & 78°03'52.90"-78°03'59.85" E Longitude (Survey of India Topo Sheets No. 58 H/13)-**Fig. 1.2**. There is no environmental issue about the site. Gulf of Mannar Marine National Park (GoMMNP) – Eco Sensitive Area (ESA) - is notified vide SO 08(E) dated 01.01.2020 with its Eco Sensitive Zone (ESZ). GoMMNP ESA boundary is located at a distance of 13.5 km in the east and ESZ is at 10.7 km in the east. Gulf of Mannar Marine Biosphere Reserve (GoMBR) is one of the Ramsar Sites in Tamil Nadu.

There is **no National Park/Wild Life Sanctuary/Reserved Forest/Hot Spot exist** within 10 km radius area. The seasonal Korampallam Odai flows at 8.3 km (SE) and there is **no Flood Hazard** to the site. There are Small, Medium and Major Industries in the SIPCOT Complex. Meelavittan SIPCOT Complex has many major industries. V V Titanium Pigments Plant is located at 0.7 km in east. Vedanta Sterlite industry (shut down now) is located in the eastern side of the Site. Sterlite Captive Thermal Power Plant (2x80 MW) is located @ 2.2 km in east from site.

The Site is well connected by road and rail modes and is accessible from nearby National Highway **NH-38. Thoothukudi Corporation Area** is located within 5-10 km distance from the site in the east. Meelavittan is the nearest settlement with a total population of 45,863 (23,167 Males and 22,696 Females-Census-2011).



2.2 Baseline Environmental Status

Considering the Environmental setting of the project, project activities and their interaction, environmental regulations and Standards, following Environmental Attributes (**Fig. 3.1**) have been included in EIA Study.

- ❖ Site specific Micrometeorological Data (hourly readings from the Site for a Season) on wind speed, wind direction (wind roses), temperature, humidity, cloud cover, atmospheric pressure, rainfall, etc.
- ❖ Ambient Air Quality Monitoring at 8 locations on 24-hourly basis, continuously for 2 days in a week for 4 weeks in a month for a season for all 12 parameters as per NAAQ Norms.
- ❖ Noise Level Measurements at all air quality monitoring station for Leq, Lday and Night values once in the season.
- ❖ Water Quality Monitoring – grab sampling once in the Season for :
Surface Waters (8 locations) as per CPCB Norms.
Ground Waters (8 Locations) as per IS:10500 Norms.
- ❖ Soil Quality Monitoring at 6 locations Land use pattern based on Satellite Imagery.
- ❖ Biotic Attributes for : Flora & Fauna.
- ❖ Socio-Economic Profile, based on 2011-Census.

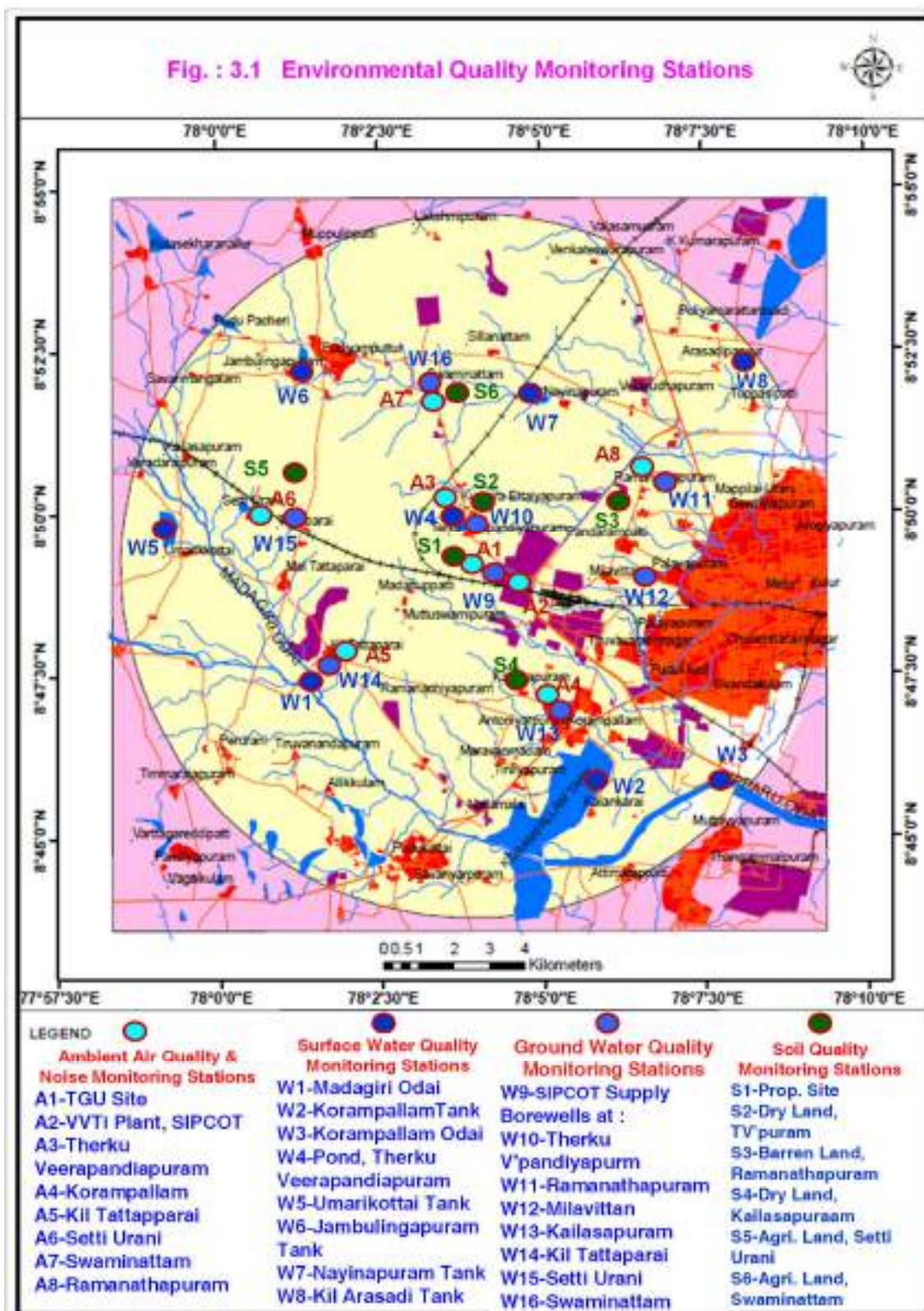
The summary of baseline status is given in **Table 2.1**.

Table : 2.1 Environmental Baseline Status

Envl. Component	Main Parameters	Minimum	Maximum	Mean	Desirable Norms
Ambient Air Quality, ug/m ³	PM2.5	11	37	22.9	60
	PM10	20	68	41.8	100
	SO ₂	6	22	12.5	80
	NO _x	8	28	15.0	80
Ambient Noise, dB(A)	Leq-Day	42.4	47.4	44.1	55
	Leq-Night	39.5	44.8	41.8	45
Surface Waters	TDS, mg/l	450	2200*	-	500/2100
Ground Waters	TDS, mg/l	280	800	-	500-2000
Soil Status	EC, mmhos/cm	1.24	1.63	-	0.2-0.5
	SAR	2.12	3.07	-	<5

*:- Tidal influenced.

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10- Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen; Leq-Day & Leq-Night - Equivalent Noise Levels during Day & Night Times; TDS-Total Dissolved Solids; EC-Electrical Conductivity & SAR-Sodium Absorption Ratio.



The findings of baseline environmental status of the study area are summarized below :

- ❖ Collected meteorological data during this season represented the local weather phenomena.
- ❖ Monitored ambient air quality in the study area was found to be in compliance with National Ambient Air Quality (NAAQ) 24-hourly Norms for Industrial, Residential, Rural and other areas.
- ❖ Ambient equivalent Noise Levels (Leq) during day and night times were found to be well within the MoEF&CC Norms for Residential Areas.
- ❖ The water quality of surface waters were found to be in compliance with CPCB/BIS Norms.
- ❖ The ground water quality was found to be in compliance with the IS:10500-2012 Norms.
- ❖ The soil in the study area would very well support vegetation after amending it suitably.
- ❖ There is no eco sensitive area exists in the study area and only domesticated animals exist.
- ❖ The basic amenities are available almost in all villages in the Study Area.

Thus, there is **adequate buffer** for the proposed Project in the physical, biological and edaphic environments of the study area.

3.0 Anticipated Environmental Impacts

Any Project would create impact on the environment in two distinct phases viz. Construction Phase which may be regarded as temporary & short term and Operation Phase which would have long term effects. Identification of all potential environmental impacts due to the Proposal are critically examined and major impacts (both **Beneficial & Adverse**) are studied. The impacts have been divided into two categories, viz. **Localised and Cumulative**. Localised Impact is confined to the area of influence of the Project and is not transmitted beyond its area. On the other hand, Cumulative Impact is aggregate impact of a number of projects on any component. Cumulative impacts can result from individually minor but collectively significant over a period of time.

Road transportation will be through National Highway-38 and SIPCOT Road to V V Ti Plant. Existing Traffic Volume at Site-SIPCOT Road Junction is computed and found to be 286 Passenger Car Units (PCUs). In the Post-Project Scenario, there will be an addition of 160 Vehicles (352 PCU/day) (in 2 ways) to the existing traffic. Cumulatively, the traffic volume in the Project vicinity will be 638 PCU/day. The existing Road & NH-38 is adequate to handle the proposed traffic volume due to the Project.

AERMOD View is used for the Prediction Modelling. The Model Inputs and Outputs are appended. The maximum incremental GLC for PM₁₀ is 0.23 ug/m³. The maximum impact is found to be confined locally i.e. within 0.1 km radius from the boundaries. Also, adequate Buffer Level exists in the Air Environment for the proposed activities.

The noise level within the plant building at a distance of one meter from the source shall be maintained at <85 db(A) for 8-hours exposure. Noise level at nearest plant boundary will be <55 dB(A) during day times and <45 dB(A) during night times. Thus, the noise levels will be well within the permissible MoEF&CC Norms for Residential Areas.

The total Water Demand of 30 KLD will be met from local Desalination Plant/water supply agencies and no ground water drawl will be there. There will be no trade effluent generation from the Unit. Domestic sewage to the tune of 2.5 KLD from the Unit will be biologically treated in Septic Tank of adequate size followed by a Dispersion Trench. Thus, '**Zero Effluent Discharge-ZLD**' will be adopted/practiced.

The dust collected from the various Air Pollution Control Measures like Bag Filters, etc. will be totally recycled in the process for cement manufacturing. Thus, no solid waste is envisaged from the process. Spent/waste Oil (Cat. 5.1) will be about 100 Lits./year which will be stored and sold to TNPCB Authorised Recyclers for recovery and further use. Filter Bags Scrap (20 kg/year) will also be generated which will be sold to Vendors.

An industrial worker may be exposed to five types of hazards, depending upon his occupation : Physical, Chemical, Biological, Mechanical and Psychosocial hazards. All efforts will be taken and followed to avoid the accidents and have a good 'Occupational Environment'.

4.0 Environmental Monitoring Programme

For effective implementations of Environmental Management Plan, ACPL will have the Environment Monitoring Cell headed by the Unit Head. The quality of air, noise, water, soil, etc. will be monitored at the identified locations as per MoEF&CC/TNPCB Norms by appointing an accredited external agency. The status reports will be submitted to MoEF&CC RO Monitoring Cell, SEIAA-TN and TNPCB periodically.

5.0 Additional Studies

There will be no handling of any hazardous chemicals in the Plant other than Fuel Storage viz. High Speed Diesel @ 0.5 KLD well within the Threshold Quantity of 2,500 Tonnes. Detailed Risk Assessment and mitigative measures are delineated and an effective Disaster Management Plan, for natural and man-made disasters, is also submitted.

6.0 Project Benefits

Environmental Benefits : Waste materials from other Industries like Fly Ash, Gypsum, etc. are beneficially utilised for cement manufacturing.

Social Benefits : The Grinding Unit will generate employment for about 50 people during the Construction Phase. About 150 persons get employment (50 Direct & 100 Indirect) during Operation Phase of the Project. About **2.5% of the Project Cost** will be earmarked for **Corporate Environment Responsibility (CER)** Works as well as for addressing Public Hearing issues.

Financial Benefits : The Project will bring Rs.23.00 crores investment in the Region. There will be a positive impact due to the proposal, by way of employment, better socioeconomic conditions, improved local and regional economy, etc.

7.0 Environmental Management Plan

An Environmental Management Plan (EMP) is formulated for mitigation of adverse impacts on the environment :

Construction Phase :-

- ❖ It shall be ensured that no change due to the constructions to the hydrology/natural drainage of the area.
- ❖ All the top soil excavated shall be stored and maintained for use for Green Belt development.
- ❖ Construction materials like sand, stone chips, etc. shall be obtained only from approved quarries.
- ❖ Proper placement of construction machineries shall be ensured to eliminate vibrations & noise.
- ❖ All construction machinery items shall be well lubricated to reduce noise.
- ❖ High Speed Diesel with low sulphur content shall be used for running the construction machineries.
- ❖ Cement handling shall be supervised properly to check fugitive emissions.
- ❖ Carrying of plastic and other nutrient locking materials shall be banned totally.
- ❖ Empty cement bags, debris, etc. shall not be disposed off at the site. They shall be collected and disposed off properly in scientific manner as per Norms/Guidelines.
- ❖ The labours for the construction works shall be pooled from the local public.
- ❖ Adequate drinking water and sanitary facilities shall be provided for construction workers.
- ❖ PPEs shall be provided to the construction workers. Protection devices viz. ear plugs/ear muffs shall be provided to the workers during welding works.
- ❖ The safe disposal of wastewater and solid wastes generated during Construction Phase shall be ensured.
- ❖ On completion of construction, all debris and extraneous materials shall be cleared off and no residuals should be left at the site.
- ❖ Adequate measures shall be taken to avoid any traffic congestion near entry and exit points.
- ❖ Periodical monitoring of environmental parameters shall be carried out during the Construction Phase as per TNPCB Norms to have a cross check and a data base.

Operation Phase :-**Air Quality:-**

- ❖ Adequate air pollution control systems viz. Bag Filters, etc. shall be installed in the Cement Mills & Packers to control PM emissions <30 mg/Nm³.
- ❖ Inside the Plant, all materials transfer shall be through closed conveyor belts.
- ❖ Adequate dust extraction systems shall be installed at various transfer points.
- ❖ The dust collected from all APC Equipments shall be totally recycled in the process.
- ❖ Fully covered sheds shall be provided for Gypsum storage.
- ❖ Silos shall be provided for Clinker, Fly Ash & Cement storages.
- ❖ Suction arrangements with suitably designed Bag Filters shall be provided at Silos to arrest the fugitive emissions.
- ❖ Dense Phase Pneumatic Handling System for receiving and conveying Fly Ash.
- ❖ All the roads in the Plant shall be paved/concreted.
- ❖ Good House Keeping will reduce the Fugitive Emissions from the Plant.
- ❖ The periodical evaluation for the efficiency performance of Bag Filters shall be carried out.
- ❖ Fugitive emissions due to storage, transportation, etc. and the leakages and spillages shall be continuously monitored and controlled.
- ❖ Periodical Ambient Air Quality and Stack Emissions shall be undertaken and the Status Reports shall be submitted to the Authorities as required.
- ❖ Charter on Corporate Responsibility for Environmental Protection (CREP) Guidelines for Fugitive Emission Control in Cement Industries shall be fully complied.

Traffic Volume:-

- ❖ Dedicated Truck Parking Area shall be earmarked and shall be fully concreted.
- ❖ No overloading of transport vehicles with materials shall be permitted.
- ❖ Loaded trucks shall be covered with tarpaulin.
- ❖ Vehicles with valid 'Pollution under Control' Certificates shall be allowed.

Noise Levels:-

- ❖ The design features of machineries shall ensure low noise levels in the working areas.
- ❖ Noise generating sources would be maintained properly to minimise noise and vibrations.
- ❖ All rotating items shall be well lubricated.
- ❖ For all fans, compressors etc. vibration isolators shall be provided to reduce noise.
- ❖ Provision of silencers shall be made wherever possible.
- ❖ The operators shall be provided with necessary safety and protection equipment like ear plugs, ear muffs etc.
- ❖ Periodical Noise monitoring shall be undertaken and Status Reports shall be submitted.

Water Environment :-

- ❖ No ground water shall be drawn for the Project.
- ❖ Source of water shall be RO Plant supply as proposed.
- ❖ No trade effluent shall be discharged from the Plant.

- ❖ The domestic sewage from the Plant shall be treated effectively so as to meet the TNPCB Discharge Norms.
- ❖ 'Zero Effluent Discharge' shall be practiced.
- ❖ Periodical monitoring for specific parameters shall be done regularly.
- ❖ Effective Rain Water Harvesting Systems shall be adopted and harvested water shall be utilized for the industrial needs.

Land Environment

- ❖ There shall be no industrial solid waste from the Plant.
- ❖ Waste Oil shall be collected and sold to the CPCB/TNPCB Authorised Agency for further treatment & disposal.
- ❖ The municipal wastes shall be collected, transported, treated in a landfill (composting) within the Plant vicinity to make use of it as manure for Green Belt.

Biological Environment

- ❖ Green Belt (33% Coverage) shall be developed and maintained effectively.
- ❖ Local species and fruit bearing trees shall be preferred.

Social Measures

- ❖ As per the Companies Act 2013, Companies should spend at least 2% of the Profit after Tax of the previous year for CSR activities but not lower than 2% of average of previous three years Profit after Tax.
- ❖ ACPL shall carry out various Social Measures for the local as well as regional populations as per CSR Norms.

Plastic Waste Management :- There will be ban on one time use and throw away Plastic usage in the Plant in compliance with Tamil Nadu, Environment and Forests (EC-2) Department, G.O.(D) No. 84 dated 25.06.2018. ACPL will encourage the use of eco friendly alternatives.

EMP Budget : The **Project Cost is Rs.23.00 crores**. A budgetary allotment of Rs.5.00 crores has been made as Capital Cost for EMP Measures and Rs.10.00 lakhs per annum towards Operating Cost.

12.0 Disclosure of Consultants

The EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-9 (Cement Plants) for Category 'A' by NABET vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of the List) which will be extended by NABET periodically. ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2024 with validity till 02.04.2026. ACPL has utilized the services of M/s.Ensyscon, Chennai for coordination of the Study.

ABC comprises a team of highly talented professionals, who work in sync with clients ensuring that the defined assessment and survey or reporting is executed with high level of efficiency. The proficient team consists of Environmentalists, Policy makers, Geologists, Chemists, Engineers, Industrial hygienists, Technicians, Research Associates, Sociologists and others with expertise in various key areas.

ABC has a proven successful track record of working with industry & institutions and in executing multi faceted projects funded by organizations like World Bank, UNDP, MoEFCC, amongst others. ABC Techno labs India Private Ltd has laid down new benchmarks in all its areas of strategic operations by the dedicated team of outstanding professionals and client-centric approach, clearly evident by the accomplishments/ clients list.

The **accredited Sectors and approved Experts** of ABC are appended.


**QUALITY COUNCIL
OF INDIA**
Creating an Ecosystem for Quality



**National Accreditation Board
for Education and Training**



Certificate of Accreditation

ABC Techno Labs India Private Limited, Chennai
 ABC Tower, 400, 13th Street, SIDCO Industrial Estate, North Phase, Ambattur, Chennai 600098

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	Off-shore 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 including pelletisation	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	Leather/skin/hide processing industry	15	4 (f)	A
10	Chemical fertilizers	16	5 (a)	A
11	Petro-chemical complexes	16	5 (c)	A
12	Petrochemical based processing	20	5 (e)	A
13	Synthetic organic chemicals industry	21	5 (f)	A
14	Distilleries	22	5 (g)	A
15	Integrated paint industry	23	5 (j)	B
16	Sugar industry	25	5 (j)	B
17	Oil & gas transportation pipeline, passing through national parks/sanctuaries/coral reefs / ecologically sensitive areas including LNG terminal	27	6 (a)	A
18	Airports	29	7 (a)	A
19	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	31	7 (c)	A
20	Ports, harbours, break waters and dredging	33	7 (e)	A
21	Highways	34	7 (f)	A
22	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
23	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
24	Building and construction projects	38	8 (a)	B
25	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 June 09, 2023 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/ENN/MCO/23/2795 dated July 11, 2023. The accreditation needs to be renewed before the expiry date by ABC Techno Labs India Private Limited, Chennai following due process of assessment.


Sr. Director, NABET
 Dated: July 11, 2023

Certificate No.
NABET/EIA/2225/RA 0290

Valid up to
Nov 16, 2025

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

		National Accreditation Board for Testing and Calibration Laboratories
CERTIFICATE OF ACCREDITATION		
ABC TECHNO LABS INDIA PRIVATE LIMITED		
has been assessed and accredited in accordance with the standard		
ISO/IEC 17025:2017		
"General Requirements for the Competence of Testing & Calibration Laboratories"		
for its facilities at		
ABC TOWER, NO 400, 13TH STREET, SIDCO INDUSTRIAL ESTATE-NORTH PHASE, AMBATTUR, CHENNAI, TAMIL NADU, INDIA		
in the field of		
TESTING		
Certificate Number:	TC-5770	
Issue Date:	03/04/2024	Valid Until: 02/04/2026
This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL. (To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)		
Name of Legal Entity: ABC Techno Labs India Private Limited		
Signed for and on behalf of NABL		
	 N. Venkateswaran Chief Executive Officer	



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Assessment (SA) [↓](#) (../FAQ(SA).pdf) Re-Accreditation (RA) [↓](#) (../FAQ(RA).pdf)

ABC Techno Labs India Private Limited (formerly known as ABC Environ Solutions Pvt. Ltd.)

S No	Name	Type	Designation	Sector	FA	Rei
1	Dr Devi Velusamy	In House	TM/FAE	33 Ports, harbours, break waters and dredging,38 Building and construction projects	WP,EB	
2	Dr Geetha S	In House	FAE		SE	
3	Dr Hemambika Balakrishnan	In House	FAE		EB	
4	Dr M Sangeetha	In House	EIA Coordinator	1. Mining of minerals including opencast/ underground mining,23 Integrated paint industry,38 Building and construction project,39. Townships and Area development projects,15 Leather/skin/hide processing industry	NV,AP	

S No	Name	Type	Designation	Sector	FA	Rei
5	Dr Mohit Kumar Ray	Empanelled	EIA Coordinator	4. Thermal power plants,10. Petroleum refining industry,18.Petrochemical complexes,20. Petrochemical based processing	RH,SHW,AQ	
6	Dr Muthiah Mariappan	In House	EIA Coordinator	4. Thermal power plants,15.Leather/skin/hide processing industry,16 Chemical fertilizers,10.Petroleum refining industry	AP,WP	SH
7	Dr N Rama Krishnan	In House	EIA Coordinator	33. Ports, harbours, break waters and dredging	LU ,SE	
8	Dr R K Jayaseelan	In House	EIA Coordinator	1. Mining of minerals including opencast/ underground mining,21. Synthetic organic chemicals industry,Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZ Special economic zones (SEZs), Biotech parks, Leather complexes,37.Common Municipal Solid Waste Management Facility (CMSWMF),39. Townships and Area development projects	LU,HG,WP	SH
9	Dr R Parmasivam	In House	EIA Coordinator	31. Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZ Special economic zones (SEZs), Biotech parks, Leather complexes,36. Common Effluent Treatment Plants (CETPs)	HG,WP	

S No	Name	Type	Designation	Sector	FA	Rei
10	Dr S Veezhinathan	In House	EIA Coordinator	1. Mining of minerals including opencast/ underground mining,8.Metallurgical industries (ferrous & non-ferrous),27. Oil & gas transportation pipeline, passing through national parks/ sanctuaries/coral reefs / ecologically sensitive areas including LNG terminal,31.Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZ Special economic zones (SEZs), Biotech parks, Leather complexes,39. Townships and Area development projects	Nuclear power projects and processing of nuclear fuel,Geo,HG	
11	Mr Abhik Saha	In House	EIA Coordinator	2. Offshore and onshore oil and gas exploration, development & production,21. Synthetic organic chemicals industry,22 Distilleries,9. Cement Plants,29. Airports	AP,WP,EB	SH
12	Mr Arijit Panja	In House	FAE		AP,NV,LU	WF
13	Mr K R Haneesh	Empanelled	EIA Coordinator	36. Common Effluent Treatment Plants (CETPs),37. Common Municipal Solid Waste Management Facility (CMSWMF),38. Building and construction projects,39.Townships and Area development projects	AP,WP,NV	

S No	Name	Type	Designation	Sector	FA	Rei
14	Mr K Sekar	Empanelled	EIA Coordinator	1. Mining of minerals including opencast/ underground mining,7. Mineral beneficiation including pelletisation,9. Cement Plants,31. Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZ Special economic zones (SEZs), Biotech parks, Leather complexes,33. Ports, harbours, break waters and dredging		
15	Mr Mohammad Akhtar	Empanelled	EIA Coordinator	29 Airports,34. Highways,38. Building and construction projects	AP,AQ	
16	Mr P Swamirajan	Empanelled	EIA Coordinator	34. Highways		
17	Mr Vinod Kumar Gautam	Empanelled	EIA Coordinator	29. Airports		
18	Mr Wriddhi Pratim Bose	In House	EIA Coordinator	2 Offshore and onshore oil and gas exploration, development & production,23 Integrated paint industry,38 Building and construction project,39. Townships and Area development projects	WP	SH
19	Ms Kavita Zog	Empanelled	EIA Coordinator	3. River Valley projects,4. Thermal power plants,22. Distilleries,25. Sugar Industry,39. Townships and Area development projects	EB,SW,WP	
20	Ms Vaishnavi Dhinakaran	In House	EIA Coordinator	38 Building and construction projects	WP	SH

1.1.2 Functional Area Experts (FAEs)

Sl. No	Name	Functional Areas (FAs)			Cat.	Remarks
		Applied	Recommended	Approved		
Empanelled						
1	K. Sekar	AP	-	-	-	Candidature withdrawn
		WP	-	-	-	
		AQ	-	-	-	
		RH	-	-	-	

Note: The followings will be communicated to the ACO by NABET

- Detailed Observations (if any)
- Result of balance candidate/s (If any)

The meeting ended with a vote of thanks to the Chair.

This is issued as per the approval of minutes of the meeting dated September 21, 2021.

Issued by

(A K Jha)
Senior Director
QCI-NABET

Abbreviations:

ACO	-	Accredited Consultant Organization
AC	-	Accreditation Committee
IA	-	Initial Accreditation
SA	-	Surveillance Assessment
RA	-	Re-Accreditation
EC	-	EIA Coordinator
FA	-	Functional Area
FAE	-	Functional Area Expert
FAA	-	Functional Area Associate
CA	-	Continue by Assessment
CWA	-	Continue with alert



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ABC Techno Labs India Private Limited (formerly known as ABC Environ Solutions Pvt. Ltd.)

S No	Name	Type	Designation	Sector	FA	Remarks	Scan QR
1	Ratnakumar V Mudliar	Empanelled	EC,FAE	2(A),21(A),32(A),37(B),39(B)	SHW(A),SC(A),WP(A)		
2	Abhik Saha	In House	EC,FAE	2(A),9(A),12(A),21(B),22(A)	WP(A),EB(A),AP(B),SHW(A)		
3	Dr. R. K Jayaseelan	In House	EC,FAE	1(B),31(B),39(B),21(A),37(B)	LU(A),WP(A),HG(A),SHW(A)		
4	Dr. R. Paramasivam	In House	EC,FAE	31(A),36(A)	WP(A),HG(A)		
5	Dr.Mohit Kumar Ray	Empanelled	EC	10(A),18(A),4(a),20(A),27(A)			
6	Geetha S	In House	,FAE		SE(B)		
7	Haneesh Paniker	Empanelled	EC,FAE	34(B),36(B),37(B),38(B),39(B)	AP(B),WP(B),NV(B)		
8	K Sekar	Empanelled	EC	1 (A),7(A),9(A),31(A),33(A)		Opencast mining only	

S No	Name	Type	Designation	Sector	FA	Remarks	Scan QR
9	Kavitha Zog	Empanalled	EC,FAE	3(A),4(B),22(A),25(B),39(B)	SHW(B),WP(B),EB(B)		
10	M.S Bhaskar	Empanelled	EC,FAE	1(A),2(A),7(B),21(A)	Geo(A),HG(A),LU(A),NV(B)	Onshore only for sector-2. Opencast mining only for sector-1.	
11	Muthiah Mariappan	Empanelled	EC,FAE	4(A),10(A),15(A),16(A),29(A)	SHW(A),AP(A),WP(A)		
12	P Swamiraj	Empanalled	EC	34(A)			
13	R Rajendran	Empanalled	EC,FAE	8(B),38(B),39(B),29(A)	SHW(B),AP(B),N(B),SC(B)		
14	Shankar N Gajbhiye	Empanalled	EC	27(A),33(A)			
15	Sushil Mishram	In House	,FAE		SE(A)		
16	Vaishnavi Dhinakaran	In House	,FAA		SHW,WP		
17	Vijayalakshmi K	Empanalled	EC,FAE	28(B),39(B),4(a),21(A)	NV(A),RH(A),AQ(A)		
18	Vinod Kumar Gautam	Empanelled	EC,FAE	29(A),38(B),28(B),21(A),34(A)	SHW(A),AQ(A),RH(A)		
19	Vivek P Navare	Empanalled	EC,FAE	1(A)	NV(A)		



தமிழ்நாடு தமில்நாடு TAMILNADU

ARIMA CEMENTS PRIVATE LIMITED.

Thoothukudi.

CH 941178

LNo. 2/2005

தமிழ்நாடு-3

தமிழ்நாடு

9 DEC 2021

LEASE AGREEMENT

THIS AGREEMENT TO LEASE made on 09th day of December 2021 at Tisaiyanvillai between M/s.V.V. MINERAL partnership firm, having its principal place of business at 17C, Kecerakaranthattu, Tisaiyanvillai - 627657, represented by its Partner Sri. S.VAIKUNDARAJAN S/o. Sri.ASV. Subbiah Nadar, herein after referred to as the "LESSOR" and M/s.ARIMA CEMENTS PRIVATE LIMITED., a body corporate having its Registered Office at No. 1/38A, East Street, South Veerapandiypuram, Thoothukudi - 628002, hereinafter referred to as the "LESSEE", represented by its Director Sri.V. SUBRAMNIAN S/o. Sri. S. Vaikundarajan witnesseth as follows:

For V.V.MINERAL


Partner
(LESSOR)

For ARIMA CEMENTS PRIVATE LIMITED


Director
(LESSEE)

WHEREAS the LESSOR is the absolute owner of the land at Survey No.399/IB PART - Hec.4.05, Therdku Veerapandiyapuram village, Tuticorin (more particularly described in the Schedule A hereunder written), herein after referred to as the demised premises.

It is now hereby agreed between the parties as follows:

1. The lease shall be for a period of 33 years with an option to the LESSEE to continue the lease thereafter for a further period mutually agreed upon.
2. The LESSEE shall however, have the liberty to vacate the premises at any time during the period of lease by giving 3 months notice in writing.
3. The LESSEE shall use the said premises as per the Lease Rent shown in the Schedule.
4. The LESSEE shall not be entitled to sublet the demised premises. The lease is restricted to the use of LESSEE alone and is neither transferable nor intended to be transferable and shall be used only for the business purpose of the LESSEE.
5. The LESSEE shall have the liberty to construct buildings as is necessary for their business purpose in the demised premises. The construction and the maintenance cost of such building including the insurance are to be borne by the LESSEE.
6. The necessary approvals for building construction and carrying out the business operations in the demised premises from various government authorities can be obtained by the LESSEE.
7. The LESSEE shall have the absolute and exclusive right to use the entire space in demised premises.
8. The LESSEE shall have the right to remove at the time of vacating the said premises, all electrical fittings and fixtures, partitions and all other furniture put up by it.

For ARIMA CEMENTS PRIVATE LIMITED

 Director
 (LESSEE)

(PAGE-3)

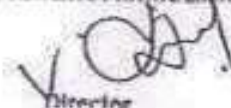
169

9. The buildings erected on the demised premises will be given by the LESSEE to the LESSOR at the time of vacating without any consideration.
10. The LESSEE shall be liable to pay all taxes, rates, cess, Electricity and water charges and other levies, if any charged there in respect of the said land and the proposed building due to State Government, Central Government or other local authorities.
11. The LESSEE shall handover possession of the said premises to the LESSOR on the expiry of the period of lease fixed herein or on the expiry of the period of option, should the LESSEE avail itself of the same, in the same state and condition as on the date of occupation but subject to natural wear and tear due to ordinary use and lapse of time.

For V.V. MINERAL


Partner
(LESSOR)

For ARIMA CEMENTS PRIVATE LIMITED


Director
(LESSEE)

SCHEDULE A OF THE PROPERTY

Land situated in Tuticorin Registration District, Ottapidaram Sub Registrar Office, Ottapidaram Taluk, south Veerapandiapuram Village, Punja Survey No.399/1B PART - Hec.4.05 (Acres 10), this area situated in new M/s.ARIMA CEMENTS PRIVATE LIMITED.

SCHEDULE OF LEASE RENT

S.NO.	Year		Amount
	From	To	
1	1	5	100000
2	6	10	110000
3	11	15	120000
4	16	20	130000
5	21	25	140000
6	26	30	150000
7	31	33	160000

In witness whereof the parties hereto have set their hands the 09th day of December 2021..

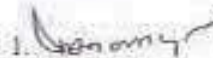
For V.V.MINERAL


Partner
(LESSOR)

For ARIMA CEMENTS PRIVATE LIMITED


Director
(LESSEE)

WITNESS:

1.  (J. THANABALAN)
239 - MAIN ROAD,
ARUMKANDI
TUTICORIN DISTRICT
2.  (T. DURAISINGH)
106, Teachers' Colony I,
Muthupers Nagar,
Near Govt Engg College,
Tirumelveli - 627007.

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU), hereinafter referred to as the Memorandum, made and entered into on January 25, 2022, between PIONEER CEMENT INDUSTRIES & ARIMA CEMENTS PRIVATE LIMITED.

M/S PIONEER CEMENT INDUSTRIES, P.O. Box: 4423, Al Ghail Industrial Park, Ras Al Khaimah, UAE Phone number +97172584333 Commercial no. 21922.

Hereinafter referred to as Seller

AND

M/S ARIMA CEMENTS PRIVATE LIMITED, No.1/38-A, East Street, Therkuvempandipuram, Thoothukudi, Tamilnadu-628002. Phone +91 4612340622, Email: info@arimacement.com.

Hereinafter referred to as the Buyer

WHEREAS Seller agrees to sell and deliver, and Buyer agrees to purchase, accept delivery of and pay for Cement Clinker on the terms and conditions set out in this memorandum.

NOW THIS MEMORANDUM WITNESSETH AS FOLLOWS:

COMMODITY

Cement Clinker deliverable here under shall be from Oman in bulk, Oman, UAE.

QUANTITY

Seller shall deliver and Buyer shall purchase Clinker following quantity.

Buyer may have the option to lift 18,000 MTs /Month at a fixed Price.

PRICE

USD 35 PMT on FOP price RAK Port, UAE and this is present price which may vary according to the Market fluctuations globally.

DELIVERY SCHEDULE

To be delivered as per Buyer's Schedule.

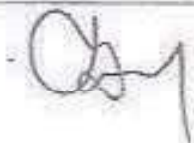
172

QUALITY DETERMINATION

The Quality of Clinker to be supplied hereunder shall be with the following typical specifications determined and analyzed as per ASTM /ISO standard by mutually agreed independent inspection agency. All percentages used refer to percentage by weight.

Specifications: -

Description	Units	Results
Chemical Analysis		
Silicon Dioxide (SiO ₂)	%	21.58
Aluminium Oxide (Al ₂ O ₃)	%	5.25
Ferric Oxide (Fe ₂ O ₃)	%	3.82
Calcium Oxide (CaO)	%	65.63
Magnesium Oxide (MgO)	%	1.61
Sulphuric Anhydride (SO ₃)	%	0.50
Alkalies as Sodium (Na ₂ O+0.658*K ₂ O)	%	0.57
Loss on Ignition (LOI)	%	0.17
Insoluble Residue (IR)	%	0.25
Tri Calcium Silicate (C ₃ S)	%	57.31
Di Calcium Silicate (C ₂ S)	%	18.64
Tri Calcium Aluminate (C ₃ A)	%	7.45
Tetra Calcium Aluminio Ferrite (C ₄ AF)	%	11.63
Free Lime	%	1.25
Chlorides	%	0.01

✓ 



QUANTITY DETERMINATION

The certified weight shall be cross checked at the Buyer's weighbridge. And Buyer's weighbridge weight shall be final and binding on both parties.

QUALITY DETERMINATION

The method of sampling and analysis shall be as per ASTM/ISO standard.

The consignment should be accompanied by certificate of sampling and analysis as per ASTM/ISO standard.

Buyer's QC laboratory result is final.

PAYMENT

Payment to be guaranteed by the Buyer 100% payment to be done after 30 days subject to buyer's QC approval.

LIABILITY

Overall liability in aggregate shall be 100% of the contract price.

TAX

Extra as applicable.

INSURANCE

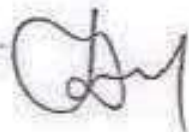
Seller shall at his or her own expense, arrange for suitable insurance to cover the material shipped to buyer premises.

FORCE MAJEURE

A Party shall not be liable for any failure of or delay in the performance of this Memorandum for the period that such failure or delay is due to causes beyond its reasonable control, including but not limited to acts of God, War, Strikes or labor disputes, embargoes, government orders or any other force majeure event.

ARBITRATION

Any controversy claim or dispute in respect of the construction of Memorandum or arising out of relating in any manner to the provisions of this contract or the breach thereof will be settled amicably. The arbitration shall take place in Tuticorin, Tamilnadu and the language of the arbitration shall be in English.

✓ 



174

SUSPENSION AND TERMINATION

Any disputes can be sorted out after mutual discussions if needed without any loss of any party at the time of Termination within a reasonable period of time given by the other party concerned.

CONFIDENTIALITY

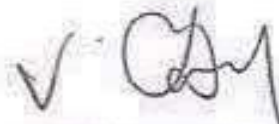
This Agreement is confidential and shall not be disclosed except to appropriate governmental entities, unless otherwise.

ENTIRE AGREEMENT

This Memorandum contains the entire agreement between Buyer and Seller in relation to the sales purchase of Cement Clicker and supersedes all prior negotiation, understanding and agreements whether written or oral in relation to the contract.

IN WITNESS WHEREOF the parties hereto have caused this Memorandum to be duly executed as of the day and Year first above written.

Signed for and on behalf of
Arima Cements Private Limited

✓ 
V. SUBRAMANIAN
DIRECTOR
(Authorized Signatory)



Signed for and on behalf of
Mr. Ajit Kumar Mishra
Commercial Manager
Pioneer Cement Industries


(Authorized Signatory)

Signed at Thoothukudi.





தமிழ்நாடு தமில்நாடு TAMILNADU

ARIMA CEMENTS PRIVATE
LIMITED

Tuticorin

M. S. J. CN 371633

100

18-01-2022

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU), hereinafter referred to as the Memorandum, made and entered into on 18-01-2022 between

M/S JVP & SONS, S/50-A1, Abirami Nagar, Muthiahpuram, Thoothukudi, Tamil Nadu 628005 South India, Phone number 0461 2355346. Email id jvpsons@gmail.com

Hereinafter referred to as Seller

AND

M/S ARIMA CEMENTS PRIVATE LIMITED, No.1/38-A, East Street, Therkuveerapandiapuram, Thoothukudi, Tamilnadu-628002, Phone -91 4612340622, Email: info@arimacements.com.

Hereinafter referred to as the Buyer

For JVP & SONS


PARTNER

For ARIMA CEMENTS PRIVATE LIMITED


Authorized Signatory



WHEREAS Seller agrees to sell and deliver and Buyer agrees to purchase, accept delivery of and pay for Gypsum on the terms and conditions set out in this memorandum.

NOW THIS MEMORANDUM WITNESSETH AS FOLLOWS :

COMMODITY

Gypsum deliverable hereunder shall be from M/S JVP & SONS in bulk, Abirami Nagar, Mathialapuram, Tuticorin District.

QUANTITY

Seller shall deliver and Buyer shall purchase Gypsum following quantity.

Buyer may have the option to lift 750 MTs /Month at a fixed Price.

PRICE

Rs 550 PMT on Basic price and this is present price which may vary according to the Market fluctuations globally.

DELIVERY SCHEDULE

To be delivered as per Buyer's Schedule.

QUALITY DETERMINATION

The Quality of Gypsum to be supplied hereunder shall be with the typical specifications determined and analysed as per ASTM /ISO standard by mutually agreed independent inspection agency. All percentages used refer to percentage by weight.

QUANTITY DETERMINATION

The certified weight shall be cross checked at the Buyer's weighbridge. And Buyer's weighbridge weight shall be final and binding on both parties.

QUALITY DETERMINATION

The method of sampling and analysis shall be as per ASTM/ISO standard.

The consignment should be accompanied by certificate of sampling and analysis as per ASTM/ISO standard.

Buyer's QC Laboratory result is final.

PAYMENT

Payment to be guaranteed by the Buyer. 100% payment to be done after 30 days subject to buyer's QC approval.

LIABILITY

Overall liability in aggregate shall be 100% of the contract price.

TAX

Extra as applicable.

INSURANCE

Seller shall at his or her own expense, arrange for suitable insurance to cover the material shipped to buyer premises.

For JVP & SONS


PARTNER

FOR ABIRAMI CEMENTS PRIVATE LIMITED


Authorized Signatory



FORCE MAJEURE

A Party shall not be liable for any failure of or delay in the performance of this Memorandum for the period that such failure or delay is due to causes beyond its reasonable control, including but not limited to acts of God, War, Strikes or labour disputes, embargoes, government orders or any other force majeure event.

ARBITRATION

Any controversy, claim or dispute in respect of the construction of Memorandum or arising out of relating in any manner to the provisions of this contract or the breach thereof will be settled amicably. The arbitration shall take place in Tuticorin, Tamilnadu and the language of the arbitration shall be in English.

SUSPENSION AND TERMINATION

Any disputes can be sorted out after mutual discussions if needed without any loss of any party at the time of Termination within a reasonable period of time given by the other party concerned.

CONFIDENTIALITY

This Agreement is confidential and shall not be disclosed except to appropriate governmental entities, unless otherwise.

ENTIRE AGREEMENT

This Memorandum contains the entire agreement between Buyer and Seller in relation to the sales purchase of Gypsum and supersedes all prior negotiation, understanding and agreements whether written or oral in relation to the contract.

IN WITNESS WHEREOF the parties hereto have caused this Memorandum to be duly executed as of the day and Year first above written.

Signed for and on behalf of

JVP & SONS
For JVP & SONS


PARTNER
(Authorized Signatory)

Signed for and on behalf of

Arima Cements Private Limited
For ARIMA CEMENTS PRIVATE LIMITED


Authorized Signatory
V. SUBRAMANIAN
DIRECTOR



Signed at Thoothukudi.



தமிழ்நாடு தமில்நாடு TAMILNADU

ARIMA CEMENTS CEMENTS

Thoothukudi.

PRIVATE LIMITED.

CH 941179

R. சந்திரன் (த.வீ)

L.No. 2/2005

சாத்திரம்-3

தாள்:

9 DEC 2021

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU), hereinafter referred to as the Memorandum, made and entered into on 18-01-2022 between

M/S Sundar Pozzo., 4/154-1, Maravanmadam, Thoothukudi - 628 008, Tamil Nadu, South India. Email id marketing@sundarpozso.com.

Hereinafter referred to as Seller

AND

M/S ARIMA CEMENTS PRIVATE LIMITED., No.1/38-A, East Street, Therkaveerapandiapuram, Thoothukudi, Tamilnadu-628002. Phone +91 4612340622, Email: info@arimacements.com.

Hereinafter referred to as the Buyer

SUNDAR POZZO

9/12/21

Proprietor

For ARIMA CEMENTS PRIVATE LIMITED

Authorized Signature



WHEREAS Seller agrees to sell and deliver and Buyer agrees to purchase, accept delivery of and pay for Fly Ash on the terms and conditions set out in this memorandum.

NOW THIS MEMORANDUM WITNESSETH AS FOLLOWS :

COMMODITY

Fly Ash deliverable hereunder shall be from M/S Sundar Pozzo in bulk, Maravannadam, Tuticorin District.

QUANTITY

Seller shall deliver and Buyer shall purchase Fly Ash following quantity.

Buyer may have the option to lift 7500 MTs /Month at a fixed Price.

PRICE

Rs900 PMT on deliverable price and this is present price which may vary according to the Market fluctuations globally.

DELIVERY SCHEDULE

To be delivered as per Buyer's Schedule.

QUALITY DETERMINATION

The Quality of Fly Ash to be supplied hereunder shall be with the typical specifications determined and analysed as per ASTM /ISO standard by mutually agreed independent inspection agency. All percentages used refer to percentage by weight.

QUANTITY DETERMINATION

The certified weight shall be cross checked at the Buyer's weighbridge. And Buyer's weighbridge weight shall be final and binding on both parties.

QUALITY DETERMINATION

The method of sampling and analysis shall be as per ASTM/ISO standard.

The consignment should be accompanied by certificate of sampling and analysis as per ASTM/ISO standard.

Buyer's QC laboratory result is final.

PAYMENT

Payment to be guaranteed by the Buyer 100% payment to be done after 30 days subject to buyer's QC approval.

LIABILITY

Overall liability in aggregate shall be 100% of the contract price.

TAX

Extra as applicable.

INSURANCE

Seller shall at his or her own expense, arrange for suitable insurance to cover the material shipped to buyer premises.

SUNDAR POZZO

[Signature]
Proprietor

For ARIMA CEMENTS PRIVATE LIMITED

[Signature]
Authorized Signatory



FORCE MAJEURE

180

A Party shall not be liable for any failure of or delay in the performance of this Memorandum for the period that such failure or delay is due to causes beyond its reasonable control, including but not limited to acts of God, War, Strikes or Labour disputes, embargoes, government orders or any other force majeure event.

ARBITRATION

Any controversy, claim or dispute in respect of the construction of Memorandum or arising out of or relating in any manner to the provisions of this contract or the breach thereof will be settled amicably. The arbitration shall take place in Tuticorin, Tamilnadu and the language of the arbitration shall be in English.

SUSPENSION AND TERMINATION

Any disputes can be sorted out after mutual discussions if needed without any loss of any party at the time of Termination within a reasonable period of time given by the other party concerned.

CONFIDENTIALITY

This Agreement is confidential and shall not be disclosed except to appropriate governmental entities, unless otherwise.

ENTIRE AGREEMENT

This Memorandum contains the entire agreement between Buyer and Seller in relation to the sales purchase of Fly Ash and supersedes all prior negotiation, understanding and agreements whether written or oral in relation to the contract.

IN WITNESS WHEREOF the parties hereto have caused this Memorandum to be duly executed as of the day and Year first above written.

Signed for and on behalf of

SUNDAR POZZO

Proprietor

(Authorized Signatory)

Signed for and on behalf of

Arima Cements Private Limited

For ARIMA CEMENTS PRIVATE LIMITED

Authorized Signatory**V. SUBRAMANIAN**
DIRECTOR

Signed at Thoothukudi.

அ-பதிவேடு விவரங்கள்

மாஸ்டர் : தரத்திற்கு

மாட்டம் : ஓட்டப்போடும்

கிராமம் : தெற்கு விவசாய அமைதி

1. புல எண்	299	9. மண் வயலாண்டு எண்	4 - 2
2. உட்கிரேவு எண்	56	10. மண் தரம்	3
3. மரபுவழி அல்லது உட்கிரேவு எண்	-1F	11. திறமை (சு - மென்)	2.77
4. பகுதி	-	12. பரப்பளவு (மீட்டர் - மீட்டர்)	8 - 25.50
5. கால / மரபுவழி	மரபுவழி	13. மரபுவழி திறமை (சு - மென்)	12.31
6. மரபுவழி வகை	மரபுவழி	14. பட்டி எண்	883
7. மரபுவழி ஆய்வு	-	15. குறிப்பு	-
8. திரு. மரபுவழி	-	16. மரபுவழி	1. மரபுவழி மரபுவழி

குறிப்பு 1:



மேற்கண்ட தகவல் / தரத்திற்கு தகவல் விவரங்கள் மின் பதிவேட்டில் உள்ளது. மேற்கண்ட தகவல் <http://eservices.tn.gov.in> என்ற இணைய தளத்தில் 70019 என்ற குறிப்பு எண்ணை உள்ளிட்டு சென்று உறுதி செய்து கொள்ளவும்.



GOVERNMENT OF INDIA
MINISTRY OF CORPORATE AFFAIRS
Central Registration Centre

Certificate of Incorporation

[Pursuant to sub-section (2) of section 7 and sub-section (1) of section 8 of the Companies Act, 2013 (18 of 2013) and rule 18 of the Companies (Incorporation) Rules, 2014]

I hereby certify that ARIMA CEMENTS PRIVATE LIMITED is incorporated on this Seventh day of December Two thousand twenty-one under the Companies Act, 2013 (18 of 2013) and that the company is limited by shares.

The Corporate Identity Number of the company is U26999TN2021PTC148417.

The Permanent Account Number (PAN) of the company is AAWCA2200P *

The Tax Deduction and Collection Account Number (TAN) of the company is MR1A05613G *

Given under my hand at Manesar this Seventh day of December Two thousand twenty-one.



Digital Signature Certificate

Pankaj Srivastava

DEPUTY REGISTRAR OF COMPANIES

For and on behalf of the Jurisdictional Registrar of Companies

Registrar of Companies

Central Registration Centre

Disclaimer: This certificate only evidences incorporation of the company on the basis of documents and declarations of the applicant(s). This certificate is neither a license nor permission to conduct business or solicit deposits or funds from public. Permission of sector regulator is necessary wherever required. Registration status and other details of the company can be verified on www.mca.gov.in.

Mailing Address as per record available in Registrar of Companies office:

ARIMA CEMENTS PRIVATE LIMITED
1/38A, EAST STREET, THERKUVVEERAPANDIYAPURAM,,
THOOTHUKUDI, Thoothukudi, Tamil Nadu, India, 628002



* as issued by the Income Tax Department

Company Master Data

CIN	U26999TN2021PTC148417
Company Name	ARIMA CEMENTS PRIVATE LIMITED
ROC Code	RoC-Chennai
Registration Number	148417
Company Category	Company limited by Shares
Company SubCategory	Non-govt company
Class of Company	Private
Authorised Capital(Rs)	15000000
Paid up Capital(Rs)	15000000
Number of Members(Applicable in case of company without Share Capital)	0
Date of Incorporation	07/12/2021
Registered Address	1/38A, EAST STREET THERKUVVEERAPANDIYAPURAM, THOOTHUKUDI Thoothukudi TN 628002 IN
Address other than R/o where all or any books of account and papers are maintained	-
Email Id	finance@vvgroup.biz
Whether Listed or not	Unlisted
ACTIVE compliance	-
Suspended at stock exchange	-
Date of last AGM	-
Date of Balance Sheet	-
Company Status(for e-filing)	Active

Charges

Assets under charge	Charge Amount	Date of Creation	Date of Modification	Status
No Charges Exists for Company/LLP				

Directors/Signatory Details

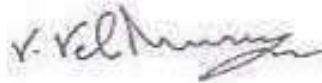
DIN/PAN	Name	Begin date	End date	Surrendered DIN
00794541	SUBRAMANIAN	07/12/2021	-	
02400199	VELMURUGAN	07/12/2021	-	
07585154	HARIHARAN	07/12/2021	-	
09125323	SUNDARAJAN	07/12/2021	-	

EXTRACT OF THE RESOLUTION PASSED AT THE BOARD MEETING OF
THE BOARD OF DIRECTORS OF ARIMA CEMENTS PRIVATE LIMITED
HELD ON MARCH 28TH, 2022 AT THE REGISTERED OFFICE OF THE
COMPANY

*RESOLVED THAT the Board do hereby appoint Mr. V Subramanian, Director having DIN no. 00794541 as Authorised Signatory for applying Environment Clearance under EIA Notification 2006 for the Company and to sign and submit various document electronically and/or physically and to make applications, representations, modifications or alterations on behalf of the Company before the State Level EIA Authority – Tamil Nadu as and when required.

//CERTIFIED TRUE COPY//

For, ARIMA CEMENTS PRIVATE LIMITED



(V. VELMURUGAN)

Director