

DRAFT ENVIRONMENTAL IMPACT

ASSESSMENT REPORT

**FOR THE PROPOSED MANUFACTURING OF INORGANIC &
COMPLEX INORGANIC COLORED PIGMENTS
(6850 TPA)**

Promoted By

M/s. ULTRAMARINE & PIGMENTS LIMITED

Located at

**Plot No. 38,39,40,41,42,43,44,46,47,50,51,52 & 53,
Kannudaiyanpatti Village,
SIPCOT Industrial Park,
Manapparai Taluk,
Tiruchirappalli District, Tamil Nadu.**

**Project Schedule No.: 5 (f) - Synthetic Organic Chemicals Industry
Category: B1**

ToR Letter No.: TO25B2412TN5665268N dated 17.10.2025

Study Period: March to May 2025

Baseline Study done by: M/s. Enviro Care India Private Limited

NABL Certificate: TC-6226 Validity: 28.11.2025

Project Type: Greenfield Project

Project Cost: Rs. 110.19 Crores

Land Area: 32.72 Acres (13.24 Hectares)

Prepared By

M/s. Enviro Care India Private Limited

Certificate No.: NABET/EIA/24-27/RA 0406

Project Identification Code: ECI/21/25-26/001

Submitted to

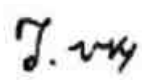
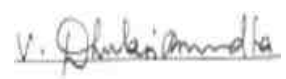
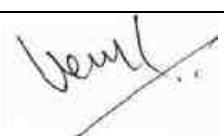
Tamil Nadu Pollution Control Board (TNPCB), Tiruchirappalli.

December 2025

DECLARATION OF EXPERTS

Declaration by Experts contributing to the Environmental Impact Assessment report for the Proposed Chemical Manufacturing unit of Inorganic Pigments (5500 TPA) and Complex Inorganic Coloured Pigments (1350 TPA) by M/s. ULTRAMARINE & PIGMENTS LIMITED to be located at Plot No. 38,39,40,41,42,43,44,46,47,50,51,52&53 in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.

We, hereby, certify that we were part of the EIA team in the following capacity that developed the above EIA report,

Functional Areas	Name of Expert	Involvement (Period & Task)	Signature
HG (A), LU (A), WP (A), NV (B)	Dr. S. Rajamohan	March to May 2025 (Hydrology, Land-Use, Water Pollution, Noise)	
AP (B), AQ (B), RH (A), SC (B)	Mr. A. Nedunchezhian	March to May 2025 (Air Pollution, Air Quality Modeling, Risk and Hazards, Soil Conservation)	
AP (B), AQ (B), SHW (B)	Mr. J. Vivek	March to May 2025 (Air Pollution, Air Quality Modeling, Solid and Waste Generation)	
WP (B), EB (A)	Dr. G. Thirumaran	March to May 2025 (Water Pollution, Ecology & Biodiversity)	
AQ (B), WP (B)	Ms. R. Suby	March to May 2025 (Air Quality Modeling, Water Pollution)	
SE (A)	Dr. V. Dhulasi Birundha	March to May 2025 (Socio-Economic Environment)	
GEO (A)	Mr. V. Venkateshwarlu	March to May 2025 (Geology)	

Declaration by the Head of the Accredited Consultant Organization

I, Dr. S. Rajamohan, hereby, confirm that the above-mentioned experts prepared the Environmental Impact Assessment report for **M/s. ULTRAMARINE & PIGMENTS LIMITED** for the Proposed Chemical Manufacturing unit of Inorganic Pigments (5500 TPA) and Complex Inorganic Coloured Pigments (1350 TPA) to be located at Plot No. 38,39,40,41,42,43,44,46,47,50,51,52&53 in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.

I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature	
Name	Dr. S. Rajamohan
Designation	Managing Director
Name of the Organization	M/s. Enviro Care India Private Limited
NABET Certificate No. & Issue Date	NABET/EIA/24-27/RA 0406 10.06.2025

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TERMS OF REFERENCE



File No: 12654
Government of India
Ministry of Environment, Forest and Climate Change
(Issued by the State Environment Impact Assessment Authority(SEIAA),
TAMIL NADU)



Dated: 17/10/2025



To,

Thiru SENTHIL KUMAR
M/s. Ultramarine and Pigments Limited
Thirumalai House, Road No.29, Near Sion Hill Fort, Sion (East), MUMBAI, MAHARASHTRA,
400022
psp@ultramarinepigments.net

Subject: Grant of Terms of Reference under the provision of the EIA Notification 2006,as amended -regarding.

Sir/Madam,

Sub: SEIAA-TN – Terms of Reference (ToR) with Public Hearing for the Proposed Manufacturing of Inorganic & Complex Inorganic Coloured Pigments located at Plot No. 38, 39, 40, 41, 42, 43, 44, 46, 47, 50, 51, 52 & 53, Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu by M/s. Ultramarine and Pigments Limited– under Category “B1” and Schedule Sl. No. 5(f) - “Synthetic Organic Chemicals Industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)” of EIA Notification 2006 – ToR with Public Hearing - issued – Preparation of EIA Report – Regarding.

Ref: 1. Online Application No. SIA/TN/IND3/549634/2025, Dated: 25/08/2025

2. Minutes of the 624th meeting of SEAC-II held on 24.09.2025

3. Minutes of the 901st meeting of SEIAA held on 10.10.2025.

2. The particulars of the proposal are as below:

(i) TOR Identification No.	TO25B2412TN5665268N
(ii) File No.	12654
(iii) Clearance Type	TOR
(iv) Category	B1
(v) Project/Activity Included Schedule No.	5(f) Synthetic organic chemicals industry Proposed Manufacturing of Inorganic & Complex Inorganic Colored Pigments by M/s. ULTRAMARINE & PIGMENTS LIMITED located at Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli
(vii) Name of Project	

(viii) Name of Company/Organization	District, Tamil Nadu.
(ix) Location of Project (District, State)	ULTRAMARINE & PIGMENTS LIMITED TIRUCHIRAPPALLI, TAMIL NADU
(x) Issuing Authority	SEIAA
(xi) Applicability of General Conditions	yes
(xii) Applicability of Specific Conditions	no

1. In view of the particulars given in the Para 1 above, the project proposal interalia including Form-1 (Part A and B) were submitted to the SEIAA for an appraisal by the SEAC under the provision of EIA notification 2006 and its subsequent amendments.

2. The above-mentioned proposal has been considered by SEIAA in the meeting held on 10.10.2025. The minutes of the meeting and all the Application and documents submitted [(viz. Form-1 Part A, Part B.)] are available on PARIVESH portal which can be accessed by scanning the QR Code above.

3. The State Expert Appraisal Committee (SEAC), based on the information & clarifications provided by the project proponent and after detailed deliberations on all technical aspects recommended the proposal for grant of Terms of Reference under the provision of EIA Notification, 2006 and as amended thereof subject to the stipulation of specific and general conditions as detailed in Annexure (2).

4. The SEIAA has examined the proposal in accordance with the Environment Impact Assessment (EIA) Notification, 2006 & further amendments thereto and after accepting the recommendations of the SEAC hereby decided to issue the following Terms of Reference for instant proposal of M/s. Ultramarine and Pigments Limited under the provisions of EIA Notification, 2006 and as amended thereof.

5. The Ministry/SEIAA-TN reserves the right to stipulate additional conditions, if found necessary.

6. The Terms of Reference to the aforementioned project is under provisions of EIA Notification, 2006. It does not tantamount to approvals/consent/permissions etc. required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals /clearances under any other Acts/ Regulations or Statutes, as applicable, to the project.

7. This issues with the approval of the Competent Authority.

8. The TORs with public hearing 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-LA-II(1)(part) dated 29th August, 2017.

Copy To

1. The Additional Chief Secretary to Government, Environment, Climate Change and Forests Department, 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 - 110 032.
3. The Chairman, 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.
5. Monitoring Cell, IA Division, Ministry of Environment, Forests & CC, Paryavaran Bhavan, CGO Complex, New Delhi - 110 003.
6. The District Collector, Kancheepuram District.
7. Stock File.

Annexure 1

Specific Terms of Reference s for (Synthetic Organic Chemicals Industry)

1. Seiaa Specific Conditions :

S. No	Terms of Reference
1.1	1. The toxic fumes anticipated due to the project activities. 2. The Persistent Organic Pollutants (POPs) anticipated and their quantities. 3. The possibilities of biomagnification. 4. Impact on human health, biodiversity, food chain, atmosphere and water resources because of the POPs emitted from project activity. 5. Impact on soil, soil biota and vegetation. 6. Impact on climate change. 7. Carbon sequestration strategies adopted. 8. Smart technologies adopted to improve energy efficiency. 9. Occupational Health & safety details shall be furnished. 10. Impact on wildlife, mammals, fishes and possibilities of behavioural change because of the pollutants emitted. 11. CO₂ emission and action for containing it. 12. Anticipated Green House Gas emissions and mitigation strategies.

Additional Terms of Reference

SEAC SPECIFIC CONDITIONS :

1. The PP shall submit details regarding the suitability of the proposed activity, along with a report that includes information on the machinery, flow chart of the operation, storage of raw materials, storage of products, air pollution, water pollution, fugitive emissions and their control, and waste management.
2. The PP shall conduct a soil test at the proposed site and submit a report on any potential leaching of harmful / heavy chemicals due to the proposed activity.
3. The PP shall furnish the mass balance for the product.
4. The PP shall provide the commercial names of the raw materials and specify the form in which the raw materials will be purchased.
5. The PP shall furnish the MSDS along with chemical structure for each raw material to be utilized for manufacturing the product.
6. The PP shall generate/buy green energy for a minimum of 50% of its total power consumption.
7. The PP shall provide roof top solar panel to cover 75% of its roof area.
8. The PP shall develop 33% green belt with native tree species all along the periphery of project boundary with geo reference and furnish the details with photographs in the EIA report.
9. The PP shall furnish a comparative study of energy efficiency in its plant vis a vis the global standards.
10. The PP shall furnish the details of all Air pollution control measures to be provided to control the emissions to be generated from its manufacturing process at various stages.
11. The PP shall furnish the emergency/disaster management plan.
12. The PP shall furnish the fire license obtained from the competent authority.
13. The PP shall provide the DG set details with eco-friendly alternate fuel other than diesel.
14. The PP shall furnish all the Hazardous wastes and Non-hazardous solid wastes to be generated from its manufacturing process and how its disposed scientifically.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

5(f): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR SYNTHETIC ORGANIC CHEMICALS INDUSTRY (DYES & DYE INTERMEDIATES; BULK DRUGS AND INTERMEDIATES EXCLUDING DRUG

FORMULATIONS; SYNTHETIC RUBBERS; BASIC ORGANIC CHEMICALS, OTHER SYNTHETIC ORGANIC CHEMICALS AND CHEMICAL INTERMEDIATES) PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

A. STANDARD TERMS OF REFERENCE (TOR)

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 (quantative) from raw material to products to be provided

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 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 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)

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, 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. Landuse 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.

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.

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 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 / 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 SYNTHETIC ORGANIC CHEMICALS INDUSTRY (DYES & DYE INTERMEDIATES; BULK DRUGS AND INTERMEDIATES EXCLUDING DRUG FORMULATIONS; SYNTHETIC RUBBERS; BASIC ORGANIC CHEMICALS, OTHER SYNTHETIC ORGANIC CHEMICALS AND CHEMICAL INTERMEDIATES)

1. Details on solvents to be used, measures for solvent recovery and for emissions control.

2. Details of process emissions from the proposed unit and its arrangement to control.

3. Ambient air quality data should include VOC, other process-specific pollutants* like NH₃*, chlorine*, HCl*, HBr*, H₂S*, HF*, etc., (*-as applicable)

4. Work zone monitoring arrangements for hazardous chemicals.

5. Detailed effluent treatment scheme including segregation of effluent streams for units adopting 'Zero' liquid discharge.

6. Action plan for odour control to be submitted.

7. A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous waste generated.

8. Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.

9. Action plan for utilization of MEE/dryers salts.

10. Material Safety Data Sheet for all the Chemicals are being used/will be used.

11. Authorization/Membership for the disposal of solid/hazardous waste in TSDF.

12. Details of incinerator if to be installed.

13. Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan for handling &

safety system to be incorporated.

14. Arrangements for ensuring health and safety of workers engaged in handling of toxic materials.

In addition to the above, the following shall be furnished: -

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 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) CER 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. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
- f. Where the documents provided are in a language other than English, an English translation should be provided.
- g. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
- h. As per the circular no. J-11011/618/2010-IA. II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate

Change, as may be applicable

i. 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 should also be followed.

j. 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 OM No.J-11013/41/2006-IA-II(I)(part) dated 29th August 2017.



Compliance for Terms of Reference

S. No.	ToR Point	Compliance
1.1 SITE SPECIFIC CONDITIONS		
1.	The toxic fumes anticipated due to the project activities.	The details are given in Chapter IV (Section 4.11)
2.	The Persistent Organic Pollutants (POPs) anticipated and their quantities.	The proposed project involves manufacturing of inorganic and complex inorganic-colored pigments. Hence, no POPs are anticipated, and the quantity is Nil.
3.	The possibilities of biomagnification.	The details are given in Chapter VII (Section 7.4)
4.	Impact on human health, biodiversity, food chain, atmosphere and water resources because of the POPs emitted from project activity.	The proposed project does not involve any activities leading to the generation or emission of Persistent Organic Pollutants (POPs). Consequently, no adverse impact on human health, biodiversity, food chain, atmospheric quality, or water resources is anticipated due to POPs.
5.	Impact on soil, soil biota and vegetation.	The details are given in Chapter IV (Section 4.12)
6.	Impact on climate change.	The details are given in Chapter IV (Section 4.13)
7.	Carbon sequestration strategies adopted.	The details are given in Chapter VII (Section 7.5)
8.	Smart technologies adopted to improve energy efficiency.	The details are given in Chapter II (Section 2.10.3)
9.	Occupational Health & safety details shall be furnished.	The details are given in Chapter VII (Section 7.6)
10.	Impact on wildlife, mammals, fishes and possibilities of behavioural change because of the pollutants emitted.	The details are given in Chapter IV (Section 4.14)
11.	CO ₂ emission and action for containing it.	The details are given in Chapter IV (Section 4.15)
12.	Anticipated Green House Gas emissions and mitigation strategies.	The details are given in Chapter IV (Section 4.16)
SEAC SPECIFIC CONDITIONS		
1.	The PP shall submit details regarding the suitability of the proposed activity, along with a report that includes information on the machinery, flow chart of the operation, storage of raw materials, storage of products, air pollution, water pollution, fugitive emissions and their control, and waste management.	The details are given in Chapter II (Section 2.7, 2.9)
2.	The PP shall conduct a soil test at the proposed site and submit a report on any potential leaching of harmful / heavy chemicals due to the proposed activity.	The details are given in Annexure I
3.	The PP shall furnish the mass balance for the product.	The details are given in Chapter II (Figure 7)
4.	The PP shall provide the commercial names of the raw materials and specify the form in which the raw	The details are given in Chapter II (Table 4)

S. No.	ToR Point	Compliance
	materials will be purchased.	
5.	The PP shall furnish the MSDS along with chemical structure for each raw material to be utilized for manufacturing the product.	Given in Annexure IX
6.	The PP shall generate/buy green energy for a minimum of 50% of its total power consumption.	We ensure that we buy green energy for a minimum of 50% of its total power consumption
7.	The PP shall provide roof top solar panel to cover 75% of its roof area.	We ensure to provide roof top solar panel to cover 75% of its roof area.
8.	The PP shall develop 33% green belt with native tree species all along the periphery of project boundary with geo reference and furnish the details with photographs in the EIA report.	Greenbelt will be developed inside the factory premises covering a total area of about 4.37 Hectares (33.01% of total area), planning to plant 6500 trees.
9.	The PP shall furnish a comparative study of energy efficiency in its plant vis a vis the global standards.	Given in Annexure V
10.	The PP shall furnish the details of all Air pollution control measures to be provided to control the emissions to be generated from its manufacturing process at various stages.	The details are given in Chapter II (Section 2.9.1)
11.	The PP shall furnish the emergency/disaster management plan.	The details are given in Chapter VII (Section 7.2)
12.	The PP shall furnish the fire license obtained from the competent authority.	We ensure to obtain fire license from the competent authority.
13.	The PP shall provide the DG set details with eco-friendly alternate fuel other than diesel.	The details are given in Chapter II (Section 2.9.1)
14.	The PP shall furnish all the Hazardous wastes and Non-hazardous solid wastes to be generated from its manufacturing process and how its disposed scientifically.	The details are given in Chapter II (Section 2.9.4, 2.9.5)
Standard Terms of Reference for Synthetic Organic Chemical Industry		
1. Executive Summary		
1.1	Executive Summary	
2. INTRODUCTION		
2.1	Details of the EIA Consultant including NABET accreditation	The details are given in Chapter XII (Section 12.1-12.5)
2.2	Information about the project proponent	The details are given in Chapter I (Section 1.2)
3. PROJECT DESCRIPTION		
3.1	Cost of project and time of completion.	The details are given in Chapter II (Section 2.5.7)
3.2	Products with capacities for the proposed project. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	The details are given in Chapter II (Section 2.5.1)
3.3	List of raw materials required and their source along with mode of transportation.	The details are given in Chapter II (Section 2.5.5)
3.4	Other chemicals and materials required with quantities and storage capacities	The details are given in Chapter II (Section 2.5.5, Table 5)
3.5	Details of Emission, effluents, hazardous waste generation and their management. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power	The details are given in Chapter II (Section 2.5 – 2.9)

S. No.	ToR Point	Compliance
	requirement (regular and contract)	
3.6	Process description along with major equipment's and machineries, process flow sheet (quantitative) from raw material to products to be provided.	The details are given in Chapter II (Section 2.7)
3.7	Hazard identification and details of proposed safety systems.	The details are given in Chapter VII (Section 7.1, 7.2)
3.8	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 08th June, 2022 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 shall be attached with the EIA-EMP report.	Not applicable as it is greenfield project.
	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 as it is greenfield project.
4. SITE DETAILS		
4.1	Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	The details are given in Chapter II (Section 2.3)
4.2	A toposheet of the study area of radius of 10 km 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)	The details are given in Chapter II (Figure 2)
4.3	Co-ordinates (lat-long) of all four corners of the site. Google map-Earth downloaded of the project site. 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.	The details are given in Chapter II (Table 1)
4.4	Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.	Given in Annexure VII
4.5	Land use break-up of total land of the project site (identified and acquired), government/ private -	The details are given in Chapter II (Section 2.5.2)

S. No.	ToR Point	Compliance
	agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area).	
4.6	A list of major industries with name and type within study area (10km radius) shall be incorporated.	Given in Annexure IV.
4.7	Details of Drainage of the project up to 10km 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).	The details are given in Chapter III (Figure 17)
4.8	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	The land required for the project is fully acquired through SIPCOT allotment, and the project can commence without delay regarding land availability.
4.9	R&R details in respect of land in line with state Government policy.	This project does not involve R&R.
5. FOREST & WILDLIFE RELATED ISSUES (If Applicable)		
5.1	Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)	Not Applicable for this project
5.2	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).	Not Applicable for this project
5.3	Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	Not Applicable for this project
5.4	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.	Not Applicable for this project
5.5	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	Not Applicable for this project
5.6	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.	Not Applicable for this project
6. ENVIRONMENTAL STATUS		
6.1	Determination of atmospheric inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	The details are given in Chapter III (Section 3.2)
6.2	AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters	The details are given in Chapter III (Section 3.2.3, Table 18)

S. No.	ToR Point	Compliance
	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.	
6.3	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.	Given in Annexure X
6.4	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.	The details are given in Chapter III (Section 3.4, Table 24)
6.5	Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.	No, the site does not fall near to polluted stretch of river identified by the CPCB/MoEF&CC.
6.6	Ground water monitoring at minimum at 8 locations shall be included.	The details are given in Chapter III (Section 3.4, Table 23)
6.7	Noise levels monitoring at 8 locations within the study area.	The details are given in Chapter III (Section 3.4, Table 21)
6.8	Soil Characteristic as per CPCB guidelines.	The details are given in Chapter III (Section 3.5, Table 26)
6.9	Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	The details are given in Chapter IV (Section 4.10)
6.10	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.	The details are given in Chapter III (Section 3.6)
6.11	Socio-economic status of the study area.	The details are given in Chapter III (Section 3.9)
7. IMPACT AND ENVIRONMENT MANAGEMENT PLAN		
7.1	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 Modeling 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 modeling 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.	The details are given in Chapter IV (Section 4.2)
7.2	Water Quality modeling - in case of discharge in water body	Not applicable for this project
7.3	Impact of the transport of the raw materials and	The details are given in Chapter IV

S. No.	ToR Point	Compliance
	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.	(Section 4.17)
7.4	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.	Given in Annexure VI
7.5	Details of stack emission and action plan for control of emissions to meet standards.	The details are given in Chapter X (Section 10.6)
7.6	Measures for fugitive emission control	The details are given in Chapter X (Section 10.7)
7.7	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.	The details are given in Chapter II (Section 2.9.5) The copies of MOU are attached in Annexure VIII
7.8	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	Not applicable for this project
7.9	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.	The details are given in Chapter II (Section 2.9.6)
7.10	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.	The details are given in Chapter VII (Section 7.3)
7.11	Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.	The details are given in Chapter X (Table 81)
7.12	Action plan for post-project environmental monitoring shall be submitted.	The details are given in Chapter VI (Section 6.6)
7.13	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.	The details are given in Chapter VII (Section 7.2)
8. OCCUPATIONAL HEALTH		
8.1	Plan and fund allocation to ensure the occupational health & safety of all contract and	The details are given in Chapter VII (Section 7.6)

S. No.	ToR Point	Compliance
	casual workers.	
8.2	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.	The proposed project is in the planning stage and no construction or operational activities have commenced. Accordingly, no workers are presently engaged, and exposure-specific health monitoring data is not available at this stage.
8.3	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.	The details are given in Chapter VII (Section 7.6.6)
8.4	Annual report of health status of workers with special reference to Occupational Health and Safety.	The proposed project is yet to commence construction and operational activities. As on date, no workforce is deployed, and therefore, an annual health status report of workers is not applicable at this stage.
9. CORPORATE ENVIRONMENTAL POLICY		
9.1	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.	Given in Annexure III
9.2	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.	Given in Annexure III
9.3	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.	Given in Annexure III
9.4	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.	Given in Annexure III
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.		The details are given in Chapter VII (Section 7.6.7)
11. ENTERPRISE SOCIAL COMMITMENT (ESC)		
11.1	Adequate funds (at least 2.5 % of the project cost) shall be ear marked 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	The details are given in Chapter X (Table 82)

S. No.	ToR Point	Compliance
	development activities need to be elaborated upon.	
11.2	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 there of and compliance/ATR to the notice(s) and present status of the case.	Not Applicable for this project
11.3	A tabular chart with index for points wise compliance of above TOR.	Complied
B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR SYNTHETIC ORGANIC CHEMICALS INDUSTRY		
1.	Details on solvents to be used, measures for solvent recovery and for emissions control.	There are no solvents used in this project.
2.	Details of process emissions from the proposed unit and its arrangement to control.	The details are given in Chapter X (Section 10.6)
3.	Ambient air quality data should include VOC, other process-specific pollutants* like NH ₃ *, chlorine*, HCl*, HBr*, H ₂ S*, HF*, etc., (*-as applicable)	The details are given in Chapter III (Section 3.2.3)
4.	Work zone monitoring arrangements for hazardous chemicals.	The details are given in Chapter VI (Section 6.8)
5.	Detailed effluent treatment scheme including segregation of effluent streams for units adopting 'Zero' liquid discharge.	Given in Annexure VI
6.	Action plan for odour control to be submitted.	The details are given in Chapter X (Section 10.8)
7.	A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous waste generated.	Not Applicable for this project
8.	Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.	Not Applicable for this project
9.	Action plan for utilization of MEE/dryers salts.	The ATFD salt will be used as a raw material or Disposal through authorized recycling facility.
10.	Material Safety Data Sheet for all the Chemicals are being used/will be used.	Given in Annexure IX
11.	Authorization/Membership for the disposal of solid/hazardous waste in TSDF.	We have made MOU with designated authorized recycling facility. Given in Annexure VIII
12.	Details of incinerator if to be installed.	Not Applicable for this project
13.	Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan for handling & safety system to be incorporated.	The details are given in Chapter VII (Section 7.1.11)
14.	Arrangements for ensuring health and safety of workers engaged in handling of toxic materials.	The details are given in Chapter VII (Section 7.1.12)
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).	Will be complied
2.	Products and capacities. If expansion proposal	Will be complied

S. No.	ToR Point	Compliance
	then existing products with capacities and reference to earlier EC.	
3.	Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative)	Will be complied
4.	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.	Will be complied
5.	Measures for mitigating the impact on the environment and mode of discharge or disposal.	Will be complied
6.	Capital cost of the project, estimated time of completion.	Will be complied
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)	Will be complied
8.	Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population	Will be complied
9.	Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.	Will be complied
10.	Likely impact of the project on air, water, land, flora-fauna and nearby population	Will be complied
11.	Emergency preparedness plan in case of natural or in plant emergencies	Will be complied
12.	Issues raised during public hearing (if applicable) and response given	Will be complied
13.	CSR plan with proposed expenditure.	Will be complied
14.	Occupational Health Measures	Will be complied
15.	Post project monitoring plan	Will be complied

CHAPTER I

INTRODUCTION

1.1 Purpose of the Report

Environmental Impact Assessment (EIA) is systematic process to identifying, predicting, evaluating and mitigating the biophysical, social and other relevant environmental effects due to the proposed developmental project. It plays a vital role in providing information for decision-making on the environmental consequences of project. It promotes environmentally sound and sustainable development through the identification appropriate enhancement and mitigation measures.

It is the responsibility of the company to document the associated positive and negative impacts, so that the attempts can be made to minimize the effects due to the negative impacts and maximize the benefits due to the positive impacts. In this regards, Environmental Impact Assessment (EIA) have been considered as the most important documentation in understanding the environmental implications and safeguarding the environment.

1.2 Identification of Project and Project Proponent

About the project

M/s. Ultramarine & Pigments Limited is a Proposed Chemical Manufacturing unit of Inorganic Pigments (5500 TPA) and Complex Inorganic Coloured Pigments (1350 TPA) to be located at Plot No. 38,39,40,41,42,43,44,46,47,50,51,52&53 in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.

As per the Ministry of Environment, Forests & Climate Change, New Delhi Notification, dated 14th September, 2006 and its subsequent amendments, Synthetic Organic Chemical industries located in notified industrial area are classified under 5(f) - Category B1. In order to obtain Environmental Clearance for the industry, Form - I, Pre-Feasibility Report along with online application of proposal no. SIA/TN/IND3/549634/2025 vide File no. 12654 have been submitted to the State Environmental Impact Assessment Authority (SEIAA). A presentation has been made before the State Expert Appraisal Committee (SEAC) on 24th September, 2025 for the

approval of TOR for EIA study. Accordingly, TOR letter has been issued vide TO25B2412TN5665268N dated 17th October, 2025. The EIA report has been prepared in accordance with the TOR issued by the SEIAA.

M/s. Enviro Care India Private Limited, which is accredited by NABET, Quality Council of India for conducting EIA studies for Synthetic Organic Chemical Industries, have prepared Environmental Impact Assessment (EIA) report for this industry.

This report furnishes the details of location of Site, Description of the project, prevailing baseline status w.r.t Air Environment, Water Environment, Noise Environment, Land Environment, Flora & Fauna and Socio-economic environment. This report also helps in identification of environmental impacts and suggesting mitigation measures to be followed during Construction and Operation of the project as part of Environmental Management Plan. This report also acts as guidance manual for the proponent for following the Environmental Management Plan (EMP) and for adopting post project Environmental Monitoring Program as per statutory norms.

About Project Proponent

M/s. Ultramarine and Pigments Limited is a top manufacturer of inorganic pigments and surfactants. With a rich history of over 60 years, they have been consistently delivering high-quality products and exceptional technological expertise. UPL operates manufacturing facilities in Chennai, & Ranipet Tamil Nadu, the new facility at Naidupet, Andhra Pradesh, as well as two ITES divisions.

Now, the proponent is proposing a Chemical Manufacturing Unit for a production of Inorganic Pigments (5500 TPA) & Complex Inorganic Colored Pigments (1350 TPA) in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District. The name and designation of the proponent is Mr. G.R. Senthilkumar, Whole Time Director.

1.3 Brief Description

1.3.1 Nature of the project

The project aims to establish a chemical manufacturing unit, producing inorganic pigments (5500 TPA) and complex inorganic-colored pigments (1350 TPA). This project is as an industrial chemical manufacturing activity (Synthetic Inorganic Chemicals) under the EIA Notification, 2006, falling under Category B1, with advanced environmental safeguards, zero liquid discharge, and sustainable operation within SIPCOT's designated industrial area.

1.3.2 Size of the Project

The proposed project by M/s. Ultramarine & Pigments Limited is planned over a total land area of 32.72 acres (13.24 hectares). The project is designed for a total production capacity of 6850 tonnes per annum (TPA), comprising:

- Inorganic Pigments: 5500 TPA
- Complex Inorganic Colored Pigments: 1350 TPA

The unit will include dedicated production blocks, raw material storage areas, utility blocks (boiler, thermic fluid heater, DG sets), ETP with ATFD for ZLD, administrative building, and greenbelt development.

1.3.4 Location of the Project

The proposed project will be located at Plot No. 38,39,40,41,42,43,44,46,47,50,51,52&53 in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu. The site is situated within the SIPCOT Industrial Park, which is a designated industrial area developed by the Government of Tamil Nadu for promoting non-polluting and medium to large-scale industries. The location offers well-developed infrastructure, including internal roads, water supply, stormwater drainage, and power connectivity from TNEB. The area is well connected by road and rail, with Manapparai town located approximately 7 km northeast of the project site and Tiruchirappalli city about 45 km east. The nearest railway station is Manapparai Railway Station (7 km), and the nearest airport is Tiruchirappalli International Airport (48 km).

1.3.5 Importance of the Project

Pigments play a crucial role in multiple industries such as paints, plastics, rubber, ceramics, inks, coatings, textiles, and construction materials. The proposed project will strengthen the chemical manufacturing base of Tamil Nadu and contribute to India's self-reliance in pigment production, reducing dependence on imports.

The project will generate direct employment for about 80 persons and indirect employment opportunities in transportation, maintenance, packaging, and support services. The project's location within SIPCOT ensures that local manpower can be engaged, thereby contributing to rural industrialization and livelihood enhancement in and around Manapparai.

The unit is designed with advanced pollution control systems, including Zero Liquid Discharge (ZLD), high-efficiency scrubbers, and bag filters to minimize emissions and waste generation. This ensures compliance with CPCB and TNPCB norms, setting an example for environmentally responsible industrial practices. The project's commitment to adopting cleaner production technologies will also help in promoting sustainable industrial development.

The project will stimulate local economic activities by increasing demand for construction materials, utilities, and ancillary services. It will also improve local infrastructure and promote industrial development in the SIPCOT Industrial Park. The pigments produced will cater to domestic and international markets, enhancing India's export potential for specialty chemical products.

1.4 Scope of the Study

The scope of work includes a detailed characterization of the environment in an area of 10 km radius of the project site for various environmental parameters like Air, Water, Noise, Land, Biological and Social-economic aspects. Public Hearing for our project to be conducted as per provision of the EIA Notification 2006 and its subsequent

amendments. The EIA Report is prepared in accordance with the Terms of Reference issued by the State Environmental Impact Assessment Authority (SEIAA).

Generic Structure of the Environmental Impact Assessment (EIA) report as per the EIA notification of the MoEF&CC, dated 14th September 2006 is detailed below:

- Chapter 1 - Introduction
- Chapter 2 - Project Description
- Chapter 3 - Description of the Environment
- Chapter 4 - Anticipated Environmental Impact & Mitigation Measures
- Chapter 5 - Analysis of Alternatives (Technology & Site)
- Chapter 6 - Environmental Monitoring Program
- Chapter 7 - Additional Studies
- Chapter 8 - Project Benefits
- Chapter 9 - Environmental Cost – Benefit Analysis
- Chapter 10 - Environmental Management Plan (EMP)
- Chapter 11 - Summary & Conclusion
- Chapter 12 - Disclosure of Consultant Engaged

The EIA report provides a comprehensive assessment of environmental impacts, proposing suitable mitigation and management measures to ensure compliance with environmental regulations. The study ensures that the project is designed, constructed, and operated in an environmentally sustainable manner with minimal adverse effects on air, water, soil, flora, fauna, and the local community.

CHAPTER II

PROJECT DESCRIPTION

2.1 Type of the Project

The proposed project is a greenfield industrial project for the manufacturing of Inorganic Pigments (5500 TPA) and Complex Inorganic Colored Pigments (1350 TPA) by M/s. Ultramarine & Pigments Limited at Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.

The project falls under Schedule 5(f) – Synthetic Organic Chemicals Industry (Dyes & Pigments) of the EIA Notification, 2006 and its subsequent amendments.

2.2 Need for the Project

The need for this project arises from the growing domestic and international demand for high-performance inorganic pigments, driven by rapid expansion in paints, coatings, plastics, rubber, ceramics, and construction industries. The pigments industry is a vital link in the manufacturing chain for multiple downstream sectors that rely on color stability, opacity, and weather resistance. The establishment of this pigment manufacturing facility will:

- Strengthen the domestic supply chain for inorganic pigments.
- Support local and regional economies through employment and infrastructure development.
- Promote environmentally responsible manufacturing with advanced pollution control systems.
- Contribute to Tamil Nadu's industrial growth in alignment with national sustainability goals.

Hence, the proposed project is justified in view of its economic viability, industrial relevance, and environmental sustainability.

2.3 Location of the Project Site

The proposed project will be located at Plot No. 38,39,40,41,42,43,44,46,47,50,51,52&53 in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu. The nearest major human settlement is Manapparai (6 km). The nearest railway station and airport are Sundaraperumal Koil station (2.42 km) and Trichy Airport (67.36 km) respectively.

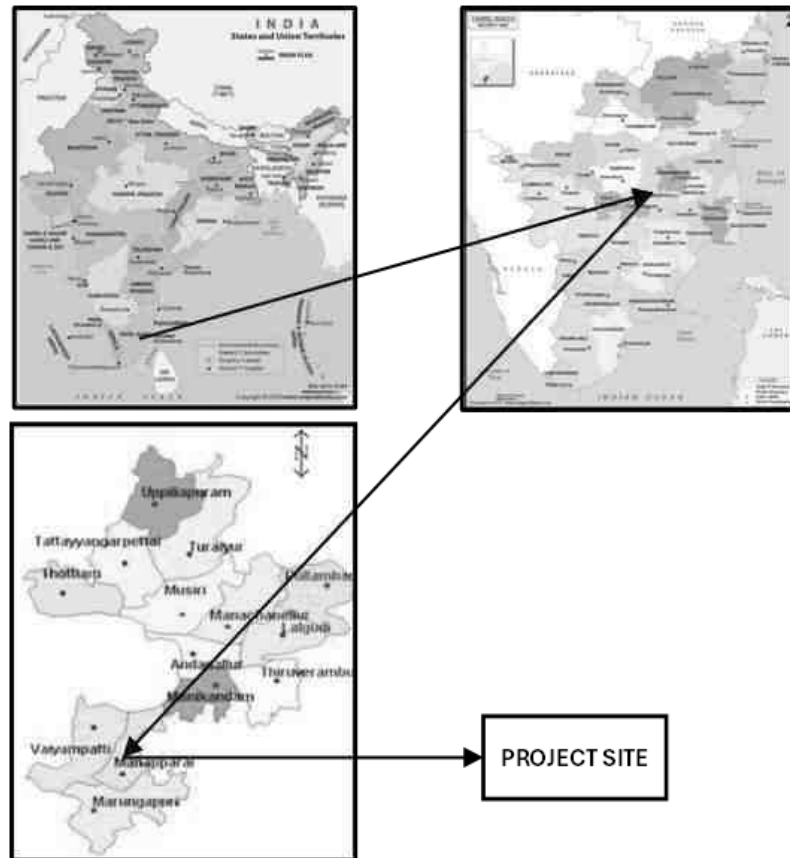


Figure 1 - Location Map of the Project Site

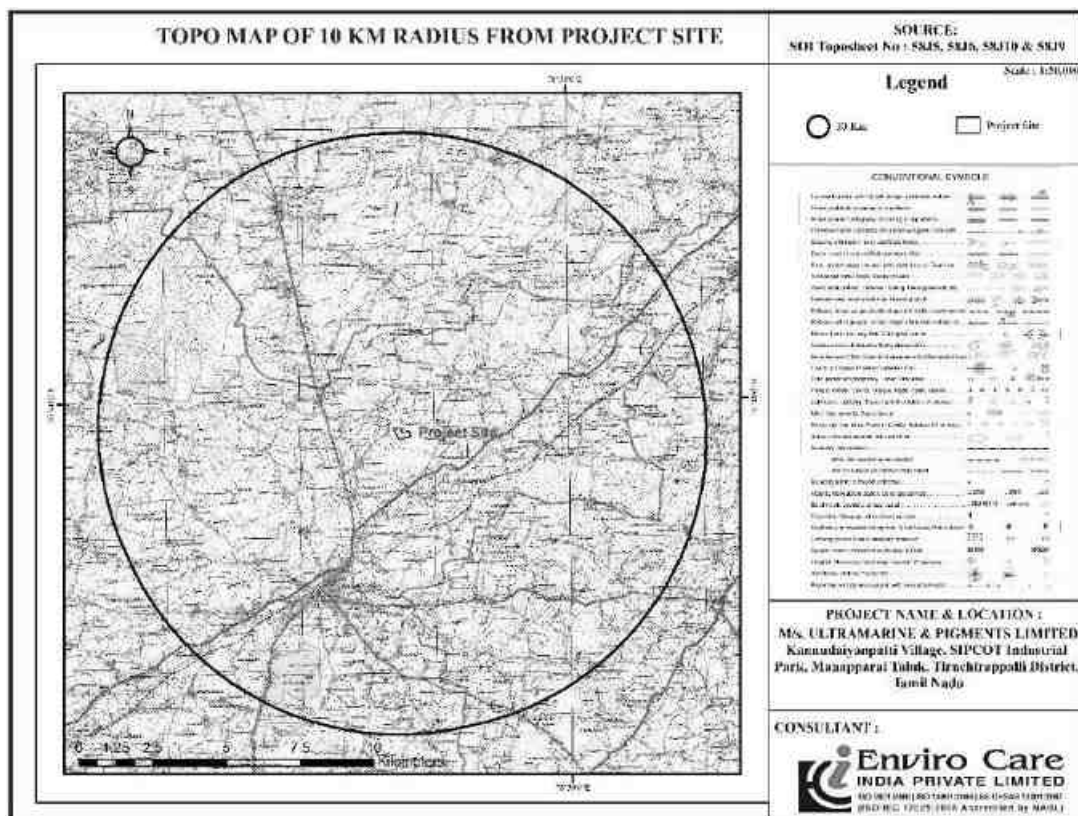




Figure 3 - Satellite Imagery of Project Site Coordinates

Table 1 - Project Site & Greenbelt Coordinates

LABEL	LATITUDE	LONGITUDE
Project Site Coordinates		
A	10°39'29.41"N	78°26'44.65"E
B	10°39'30.29"N	78°26'52.14"E
C	10°39'25.66"N	78°26'54.30"E
D	10°39'26.82"N	78°27'1.76"E
E	10°39'20.87"N	78°27'3.96"E
F	10°39'17.87"N	78°26'49.86"E
Greenbelt Coordinates		
G1	10°39'27.64"N	78°26'46.84"E
G2	10°39'27.85"N	78°26'50.66"E
G3	10°39'22.76"N	78°27'0.03"E

2.4 Salient Features of the Project

Promoter	M/s. ULTRAMARINE & PIGMENTS LIMITED
Name of the Project	Proposed Manufacturing of Inorganic & Complex Inorganic Colored Pigments by M/s. ULTRAMARINE & PIGMENTS LIMITED located at Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.
Location	Village: Kannudaiyanpatti, SIPCOT Industrial Park Taluk: Manapparai District: Tiruchirappalli State: Tamil Nadu
Land Area	32.72 Acres (13.24 Hectares)
Greenbelt Area	10.80 Acres (4.37 Hectares – 33.01%)
Geographical Location	Latitude: 10°39'29.11"N Longitude: 78°26'44.49"E
Mean Sea Level (MSL)	166 m
Land Use Classification	Industrial Area (SIPCOT Industrial Park, Manapparai)
Proposed Capacity	Inorganic Pigments – 5500 TPA Complex Inorganic Colored Pigments – 1350 TPA
Raw Materials	China Clay, Sulphur, Sodium Carbonate, Silica, Tar Pitch
Water Consumption	Freshwater – 101 KLD Recycled Water – 254 KLD Total Water Requirement – 355 KLD
Source of Water	Water supply from SIPCOT Industrial Park, Manapparai.
Wastewater Generation	Sewage – 23 KLD Effluent – 248 KLD
Power Consumption with source	1000 KWH (Source - TNEB)
Manpower Requirement	80 Employees (330 days)
Nearest City	Manapparai – 6.00 km
Populated Areas	Sathirapatti – 0.97 km (SE) Udayapatti – 1.38 km (SW) Muthapudyanpatti – 1.51 km (S)
Reserve Forests	No notified reserve forests within 10 km radius. However, following unnotified reserve forests are present within 10 km radius, Veeramalai Reserve Forest – 5.62 km (NW) Amayapuram Reserve Forest – 5.73 km (W) Poigai Malai Reserve Forest – 8.02 km (SW)
Eco-Sensitive Areas	No eco-sensitive zones within 10 km radius
Water Bodies within 10km radius	Pond near Samudram – 4.67 km (SE) Vengaikurichi Kulam – 9.0 km (SW)
Project Cost	Rs. 110.19 Crores

2.5 Size / Magnitude of Operation

2.5.1 Production Capacity

The production capacity of the chemical manufacturing unit is given below,

Table 2 - Details of Production Capacity

S. No.	Description	Quantity (TPA)
A. Inorganic Pigments		
1	Pigment Blue - 29	5000
2	Pigment Violet - 15	400
3	Pink under Pigment Violet - 15	100
Sub-Total		5500
B. Complex Inorganic Coloured Pigments (Mixed Metal Oxides)		
1	Pigment Yellow - 119	700
2	Pigment Yellow - 184	250
3	Pigment Yellow - 53	50
4	Pigment Yellow - 164	50
5	Pigment Brown - 29	150
6	Pigment Green - 17	150
Sub-Total		1350
GRAND TOTAL		6850

2.5.2 Land Requirement

The details of the land requirement are given below,

Table 3 - Details of Land Requirement

Description	Area		
	Acres	Hectares	(%)
Building Area	8.55	3.46	26.13
Roads and Pavement Area	3.39	1.37	10.36
Green belt Area	10.8	4.37	33.01
Solid Waste Storage Area	0.07	0.03	0.21
Parking Area	1.45	0.59	4.43
Vacant Area	8.46	3.42	25.86
Total area	32.72	13.24	100.00

2.5.3 Power Requirement

Total power requirement of the unit will be 1000 KWH, which is met from Tamil Nadu Electricity Board (TNEB).

2.5.4 Manpower Requirement

The proposed project will generate employment opportunity for 80 people (direct & indirect) The unit will be operated for a maximum 330 days a year.

2.5.5 Raw Material Requirement

The details of the raw materials are given below,

Table 4 - Details of Raw Materials Required

S. No.	Raw material	CAS No.	HSN Code	Quantity (TPA)
1	Sulphur	7704-34-9	2503	3399.00
2	Sodium Carbonate	497-19-8	28362010	3792.00
3	China Clay	1332-58-7	2507	4470.00
4	Tar pitch	7631-86-9	250510	390.00
5	Silica/Feldspar	65996-93-2	2708	672.00
6	Ammonium Chloride	12125-02-9	28271000	69.00
7	Hydrogen Chloride Gas	7647-01-0	28061000	10.50
8	Iron (III) oxide Fe_2O_3	1309-37-1	28211020	489.24
9	Zinc Oxide-ZnO	1314-13-2	28170010	249.41
10	Titanium dioxide- TiO_2	13463-67-7	28230010	22.22
11	Bismuth trioxide	1304-76-3	28259090	179.50
12	Vanadium pentoxide	1314-62-1	28253010	70.50
13	Con. Nitric acid (60%)	7697-37-2	28080010	175.00
14	Aluminum sulphate	17927-65-0	28332210	1.37
15	Sodium Hexa Meta Phosphate- (NaPO_3) ₆	68915-31-1	28352940	2.50
16	Ortho phosphoric acid - H_3PO_4	7664-38-2	28092010	4.75
17	Titanium Dioxide - Anatase- TiO_2	13463-67-7	28080010	42.78
18	Nickel Carbonate - NiCO_3	39430-27-8	28369990	4.37
19	Antimony Trioxide - Sb_2O_3	1309-64-4	28258000	6.80
20	Potassium Chloride - KCl	7447-40-7	31042000	0.95
21	Potassium Carbonate - K_2CO_3	584-08-7	28364000	0.65
22	Titanium Dioxide - Anatase- TiO_2	13463-67-7	28080010	32.54
23	Manganese carbonate- MnCO_3	598-62-9	28369990	9.36
24	Antimony Trioxide - Sb_2O_3	1309-64-4	28258000	12.02
25	Iron oxide (III) Fe_2O_3	1309-37-1	28211020	0.42
26	Iron (III) oxide Fe_2O_3	1309-37-1	28211020	130.64
27	Manganese carbonate- MnCO_3	598-62-9	28369990	1.92
28	Chromium Trioxide - Cr_2O_3	1308-38-9	28191000	41.86
29	Chromium Trioxide - Cr_2O_3	1308-38-9	28191000	142.02
30	Aluminium Tri Hydrate-ATH - $\text{Al}(\text{OH})_3$	21645-51-2	28183000	11.17
31	Magnetite iron oxide - Fe_3O_4	1309-38-2	28211010	3.99
32	Magnesium oxide - MgO	1309-48-4	25199040	1.51
33	Tungsten trioxide - WO_3	1314-35-8	28259090	0.80
TOTAL				14440.79

Table 5 - List of Ancillary Raw Materials

S. No.	Ancillary Raw material	Quantity (TPA)
1	Silica	100.00
2	Sodium Bi Carbonate	82.00
3	Precipitated Calcium Carbonate	550.00
4	Pine Oil	20.00
5	Sodium Silicate	100.00
6	Flocculants	20.00
TOTAL		872.00

2.5.6 Water Requirement

The total water requirement for the unit is around 355 KLD. In which 101 KLD of fresh water will be obtained from SIPCOT Water Supply, and 254 KLD will be recycled water within premises.

Table 6 - Water Requirement Details

S. No.	Source	Quantity (KLD)
1.	Process	265.00
2.	Cooling Tower Make-Up	20.00
3.	Boiler Make-Up	25.00
4.	Domestic Usage	25.00
5.	Greenbelt	20.00
Total Water Requirement		355.00
Freshwater from SIPCOT		101.00
Recycled Water (Greenbelt & Process)		254.00

2.5.7 Project Cost

The project cost for this proposed project is about Rs. 110.19 crores. This cost encompasses land, buildings, plant and machinery, environmental management systems, utilities, and other associated infrastructure within the SIPCOT Industrial Park, Manapparai.

2.6 Proposed Schedule for Approval & Implementation

As soon as the EC is accorded, the industry will obtain Consent Order from TNPCB and take up construction work. The probable date of commissioning of the project is scheduled for July 2026. The schedule for project implementation is given below,

Table 7 - Time Schedule for Project Implementation

S. No.	Activity	Estimated completion time
1	Application for ToR to SEIAA, Tamil Nadu	25.09.2025
2	ToR from SEIAA, Tamil Nadu	17.10.2025
3	Baseline monitoring	March, April, May 2025
4	Submission of Draft EIA report to TNSPCB for conducting public hearing	December 2025
5	Probable time of PH	January 2026
6	PH proceedings from TNSPCB	February 2026
7	Submission of Final EIA and other documents	February 2026
8	Approval of EC	May 2026
9	Civil works completion	October 2027
10	Commissioning & Operation	November 2027

2.7 Technology and Process Description

A. Inorganic Pigments (Ultramarine Blue)

Raw materials like China Clay, Sulphur, Soda Ash, Silica Powder and Tar pitch are mixed and grinded to the required particle size in dry ball mill using grinding media like pebble or ceramic balls. After grinding, this raw mix is filled in refractory pots and loaded in the batch kilns.

These kilns are heated using fuels like coal & Coke or LPG/LNG/PNG to the required temperature and the same is maintained to particular time. After this the kiln is allowed for natural cooling which will take min 25 to 30 days depending upon the atmospheric conditions. Then the kilns are opened to unload raw blue (Pigment + By Product) and washed in the washing tanks / equipment's to remove the water-soluble salts.

After washing or before washing the pigment is grinded using wet mills to get desired particle size followed by natural settling to separate the pigment based on the particle size. After settling separation wet pigment is taken to the different type of dryers where hot air or oil is circulated to remove the moisture. Final dried pigment is de-agglomerated using high speed turbo grinders and blended to get the desired shade and strength. Then the final product is packed based on the customer requirement.

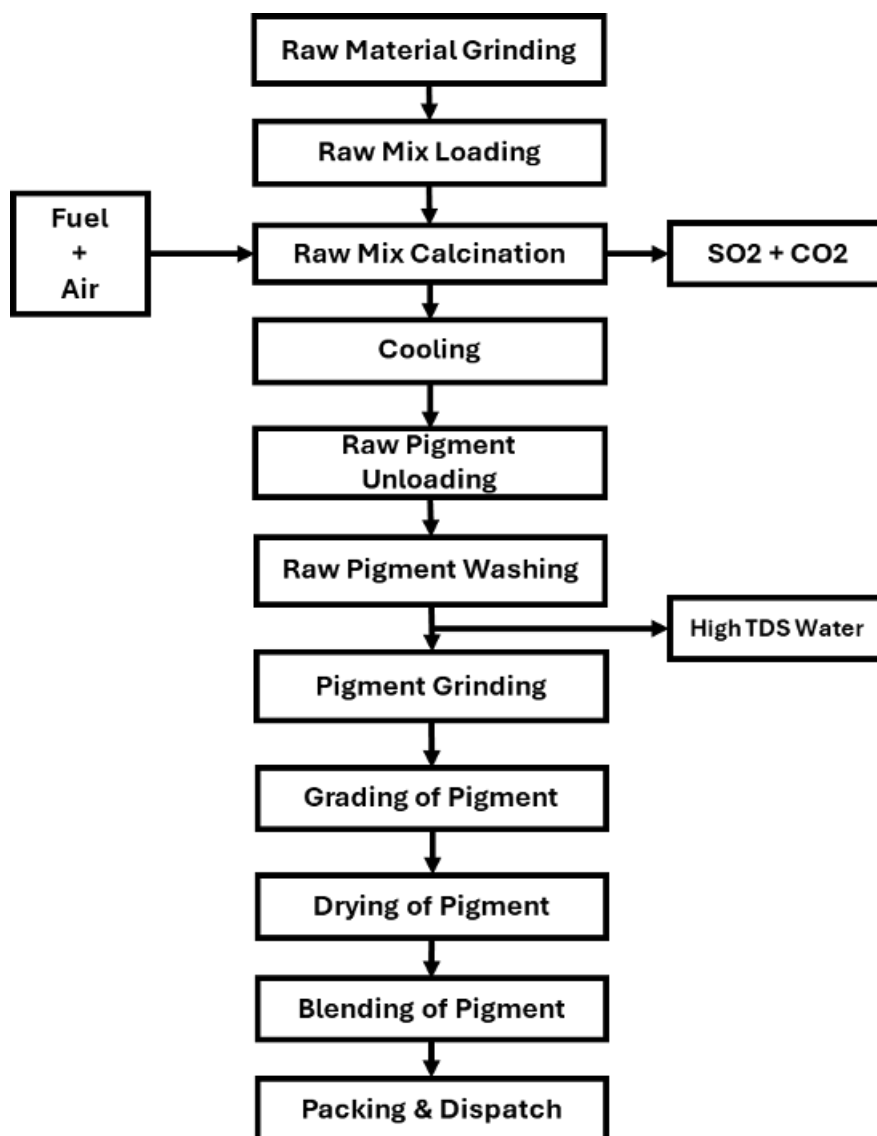


Figure 4 - Process Flow Chart (Ultramarine Blue)

B. Inorganic Pigments (Ultramarine Violet)

Ultramarine violet is produced by heating the Ultramarine Blue pigment along with Ammonium Chloride to the specific temperature in a Heating equipment like Tray dryer or Blender. During heating sodium is removed from Ultramarine Blue pigment and producing Ultramarine Violet which is washed, dried, grinded and blended to get desired shades.

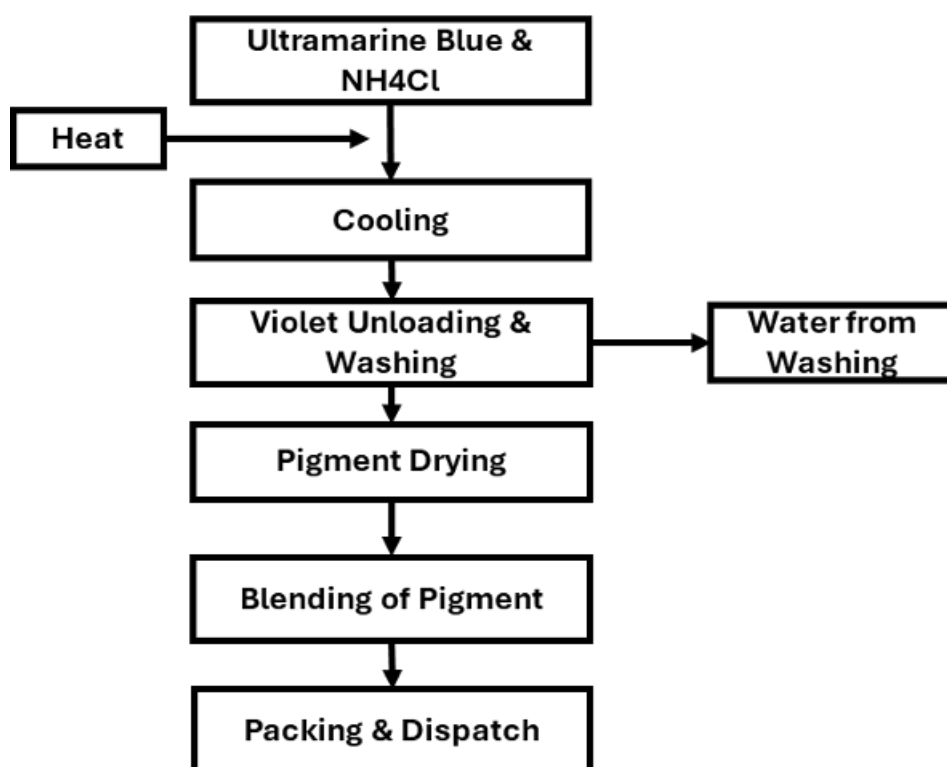


Figure 5 - Process Flow Chart (Ultramarine Violet)

C. Inorganic Pigments (Ultramarine Pink)

Reaction Type: Solid Gas Fluidization.

Heating Method: Indirect Heating.

Ultramarine Violet is heated to 180°C with the help of indirectly heated jacket using Thermic fluid oil. Then HCl Gas will be purged inside the reactor with pressurized for Colour conversion in physical as well as chemical changes. After conversion the pigment goes for washing stage to remove impurities associated with it.

D. Complex Inorganic-Colored Pigments (Bismuth Vanadate Pigment)

Bismuth vanadate pigment is produced in two methods; one is by high temperature calcination of Bismuth Tri Oxide with Vanadium Pentoxide and another one is by wet milling the Bismuth tri oxide & Vanadium pentoxide in suitable acidic medium. In calcination process, the raw yellow pigment is wet grinded in the wet mill / bead mills to get desired particle size and shade. After grinding, the pigment is filtered using vacuum filters followed by drying in tray dryers. Dried pigment is pulverized to disintegrate the particles and then blended to get desired shade.

E. Complex Inorganic-Colored Pigments (Mixed Metal Oxide (MMO) Pigments)

Mixed metal oxide pigments are produced by calcining the parent metal oxide powder along with colouring metal oxide (Chromophores / Dopants) at very high temperature of 1100 deg C plus. During calcination the dopants are doped inside the lattice of parent metal oxides and thus colour is obtained. The colour of the final product will vary based on the parent metal oxide, dopants and their quantity.

After calcination the raw pigment is wet grinded using ball mills / bead mills to get desired colour shade and particle size followed by filtration and drying. Drying is done using tray driers / drying cum blending equipment's which is preheated using Thermic Fluid Heaters. After drying pigment is disintegrated using high speed Turbo Mills and then blended to get desired colour shade.

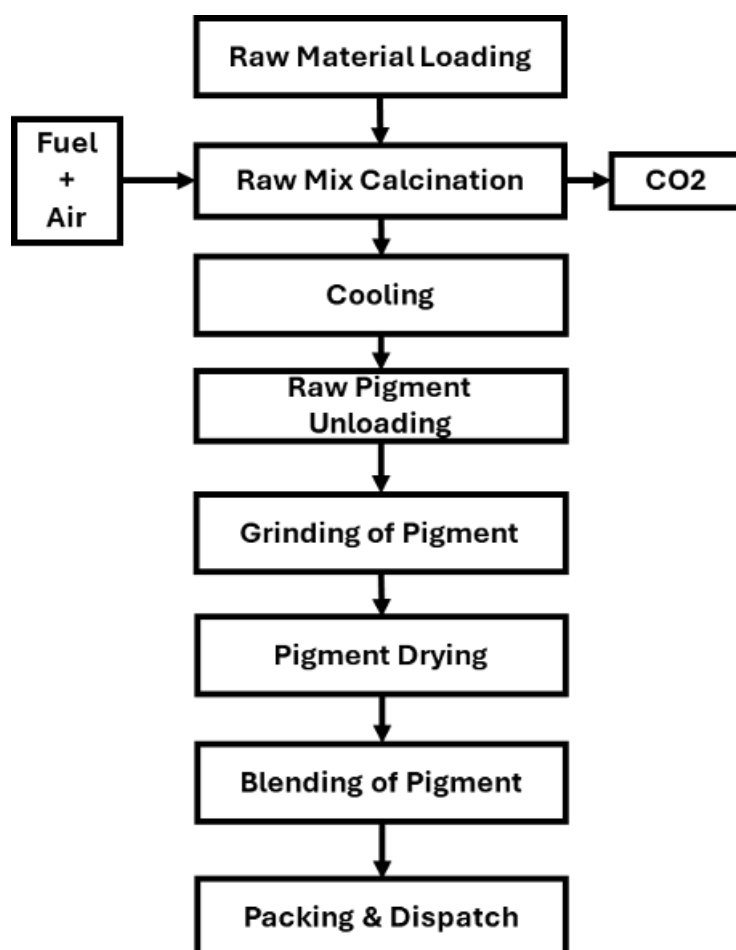


Figure 6 - Process Flow Chart (Mixed Metal Oxide Pigments)

Table 8 - List of Equipment's and Machinery Used

S. No.	Description	UNIT	TOTAL NOS
1	Process Kilns	No	48
2	Ball mill with hopper	No	7
3	Vibrator	No	3
4	Paddle Mixer	No	1
5	Hoist	No	2
6	Raw material cart	No	10
7	Weighing Scale with SCADA	No	2
8	Dust collecting system	No	3
9	Gas Burner with Trally	No	12
10	LPG/LNG/PNG gas train & Valves & Flow Meter	Set	6
11	Trolley for pot moving	No	6
12	Cyclones	No	8
13	Ducts for cyclone, Scrubber & Chimney inlets	No	6
14	Scrubber	No	6
15	Bottom conical Caustic doing tank	5 KL	3
16	Chimney	No	2
17	Blowers	No	2
18	Circulation Tank 20 KL with ebonite lining	No	2
19	Circulation pump 60 M3/Hr	No	5
20	48% Caustic storage Tank 50 KL	No	1
21	Caustic pump	No	2
22	Caustic Preparation Tank 10 KL	No	1
23	Caustic unloading pump	No	1
24	Slurry pump	No	3
25	Slurry tank with agitator (Easy cleaning) with hydraulic system	No	4
26	Tank with agitator SS 304	No	2
27	Vibrator	No	2
28	Centrifugal pump	No	2 + 1
29	Nutsche filter	No	6
30	Vacuum pump / ejector for Notch	No	6
31	Receiving tank	No	6
32	Ejector Tank	No	2
33	Effluent Pump	No	3
34	Effluent Tank 150 KL 304	No	1 X 150 KL
35	ETS Tank pump	NO	2
36	Slurry transfer pump	No	2 + 1
37	Recycle water tank	No	2
38	Wheel barrow	No	5
39	Effluent tank	No	3X 150 KL
40	Pit pump	No	2
41	Air Compressor	No	300 + 300 CFM
42	Wet Mill	No	20 sets
43	Slurry Pump	No	6
44	Tank with Agitator -SS	No	5
45	Centrifugal pump	No	5
46	SKO/Sodium Silicate tank	No	4

S. No.	Description	UNIT	TOTAL NOS
47	SKO/Sodium Silicate pump	No	4
48	Settling tank SS	No	8 sets
49	Silicate tank SS	No	30 KL
50	Centrifugal pump	No	1
51	Centrifuge	No	6
52	Tank - SS	No	6
53	Centrifugal pump	No	3
54	Centrifugal pumps	No	8
55	Chemical Dosing pumps	No	6
56	Floculation tank	No	3 sets
57	Floculation water pump	No	3
58	Paddle Dryer	No	8
59	Ribbon Blender	No	10
60	Attritor Pulveriser	No	1
61	Chimney for TFH	No	4
62	TFH	No	5 X 4 L kcal
63	Blowers for PD	No	2
64	Dust collector	No	1
65	Turbo Grinder	No	10
66	Nauta Mixer Normal	No	11
67	Goods Lifting Hoist	No	3
68	Vibro sieve	No	5
69	Stitching machine	No	4
70	Stitching machine for paper bag	No	1
71	Conveyor system	No	2
72	Fork Lift	No	1 No (3 MT)
73	Vaccum Jet/ Vaccum pump	No	2
74	MEE/ETP/SALT storage room/Chemical storage room	No	
75	RO	No	1
76	PTRO	No	2
77	HPTR	No	2
78	Nano Filter	No	1
79	MVR / MEE	No	1
80	AVPF	No	4
81	AVPF Feed Tank with agitator	No	4
82	AVPF Feed tank pump	No	4
83	AVPF Sump Pump	No	2
84	AVPF Sump tank	No	2
85	AVPF Header wash Tank	No	2
86	AVPF Conveyor	No	2
87	AVPF Cart	No	10
88	Pump	No	1
89	Weighing scale	No	3
90	Dilution Blower	No	1
91	SCADA with PLC	No	1 set
92	Ribbon blender loading conveyor	No	1
93	Vaccum cart for scum removal	No	4 Nos

S. No.	Description	UNIT	TOTAL NOS
94	Metal Detector	No	1 No
95	Chemical Storage Room	No	1
96	De lumpers & Hammer	No	1
97	Broken Pots Crusher	No	1
98	Hazardous Storage Room	No	1
99	Boiler	No	1
100	Cooling Tower	No	1
101	Tank with Agitator (limpet coil with Steam) 10 KL	No	1
102	NaOH dosing pump	No	1
103	NH ₄ Cl dosing pump	No	1
104	Conveyer belt	No	1
CICP - EQUIPMENT LIST			
105	TFH	No	6
106	Ball Mill	No	12
107	Ribbon Blender	No	16
108	Agitating tank SS	No	10
109	AVPF	No	5
110	Effluent tank SS	No	9
111	Nauta Mixer Normal	No	5
112	Electric furnace 600 °C	No	6
113	Tunnel kiln with system	No	1
114	UGM	No	1
115	Dust collecting system	No	1

2.8 Feasibility Drawings

2.8.1 Material Balance Chart

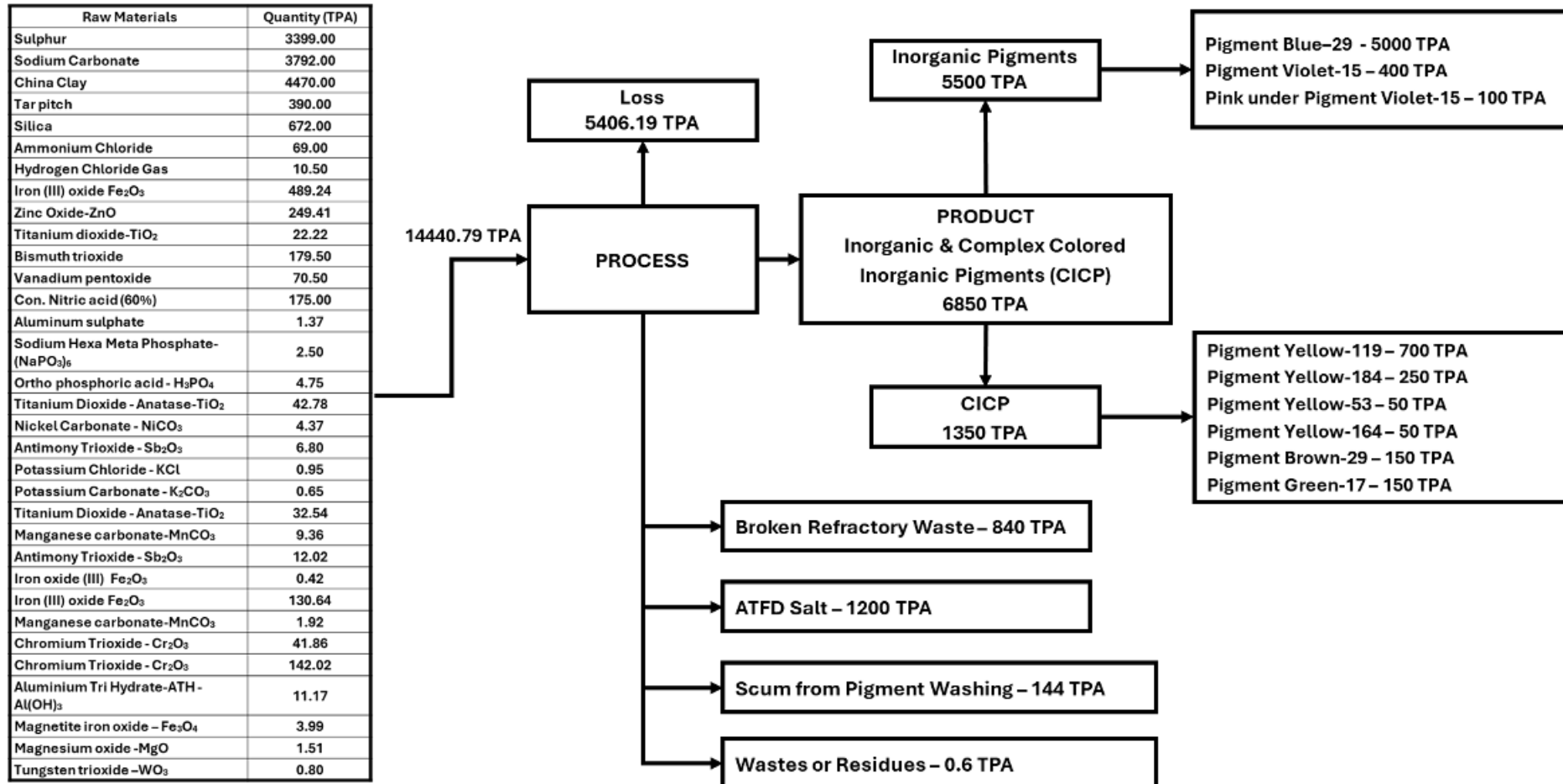


Figure 7 - Material Balance Chart

2.8.2 Water Balance Chart

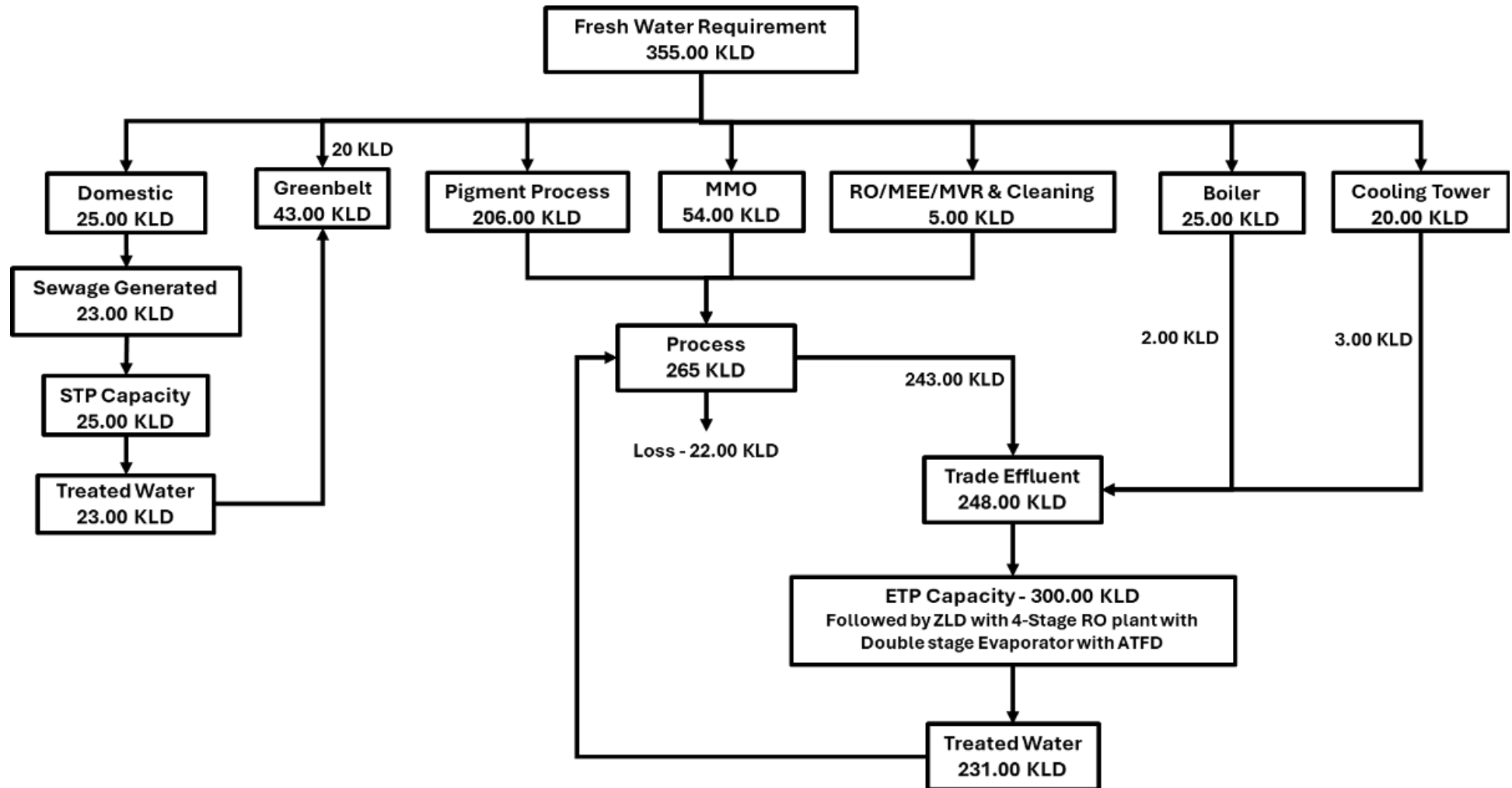


Figure 8 - Water Balance Chart

2.8.3 Site Layout of the Project Site

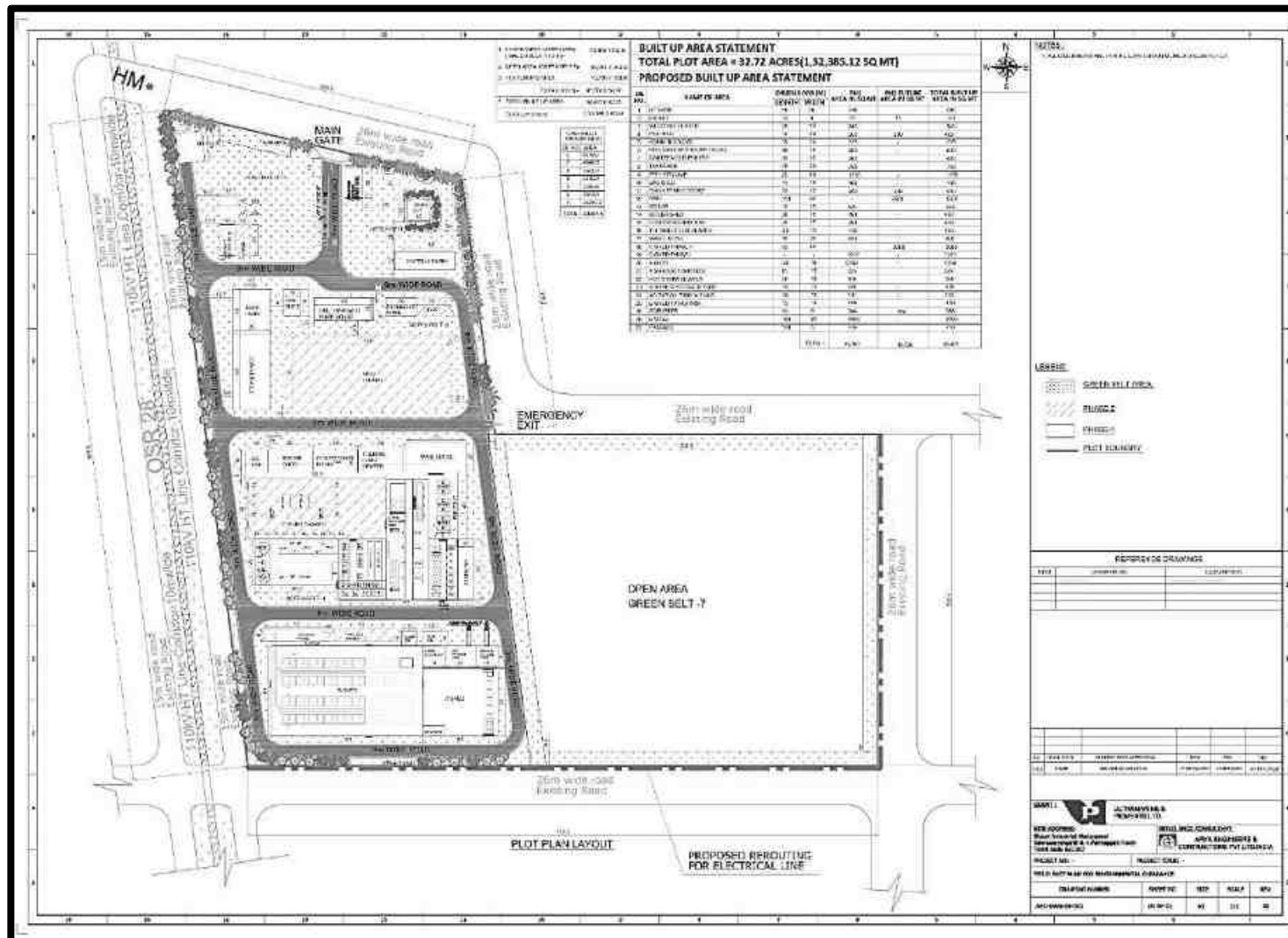


Figure 9 - Site Layout of the Project Site

2.9 Description of Mitigation Measures

2.9.1 Air Pollution Control Measures

Table 9 - Details of APC Measures

S. No.	Source of Emission Source	APC Measures	No. of Stacks
1	Kiln Process (Pigment Plant)	Stack with wet scrubber at a height of 55m.	2
2	Boiler – 6TPH	Stack with a height of 30m.	1
3	DG Set (1100 KVA)	Stack with a height of 30m	2
4	Thermic Fluid Heater	Stack with a height of 12m	6
5	Drying Process	Dust Collector with wet scrubber connected with stack at a height of 15m.	2
6	Dust Collectors (4 Nos.)	Bag filter connected to stack with a height of 15m	4

Quantity of Fuel Used:

1. LPG/LNG/PNG – 2000 TPA
2. Superior Kerosene Oil (SKO) – 50 TPA
3. Diesel – 500 Liter / hour

2.9.2 Noise Level Control

All the machinery will be complying with noise levels stipulated by MoEF&CC vide notification dated 14-02-2000. Personal protective equipment's such as; ear mufflers will be provided to all employees. Greenbelt development for an area of 10.80 hectares (33.01% of total area), is provided. Hence there will not be any adverse impact on noise environment due to the project.

2.9.3 Water Pollution Control

The details of the wastewater generation are given below,

Table 10 - Details of Wastewater Generation

S. No.	Particulars	Quantity (KLD)	Method of Treatment
1	Sewage	23.00	Will be treated by proposed STP of capacity 25 KLD. Treated sewage will be used for greenbelt.
2	Trade Effluent from process	243.00	Will be treated by proposed ETP of capacity 300 KLD. Recovery water to be used in process and ATFD salt will be used as a Raw material or Disposal through authorized user as a raw material.
3	Boiler Blowdown	2.00	
4	Cooling Tower Blowdown	3.00	

2.9.4 Solid Waste Disposal

The details of the solid waste generation are given below,

Table 11 - Details of Solid Waste Generation

S. No.	Description	Quantity (TPM)	Method of Disposal
1	Broken Refractory Waste	70.00	Reused in the process
2	Used empty HDPE Bags	0.60	Disposal through authorized vendor
3	ATFD salt (Sodium Sulphate)	100.00	Used as a Raw material or Disposal through authorized user as a raw material
4	STP Sludge	0.04	Used as manure

2.9.5 Hazardous Waste Disposal

The details of the hazardous waste generation are given below,

Table 12 - Details of Hazardous Waste Generation

S. No.	Description	Quantity (TPM)	Method of Disposal
1	Scum from Pigment Washing	12.00	Disposal through authorized vendor
2	Wastes or Residues Containing Oil	0.05	Disposal through authorized recycling facility
3	Used or Spent Oil	0.10	Disposal through authorized recycling facility
4	ETP Sludge	24.00	Disposal through authorized recycling facility

2.9.6 Greenbelt Development

Greenbelt will be developed inside the factory premises covering a total area of about 4.37 Hectares (33.01% of total area). The inter-spaces are laid with shrubs. The inter-space between trees planted is about 5 m.

Table 13 - Greenbelt Development

S. No.	Categories	To be Provided (Nos.)
1	Punga Maram	950
2	Veppa Maram	920
3	Arasa Maram	920
4	Vengai Maram	930
5	Poovarasu Maram	950
6	Vilva Maram	950
7	Vaagai Maram	880
TOTAL		6500

2.10 Assessment of New & Untested Technology for The Risk of Technological Failure

The proposed project involves the manufacturing of Inorganic and Complex Inorganic Colored Pigments, which is based on proven, well-established industrial technology that has been successfully implemented in similar facilities across India and abroad. The process technology is robust, stable, and well-tested under diverse operating conditions, minimizing the likelihood of technological failure.

2.10.1 Technology Overview

The production process includes high-temperature calcination, washing, filtration, drying, and blending operations. These are standard physicochemical operations utilized globally in pigment manufacturing. All process steps are continuous or batch-controlled with automated instrumentation, ensuring product consistency and safety. The design incorporates redundancy and safety interlocks to prevent operational hazards.

2.10.2 Risk Evaluation

There are no elements of untested or experimental technology in this project. Potential risks such as equipment malfunction, process deviation, or utility disruption are mitigated through:

- Preventive maintenance schedules.
- Adequate instrumentation and automation systems
- Trained operational staff and standard operating procedures (SOPs).
- Fire and safety management systems integrated into plant design.

The project employs time-tested and reliable technology with minimal technological risk. Continuous monitoring, process control systems, and well-defined safety mechanisms will ensure smooth and safe operation of the plant. Hence, the risk of technological failure is negligible and the project can be implemented with high reliability and operational confidence.

2.10.3 Smart Technologies Adopted to Improve Energy Efficiency

The project incorporates smart and energy-efficient technologies such as automated process control, waste heat recovery, variable frequency drives, high-efficiency combustion systems, and efficient electrical infrastructure.

Table 14 - Technologies Adopted for the Benefits of Energy Efficient

S. No.	Technology	Description	Energy Efficiency Benefit
1	Use of LPG/LNG/PNG - Fired Boiler and Thermic Fluid Heater	Adoption of LPG/LNG/PNG as fuel instead of solid or liquid fuels	Lower specific fuel consumption, reduced heat losses, and higher combustion efficiency
2	High-Efficiency Kiln Design	Use of optimized kiln design with controlled combustion and heat distribution	Reduced energy input per tonne of pigment produced
3	Automated Process Control System (PLC/DCS)	Automated monitoring and control of temperature, pressure, and flow rates in kiln, boiler, and TFH	Minimizes energy wastage due to over-heating or process inefficiencies
4	Variable Frequency Drives (VFDs)	Installation of VFDs for motors, blowers, pumps, and fans	Energy savings through speed regulation based on actual load demand
5	Waste Heat Recovery (WHR)	Recovery of sensible heat from kiln and boiler exhaust gases for preheating combustion air or feed material	Reduction in primary fuel consumption
6	High-Efficiency Burners	Use of low-excess-air, high-efficiency burners in combustion systems	Improved fuel utilization and reduced heat losses
7	Proper Insulation of Hot Surfaces	Insulation of kilns, boilers, thermic fluid lines, and reactors	Minimization of radiant and convective heat losses
8	LED Lighting with Automation	Use of LED lights with timers and motion sensors in plant and utility areas	Reduced electricity consumption for lighting
9	Energy-Efficient Motors (IE3 / IE4)	Deployment of high-efficiency motors for process equipment	Lower electrical energy consumption and improved reliability
10	Energy Monitoring and Auditing System	Periodic energy audits and real-time energy monitoring	Identification of inefficiencies and continuous improvement in energy performance
11	Power Factor Improvement System	Installation of automatic power factor correction (APFC) panels	Reduction in reactive power losses and improved electrical efficiency
12	Preventive Maintenance Program	Regular maintenance of equipment to avoid efficiency degradation	Sustained energy efficiency over the operational life of the plant

These measures significantly reduce specific energy consumption, lower greenhouse gas emissions, and enhance overall operational sustainability.

CHAPTER III

DESCRIPTION OF ENVIRONMENT

3.1 Introduction

This chapter gives an idea and description of environmental status of the study area with reference to the prominent environmental attributes. The general study area covers 10 km radius of the project site. The impact identification always commences with the collection of baseline data such as ambient air quality, ground water quality, noise levels, land environment, land use pattern, flora & fauna and socio-economic aspects with in the study zone of 10 km radius during **March to May 2025**.

Baseline data has been collected pertaining to Ambient Air, Noise, Water & Soil by M/s. Enviro Care India Private Limited, which is an NABL Accredited Laboratory. Due care has been taken to ensure that calibrated samplers / equipment / instruments have been utilized for sampling & analysis. Adequate care has also been taken to ensure proper Preservation & Transportation methods in accordance with the standard procedures.

3.2 Air Environment

3.2.1 Meteorology

Meteorology of the study area plays an important role in the air pollution studies. The prevailing micro meteorological conditions at the plant site will regulate the dispersion and dilution of air pollutants in the atmosphere. The predominant wind directions and the wind speed will decide the direction and distance of the most affected zone from the project site. The meteorological data collected during the monitoring period is very useful in interpretation of baseline data as input for dispersion models for predicting the Ground Level Concentrations (GLC).

3.2.2 Meteorological Data Recorded at Site

A Temporary Weather Monitoring Station was installed at the project site and temperature, relative humidity, wind direction, wind speed, and rainfall were recorded for one season from March to May 2025.

Temperature

The maximum temperature recorded was 31.8°C and the minimum temperature was 22.2°C at the weather monitoring station at the project site.

Relative humidity

Relative humidity at site ranged from 40% to 55%.

Rainfall recorded at the site

The total rainfall recorded during the study period is NIL.

Wind Pattern at Project Site during the study period

Wind speed and direction are recorded at site every hour. The predominant winds during this season are mostly from W to E.

Between March to May 2025, wind observations were recorded over a total of 2,183 hours, providing valuable insight into the wind conditions during this period. The prevailing wind direction was from the west (W) to the east (E), indicating a consistent wind pattern from one direction to another. Throughout this timeframe, the average wind speed was 5.24 meters per second, which is moderate, suggesting that the wind was not excessively strong but still noticeable. Notably, the data reveals those calm winds—defined as periods when the wind speed was extremely low—accounted for only 0.14% of the total observation time. This small percentage of calm winds indicates that the region experienced very few moments of complete stillness, with most of the time seeing some level of wind activity.

Overall, the wind conditions during this period were relatively stable and consistent, with moderate speeds and a clear directional trend, contributing to the overall understanding of the area's wind patterns during the specified months.

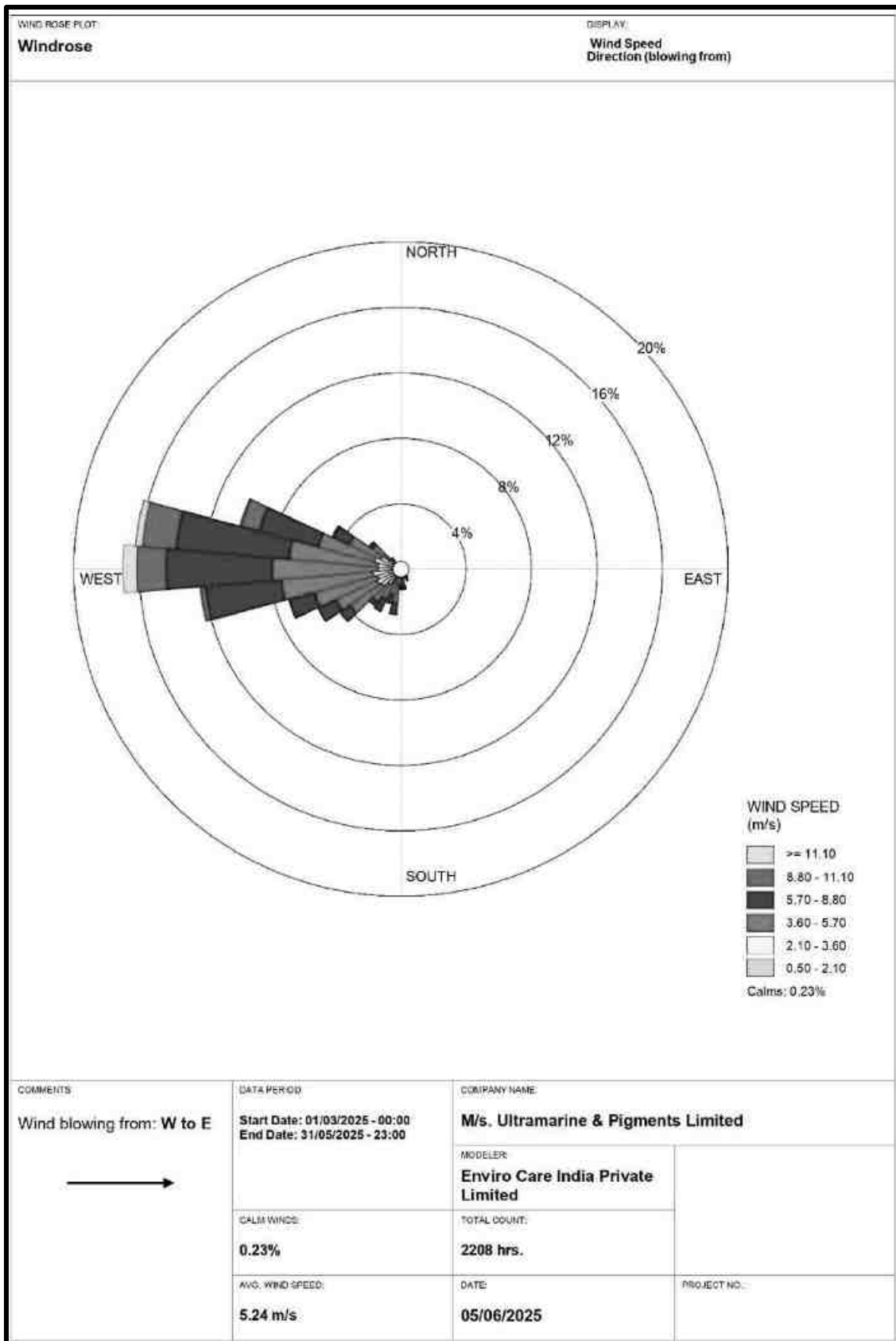


Figure 10 - Windrose Diagram (March - May 2025)

Table 15 - Meteorological Data from the nearest station (Secondary data)

GOVERNMENT OF INDIA												
INDIA METEOROLOGICAL DEPARTMENT												
STATION: TIRUCHIRAPPALLI									PERIOD: 2018 - 2022			
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Humidity (%)												
2018	66.38	60.88	61.62	49.56	61.94	60.44	55.5	71.19	79.69	79.5	86.62	83.12
2019	73.88	69.31	59.25	57.62	68.38	65	66.31	62.25	64.31	78.12	82.25	79.75
2020	69.88	62.19	52.81	51.56	52.25	58.56	59.88	65.94	77	86.31	87.69	87.5
2021	78.69	66.94	55.56	56.56	52.5	61.69	73.19	72.94	77.06	79	83.94	87.75
2022	87.75	76.94	67.25	61.56	65.25	64.94	71.44	70.25	77.19	85.62	91	87.12
Wind Direction												
2018	54.56	64.69	114.56	155.75	235.81	259.81	266.69	266.38	243.75	289.25	33.12	44.69
2019	49.94	59.88	91.81	126.88	205.06	257.19	262.31	267.31	248.38	57.19	46.31	46.44
2020	54.88	81.94	114.56	136.31	208.75	255.62	261.69	258.44	245.75	124.31	52.31	50.12
2021	66.94	71.94	101.44	120.69	203.44	258.44	251.25	262.94	253.62	280.62	37.19	37.38
2022	48.56	54.56	87.06	129.81	227.31	261.38	263.19	262.56	262.69	289.81	7.06	44.94
Wind Speed (m/s)												
2018	3.98	3.7	2.96	3.09	3.5	5.17	5.45	3.93	2.9	2.77	3.4	3.48
2019	3.59	3.62	3.28	3.29	2.77	5.21	5.91	6.09	2.88	2.8	3.45	3.49
2020	3.77	3.72	3.42	3.2	3.27	4.89	4.92	5.29	3.45	2.27	2.97	3.8
2021	3.26	3.84	3.38	3.16	3.78	4.43	3.51	4.16	3.7	3.04	3.43	4.1
2022	3.55	3.55	3.1	2.7	3.7	4.25	4.81	4.07	3.45	2.47	2.86	3.3
Temperature (°C)												
2018	24.91	25.45	28.91	32.98	30.89	29.8	30.49	28.23	27.06	26.88	25.08	23.56
2019	23.55	25.14	28.85	31.33	29.62	29.05	28.65	28.98	29.13	26.68	25.15	24.38
2020	23.72	27.97	30.35	32.18	33.21	31.08	29.89	28.49	27.27	25.91	25.44	23.88
2021	24.24	26.17	29.83	31.47	32.83	29.77	27.73	28.01	26.9	26.59	25.44	23.28
2022	23.43	23.48	27.37	30.52	30.03	29.3	28.08	28.03	27.16	26.25	24.8	23.29
Rainfall (Avg) mm/day												
2018	1.38	0.08	1.26	0.18	1.83	1.15	1.69	4.08	4.77	3.43	5.88	1.45
2019	0.39	0.53	0.42	0.82	2.9	1.82	1.98	1.22	3.48	3.65	5.36	0.58
2020	0	0.12	0.02	0.58	0.68	1.17	1.56	4.05	6.47	6.17	5.02	2.49
2021	0.28	0.01	0.01	0.69	0.68	2.05	5.12	2.83	4.53	2.99	5.87	6.62
2022	4.42	0.38	0.17	1.09	2.7	2.03	3.69	3.9	5.41	6.89	12.29	1.25
Rainfall (Total) mm												
2018	36.91	0	42.19	0	52.73	36.91	47.46	110.74	131.84	94.92	163.48	42.19
2019	10.55	15.82	15.82	15.82	63.28	42.19	52.73	26.37	105.47	100.2	147.66	15.82
2020	0	0	0	15.82	10.55	31.64	31.64	126.56	189.84	195.12	152.93	68.55
2021	5.27	0	0	10.55	10.55	52.73	147.66	84.38	126.56	94.92	179.3	200.39
2022	137.11	10.55	5.27	32.75	83.61	60.82	114.48	120.88	162.29	213.61	368.76	38.62

3.2.3 Air Quality

The ambient air quality with respect to the study zone of 10 km radius around the project site forms the baseline information. The study area represents mostly rural environment. The various sources of air pollution in the region are vehicular traffic, dust arising from unpaved village roads. The Prime objective of baseline air quality survey is to assess the air quality of the area. This will also be useful in assessing the conformity to standards of the ambient air quality during the unit operation. AAQ is being monitored in the existing unit and air quality is within the National Ambient Air Quality standards.

Table 16 - National Ambient Air Quality Standards

S. No.	Pollutant	Time Weighted average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and Other Area	Ecologically sensitive area(notified by Central Govt.)	
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual*	50	20	Improved West and Geake Ultraviolet fluorescence
		24 hours**	80	80	
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual*	40	30	Modified Jacob & Hochheiser (Na- Arsenite) Chemiluminescence
		24 hours**	80	80	
3	Particulate Matter (size less than 10 µm) or PM ₁₀ µg/m ³	Annual*	60	60	Gravimetric TOEM Beta attenuation
		24 hours**	100	100	
4	Particulate Matter (size less than 2.5 microns) or PM _{2.5} µg/m ³	Annual*	40	40	Gravimetric TOEM Beta attenuation
		24 hours**	60	60	
5	Ozone (O ₃) µg/m ³	8 hours **	100	100	UV photometric Chemiluminescence Chemical method
		1 hour **	180	180	
6	Lead (Pb) µg/m ³	Annual*	0.5	0.5	ASS / ICP method after sampling on EPM 2000 or equivalent filter paper ED – XRF using Teflon filter
		24 hours**	1.0	1.0	
7	Carbon Monoxide(CO) mg/m ³	8 hours**	2	2	Non-Dispersive Infra-RED (NDIR) Spectroscopy
		1 hour**	4	4	
8	Ammonia (NH ₃) µg/m ³	Annual*	100	100	Chemiluminescence Indophenol blue method
		24 hours**	400	400	

9	Benzene (C ₆ H ₆) µg/m ³	Annual*	5	5	Gas chromatography based continuous analyzer Adsorption and desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only ng/m ³	Annual*	1	1	Solvent extraction followed by HPLC / GC analysis
11	Arsenic (As)ng/m ³	Annual*	6	6	AAS / ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni) ng/m ³	Annual*	20	20	AAS / ICP method after sampling on EPM 2000 or equivalent filter paper

* **Annual arithmetic means of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.**

** **24 hourly or 8 hourly or 1 hourly monitored value, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.**

Note:

Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

3.2.4 Selection of Sampling Locations

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality monitoring network. The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Meteorological conditions are synoptic scale
- Topography of the study area
- Representative of regional background air quality for obtaining baseline status
- Representatives of likely impact areas

Ambient Air Quality Monitoring (AAQM) stations were set up at eight locations with due consideration to the above-mentioned points.

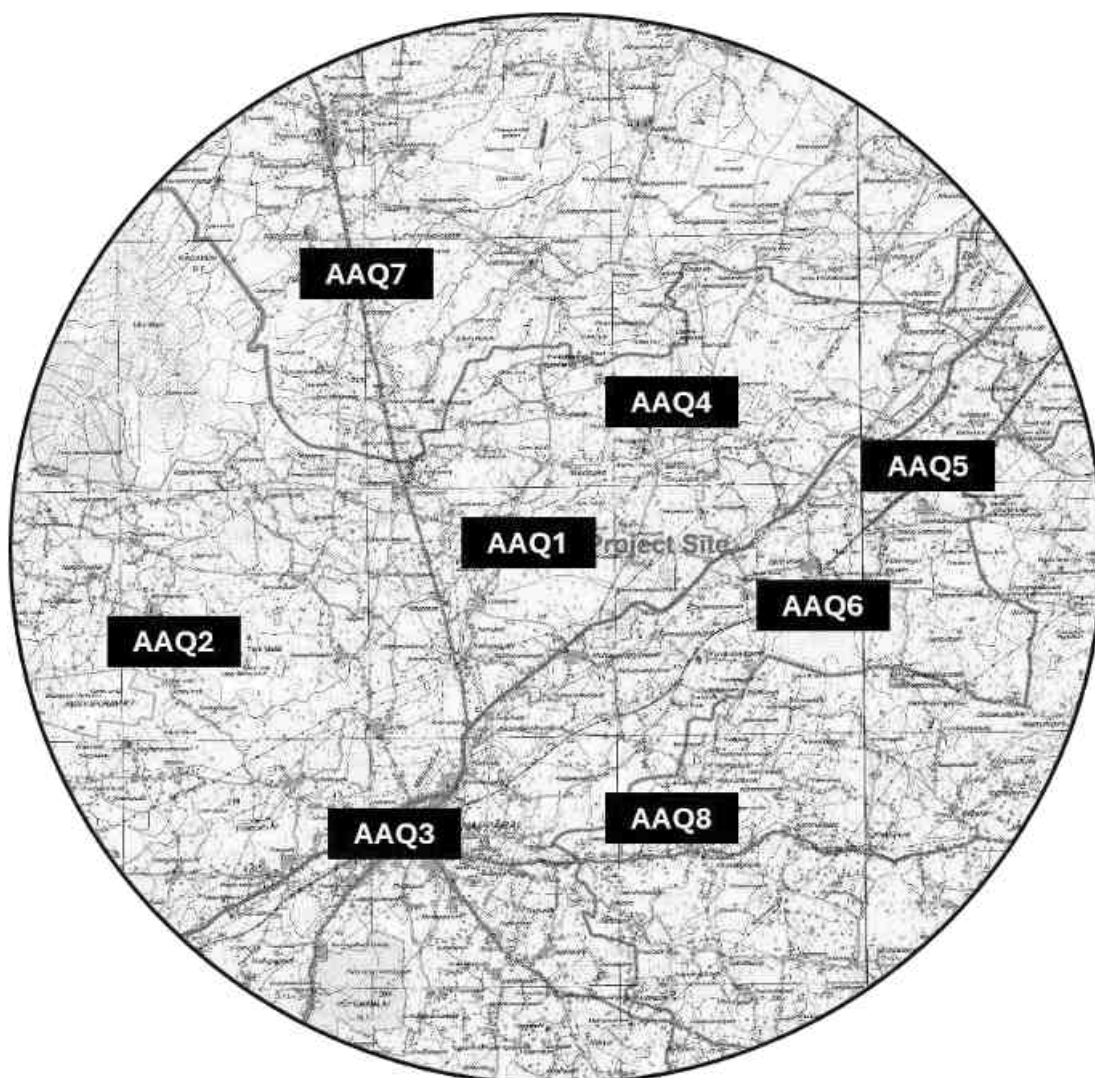


Figure 11 - Location of Air Monitoring Stations

Table 17 - Air Monitoring Stations

Code	Location	Latitude	Longitude	Distance from Project Site (km)	Direction
AAQ1	Project Site	10°39'22.25"N	78°26'54.08"E	-	-
AAQ2	Amayapuram	10°37'43.19"N	78°22'47.77"E	8.14	SW
AAQ3	Manapparai	10°36'28.94"N	78°25'23.61"E	5.70	SW
AAQ4	Periapatty	10°40'18.43"N	78°27'43.40"E	2.30	NE
AAQ5	Kalarampatty	10°40'4.71"N	78°29'51.26"E	5.58	NE
AAQ6	Samudram	10°39'9.45"N	78°29'31.59"E	4.76	E
AAQ7	Porundalur	10°42'3.99"N	78°24'49.03"E	6.29	N
AAQ8	Rajalipatty	10°36'33.87"N	78°28'13.44"E	5.68	S

Table 18 - Air Quality Results

PARAMETERS	CODE	Min	Max	Avg.	98 per	NAAQS
PM ₁₀ , µg/m ³	AAQ1	42.60	46.70	44.65	45.77	100
	AAQ2	41.90	45.50	43.70	44.59	
	AAQ3	56.30	60.40	58.35	59.19	
	AAQ4	44.80	49.20	47.00	48.22	
	AAQ5	47.90	52.30	50.10	51.25	
	AAQ6	45.50	49.90	47.70	48.90	
	AAQ7	44.20	48.30	46.25	47.33	
	AAQ8	49.40	53.50	51.45	52.43	
PM _{2.5} , µg/m ³	AAQ1	21.30	23.35	22.33	22.88	60
	AAQ2	20.95	22.75	21.85	22.30	
	AAQ3	28.15	30.20	29.18	29.60	
	AAQ4	22.40	24.60	23.50	24.11	
	AAQ5	23.95	26.15	25.05	25.63	
	AAQ6	22.75	24.95	23.85	24.45	
	AAQ7	22.10	24.15	23.13	23.67	
	AAQ8	24.70	26.75	25.73	26.22	
SO ₂ , µg/m ³	AAQ1	6.60	7.00	6.80	6.86	80
	AAQ2	5.70	6.30	6.00	6.17	
	AAQ3	7.50	7.90	7.70	7.74	
	AAQ4	6.30	6.70	6.50	6.57	
	AAQ5	6.80	7.20	7.00	7.06	
	AAQ6	6.20	6.60	6.40	6.47	
	AAQ7	6.40	6.80	6.60	6.66	
	AAQ8	6.10	6.50	6.30	6.37	
NO _x , µg/m ³	AAQ1	12.54	13.30	12.92	13.03	80
	AAQ2	10.83	11.97	11.40	11.73	
	AAQ3	14.25	15.01	14.63	14.71	
	AAQ4	11.97	12.73	12.35	12.48	
	AAQ5	12.92	13.68	13.30	13.41	
	AAQ6	11.78	12.54	12.16	12.29	
	AAQ7	12.16	12.92	12.54	12.66	
	AAQ8	11.59	12.35	11.97	12.10	
CO, mg/m ³	AAQ1	< 0.02	< 0.02	< 0.02	< 0.02	2
	AAQ2	< 0.02	< 0.02	< 0.02	< 0.02	
	AAQ3	< 0.02	< 0.02	< 0.02	< 0.02	
	AAQ4	< 0.02	< 0.02	< 0.02	< 0.02	
	AAQ5	< 0.02	< 0.02	< 0.02	< 0.02	
	AAQ6	< 0.02	< 0.02	< 0.02	< 0.02	
	AAQ7	< 0.02	< 0.02	< 0.02	< 0.02	
	AAQ8	< 0.02	< 0.02	< 0.02	< 0.02	

Data Interpretation

The ambient air quality monitoring results for the eight locations — Project Site (AAQ1), Amayapuram (AAQ2), Manapparai (AAQ3), Periapatty (AAQ4), Kalarampatty (AAQ5), Samudram (AAQ6), Porundalur (AAQ7), and Rajalipatty (AAQ8) — show that all monitored parameters are well within the National Ambient Air Quality Standards (NAAQS, 2009).

For PM_{10} , the minimum concentration recorded was $41.9 \mu\text{g}/\text{m}^3$ at Amayapuram (AAQ2), and the maximum was $60.4 \mu\text{g}/\text{m}^3$ at Manapparai (AAQ3). The average PM_{10} values across all monitoring stations ranged from $43.7 \mu\text{g}/\text{m}^3$ to $58.35 \mu\text{g}/\text{m}^3$, indicating that particulate levels remain comfortably below the NAAQS limit of $100 \mu\text{g}/\text{m}^3$ and represent good air quality in the region.

For $PM_{2.5}$, the minimum concentration was $20.95 \mu\text{g}/\text{m}^3$ at Amayapuram (AAQ2), and the maximum was $30.20 \mu\text{g}/\text{m}^3$ at Manapparai (AAQ3). The average $PM_{2.5}$ levels ranged between $21.85 \mu\text{g}/\text{m}^3$ and $29.18 \mu\text{g}/\text{m}^3$, showing that fine particulate matter concentrations are well within the NAAQS limit of $60 \mu\text{g}/\text{m}^3$, with no exceedances observed.

In the case of sulphur dioxide (SO_2), the lowest value was $5.70 \mu\text{g}/\text{m}^3$ at Amayapuram (AAQ2) and the highest was $7.90 \mu\text{g}/\text{m}^3$ at Manapparai (AAQ3). The average SO_2 concentrations ranged from $6.00 \mu\text{g}/\text{m}^3$ to $7.70 \mu\text{g}/\text{m}^3$, well below the prescribed limit of $80 \mu\text{g}/\text{m}^3$, indicating negligible sulfur emissions in the area.

For nitrogen oxides (NO_x), concentrations varied between $10.83 \mu\text{g}/\text{m}^3$ at Amayapuram (AAQ2) and $15.01 \mu\text{g}/\text{m}^3$ at Manapparai (AAQ3), with average values from $11.40 \mu\text{g}/\text{m}^3$ to $14.63 \mu\text{g}/\text{m}^3$. These are considerably below the NAAQS limit of $80 \mu\text{g}/\text{m}^3$, reflecting minimal vehicular or combustion-related pollution in the study area.

Carbon monoxide (CO) levels were below the detectable limit of $<0.02 \text{ mg}/\text{m}^3$ at all eight monitoring stations, much lower than the NAAQS limit of $2 \text{ mg}/\text{m}^3$, confirming an absence of significant combustion sources nearby.

Overall, the baseline air quality across the study area — including both the project site and the surrounding settlements of Amayapuram, Manapparai, Periapatty, Kalarampatty, Samudram, Porundalur, and Rajalipatty — indicates a clean atmospheric environment with pollutant concentrations well within permissible limits. The 98th percentile values for all parameters also comply with the NAAQS thresholds, confirming that the region currently maintains good ambient air quality suitable for the establishment of the proposed Ultramarine & Pigments Limited project.

3.3 Noise Environment

The noise monitoring has been conducted for determination of noise levels at eight locations around the study area. Levels of noise have been monitored during 6am to 10 pm and night levels during 10pm to 6am. In the residential cum rural areas equivalent day and night noise levels ranges from 44 to 64 dB(A). The details of sampling locations with respect to the plant site and the equivalent day night levels are tabulated.

3.3.1 Ambient Noise Standards

Ambient Noise level standards have been notified by the MoEF&CC vide Gazette Notification dated 26th December 1989 and also in the Schedule III of the Environmental (Protection) Rules 1986. It is based on the 'A' weighted equivalent noise level (Leq).

Table 19 - National Ambient Noise Standards

Category of Zones	Leq in dB(A)	
	Day *	Night+
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence Zone **	50	40

Source: Central Pollution Control Board

* Day Time is from 6.00 AM and 9.00 PM.

+ Note -2: Night Time is reckoned between 9.00 PM and 6.00 AM

** Silence Zone is defined as an area up to 100m around premises of Hospitals, Educational Institutions and Courts. Use of vehicle horn, loudspeaker and bursting of crackers is banned in these zones.

Note: Mixed categories of areas be declared as one of the four above mentioned categories by the competent Authority and the corresponding standards shall apply.

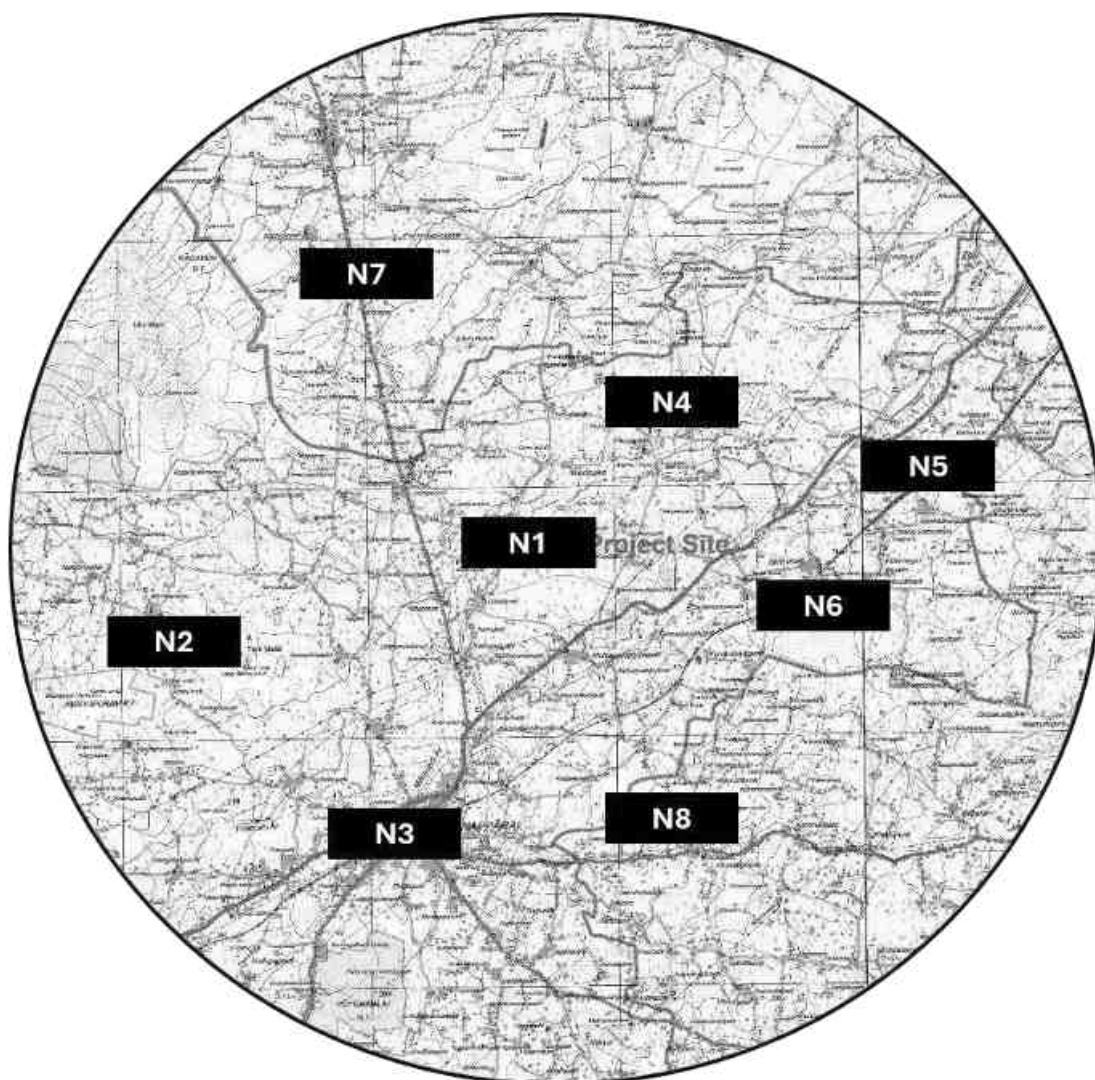


Figure 12 - Location of Noise Monitoring Stations

Table 20 - Details of Noise Level Monitoring Stations

Code	Location	Latitude	Longitude	Distance from Project Site (km)	Direction
N1	Project Site	10°39'22.25"N	78°26'54.08"E	-	-
N2	Amayapuram	10°37'43.19"N	78°22'47.77"E	8.14	SW
N3	Manapparai	10°36'28.94"N	78°25'23.61"E	5.70	SW
N4	Periapatty	10°40'18.43"N	78°27'43.40"E	2.30	NE
N5	Kalarampatty	10°40'4.71"N	78°29'51.26"E	5.58	NE
N6	Samudram	10°39'9.45"N	78°29'31.59"E	4.76	E
N7	Porundalur	10°42'3.99"N	78°24'49.03"E	6.29	N
N8	Rajalipatty	10°36'33.87"N	78°28'13.44"E	5.68	S

Table 21 - Noise Level Results

Code	Locations	L _{max} dB (A)		L _{min} dB (A)		L _{eq} dB (A)	
		Day	Night	Day	Night	Day	Night
N1	Project Site	62.80	50.60	59.30	49.30	61.40	50.00
N2	Amayapuram	62.90	48.10	61.40	46.30	62.20	47.30
N3	Manapparai	61.80	53.30	60.30	50.70	61.10	52.20
N4	Periapatty	63.00	53.10	61.30	50.70	62.20	52.10
N5	Kalarampatty	61.30	51.10	59.70	48.70	60.60	50.10
N6	Samudram	64.00	48.80	59.90	47.30	62.40	48.10
N7	Porundalur	63.90	50.80	61.70	48.90	62.90	50.00
N8	Rajalipatty	61.80	48.70	59.60	46.80	60.80	47.90

Data Interpretation**Maximum Noise Levels (L_{max} dB(A)):**

The highest recorded maximum noise level was observed at Samudram (N6) during the day, measuring 64.0 dB(A), followed closely by Periapatty (N4) and Porundalur (N7) with 63.0–63.9 dB(A). The lowest maximum daytime noise level was recorded at Kalarampatty (N5), measuring 61.3 dB(A). During the night, the highest maximum noise level was 53.3 dB(A) at Manapparai (N3), while the lowest was 48.1 dB(A) at Amayapuram (N2).

Minimum Noise Levels (L_{min} dB(A)):

The lowest minimum noise level during the day was recorded at Samudram (N6) at 59.9 dB(A), whereas the highest was noted at Porundalur (N7) with 61.7 dB(A). During the night, Amayapuram (N2) exhibited the lowest minimum noise level at 46.3 dB(A), while Periapatty (N4) recorded the highest nighttime minimum level at 50.7 dB(A).

Equivalent Continuous Noise Levels (L_{eq} dB(A)):

The highest equivalent noise level during the day was observed at Porundalur (N7) with 62.9 dB(A), and the lowest at Kalarampatty (N5) with 60.6 dB(A). At night, the maximum L_{eq} was 52.2 dB(A) at Manapparai (N3), and the minimum was 47.3 dB(A) at Amayapuram (N2).

Day vs. Night Noise Levels:

Overall, daytime noise levels (L_{max} , L_{min} , and L_{eq}) are consistently higher than nighttime levels at all locations, which is expected due to increased human activity, vehicular movement, and industrial operations during the day. The reduction in noise levels at night reflects limited activity and quieter surroundings.

Location Comparisons:

Among the monitored sites, Samudram (N6) and Porundalur (N7) exhibit relatively higher noise levels during the day, likely due to traffic or movement near active routes. In contrast, Amayapuram (N2) and Rajalipatty (N8) recorded lower noise levels, indicating quieter and less-disturbed environments, possibly more rural or residential in nature.

Overall, noise levels across all locations remain well within CPCB-prescribed limits for both industrial and mixed-use zones, confirming a stable and acceptable acoustic environment in the project influence area.

3.4 Water Environment

The water samples are collected from eight locations (Groundwater - 6 locations, Surface Water - 2 locations) in the study area. We have submitted the permissible limit for the drinking purposes as well as the permissible limits in the absence of alternative sources. Generally, the desirable limit is obtained by the river water only, whereas we have received the water samples from ground water. The water from sampled location falls in the range mentioned for drinking water when there is no alternative source. In case, water for drinking purposes to be used is no alternative source.

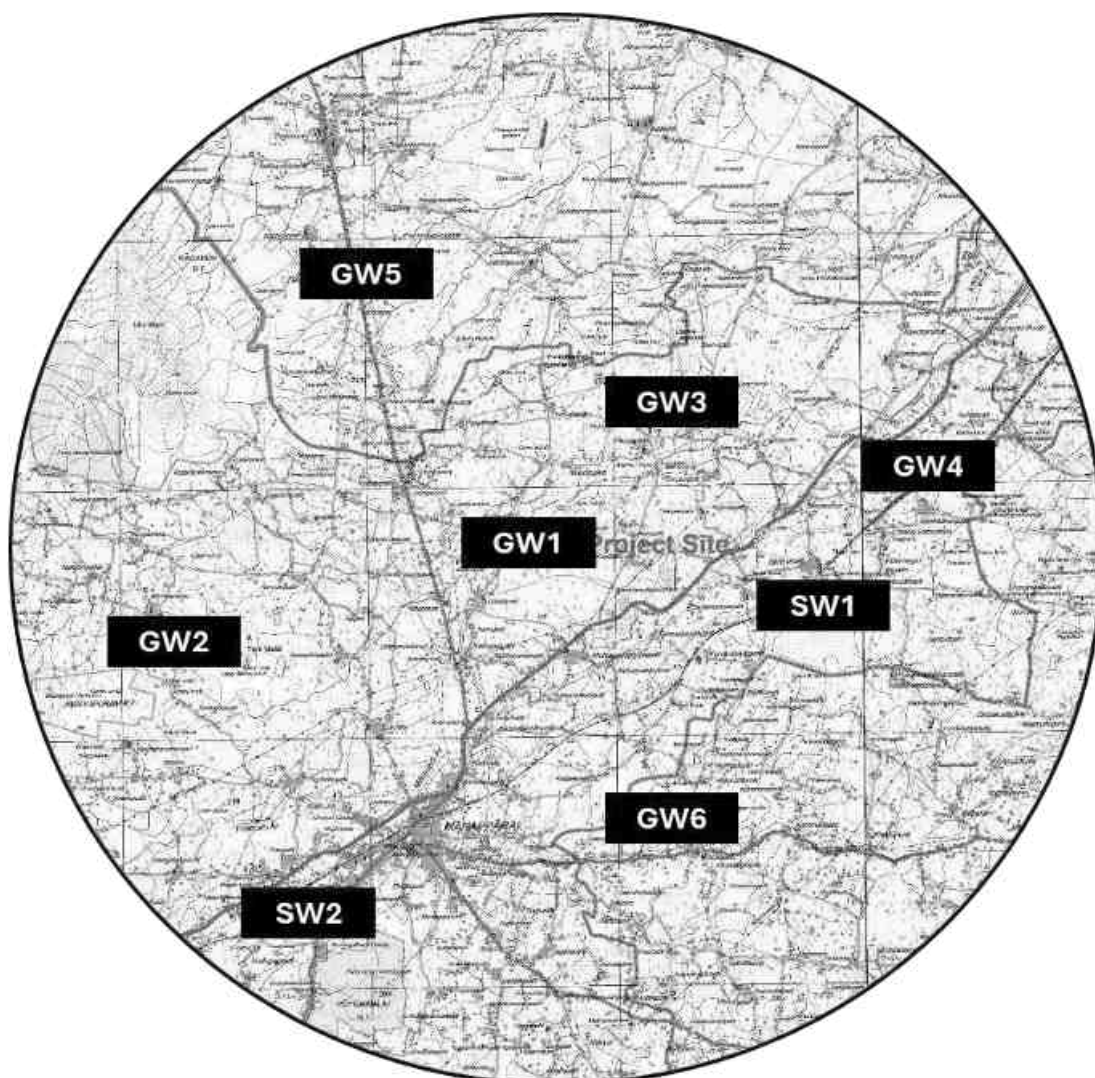


Figure 13 - Location of Water Monitoring Stations

Table 22 - Details of Water Monitoring Stations

Code	Location	Latitude	Longitude	Distance from Project Site (km)	Direction
GW1	Project Site	10°39'22.25"N	78°26'54.08"E	-	-
GW2	Amayapuram	10°37'43.19"N	78°22'47.77"E	8.14	SW
GW3	Periapatty	10°36'28.94"N	78°25'23.61"E	5.70	SW
GW4	Kalarampatty	10°40'18.43"N	78°27'43.40"E	2.30	NE
GW5	Porundalur	10°39'9.45"N	78°29'31.59"E	4.76	E
GW6	Rajalipatty	10°42'3.99"N	78°24'49.03"E	6.29	N
SW1	Pond near Manapparai	10°35'46.71"N	78°24'19.12"E	8.15	SW
SW2	Pond near Samudram	10°38'41.91"N	78°29'22.98"E	4.66	NE

Table 23 - Groundwater Quality Results

S. No.	Parameter	Unit	GW1	GW2	GW3	GW4	GW5	GW6
1	Color	Hazen	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2	Odor	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Turbidity	NTU	0.9	0.6	0.7	1.0	0.7	0.8
4	pH Value @ 25°C	--	7.2	7.4	7.6	6.9	7.1	7.5
5	Temperature	°C	25	25	25	25	25	25
6	Electrical Conductivity (EC) @ 25°C	µmhos/cm	1830	1375	2060	1200	1730	1500
7	Salinity	ppt	0.43	0.36	0.25	0.30	0.31	0.25
8	Total Solids	mg/L	1530	1250	1690	1140	1480	1330
9	Total Hardness (as CaCO ₃)	mg/L	385	275	445	205	325	300
10	Total Alkalinity (as CaCO ₃)	mg/L	370	240	120	190	160	118
11	Iron (as Fe)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
12	Chlorides (as Cl)	mg/L	460	370	430	355	415	445
13	Residual Free Chlorine (RFC)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
14	Total Dissolved Solids (TDS) @ 105°C	mg/L	775	495	935	385	725	575
15	Calcium (as Ca)	mg/L	142	122	165	122	141	136
16	Magnesium (as Mg)	mg/L	62	47	63	29	48	44
17	Manganese (as Mn)	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
18	Copper (as Cu)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
19	Sulphates (as SO ₄ ²⁻)	mg/L	215	138	182	120	220	221
20	Nitrate (as NO ₃)	mg/L	4.8	3.7	3.4	3.0	2.8	3.0
21	Fluoride (as F)	mg/L	0.2	0.4	0.5	0.3	0.4	0.5
22	Sodium (as Na)	mg/L	39	38	22	32	23	34
23	Potassium (as K)	mg/L	11	15	13	9.8	14	18
24	Total Kjeldahl Nitrogen (as N)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
25	Total Phosphorous	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
26	Free Ammonia (as NH ₃)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
27	Phenolic Compound (as C ₆ H ₅ OH)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Dissolved Oxygen (DO)	mg/L	6.6	6.3	7.4	6.0	6.5	6.7
29	Arsenic (as As)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
30	Mercury (as Hg)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
31	Cadmium (as Cd)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
32	Selenium (as Se)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
33	Cyanide (as CN)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
34	Lead (as Pb)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
35	Zinc (as Zn)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
36	Total Chromium (as Cr)	mg/L	BDL	BDL	BDL	BDL	BDL	BDL

Data Interpretation

Groundwater quality was monitored at six locations (GW1–GW6) namely Project Site (GW1), Amayapuram (GW2), Periapatty (GW3), Kalarampatty (GW4), Porundalur (GW5), and Rajalipatty (GW6) in and around the proposed project site to evaluate the baseline water characteristics of the area. The analysis indicates that all physicochemical parameters are within the acceptable limits prescribed by IS 10500:2012 (Drinking Water Standards), demonstrating that the groundwater in the study area is generally suitable for domestic and industrial purposes.

The pH of groundwater samples ranged from 6.9 to 7.6, signifying neutral to slightly alkaline conditions, which are favorable for most uses. Electrical Conductivity (EC) varied between 1200 and 2060 $\mu\text{mhos/cm}$, reflecting moderate mineralization, consistent with the region's geological composition. Total Dissolved Solids (TDS) ranged from 385 to 935 mg/L, remaining below the acceptable limit of 2000 mg/L, suggesting that the water is of good quality with low salinity impact.

Total Hardness levels ranged from 205 to 445 mg/L, indicating moderately hard water, primarily due to the presence of Calcium (122–165 mg/L) and Magnesium (29–63 mg/L) ions. Chloride concentrations (355–460 mg/L) were found to be within acceptable limits, while Sulphate levels ranged from 120 to 221 mg/L, which are also well below the permissible threshold.

Nutrient parameters such as Nitrate (2.8–4.8 mg/L), Fluoride (0.2–0.5 mg/L), and Phosphate (<0.2 mg/L) were found to be very low, indicating no anthropogenic contamination from fertilizers or sewage sources. Dissolved Oxygen (DO) values ranged from 6.0 to 7.4 mg/L, showing well-oxygenated water conditions. Heavy metals such as Iron, Copper, Lead, Zinc, Chromium, Cadmium, Mercury, and Arsenic were below detectable limits (BDL), demonstrating the absence of toxic contamination.

Overall, the groundwater quality in the study area exhibits neutral pH, moderate hardness, low nutrient load, and negligible heavy metal contamination, confirming that the aquifers are chemically safe and suitable for drinking and industrial use. Continuous monitoring is, however, recommended to ensure that groundwater characteristics remain stable during and after the project operation.

Table 24 - Surface Water Quality Results

S. No.	Description	Unit	SW1	SW2
1.	Color	Hazen	<1.0	<1.0
2.	Odor	--	Agreeable	Agreeable
3.	Turbidity	NTU	1.2	1.6
4.	pH Value @ 25°C	--	7.2	7.5
5.	Temperature	°C	25	25
6.	Electrical Conductivity (EC) @ 25°C	µmhos/cm	6430	7700
7.	Salinity	Ppt	3.6	4.8
8.	Total Solids	mg/L	847	726
9.	Total Hardness (as CaCO ₃)	mg/L	611	877
10.	Total Alkalinity (as CaCO ₃)	mg/L	777	551
11.	Iron (as Fe)	mg/L	0.03	0.05
12.	Chlorides (as Cl)	mg/L	652	884
13.	Residual Free Chlorine	mg/L	< 0.1	< 0.1
14.	Total Dissolved Solids (TDS) @ 105°C	mg/L	746	925
15.	Calcium (as Ca)	mg/L	251	321
16.	Magnesium (as Mg)	mg/L	153	132
17.	Manganese (as Mn)	mg/L	< 0.03	< 0.03
18.	Copper (as Cu)	mg/L	BDL	BDL
19.	Sulphates (as SO ₄ 2-)	mg/L	420	355
20.	Nitrate (as NO ₃)	mg/L	12.7	11.4
21.	Fluoride (as F)	mg/L	< 0.2	< 0.2
22.	Sodium (as Na)	mg/L	149	224
23.	Potassium (as K)	mg/L	65	46
24.	Total Kjeldahl Nitrogen	mg/L	<1.0	<1.0
25.	Total Phosphorous	mg/L	<0.2	<2.0
26.	Free Ammonia (as NH ₃)	mg/L	<1.0	< 1.0
27.	Phenolic Compound (as C ₆ H ₅ OH)	mg/L	<0.001	< 0.001
28.	Bio chemical oxygen demand (BOD @ 27°C for 3 days)	mg/L	<1.0	<1.0
29.	Chemical Oxygen Demand (COD)	mg/L	<4.0	< 4.0
30.	Dissolved Oxygen (DO)	mg/L	5.3	5.9
31.	Arsenic (as As)	mg/L	BDL	BDL
32.	Mercury (as Hg)	mg/L	BDL	BDL
33.	Cadmium (as Cd)	mg/L	BDL	BDL
34.	Selenium (as Se)	mg/L	BDL	BDL
35.	Cyanide (as CN)	mg/L	< 0.02	< 0.02
36.	Lead (as Pb)	mg/L	BDL	BDL
37.	Zinc (as Zn)	mg/L	BDL	BDL
38.	Anionic Surface-Active Agent (as MBAS)	mg/L	< 0.01	< 0.01
39.	Total Chromium (as Cr)	mg/L	BDL	BDL
Microbiological parameters:				
40.	Total coliform (MPN)	MPN/100ml	20	35
41.	Faecal Coliforms (MPN)	MPN/100ml	<2.0	<2.0

Data Interpretation

Surface water samples from two locations—SW1 (Pond near Manapparai) and SW2 (Pond near Samudram)—were analyzed to assess existing water quality status. The analysis results indicate that both sampling locations exhibit neutral to slightly alkaline pH (7.2–7.5), which is within the desirable limit of IS 10500:2012 standards.

Electrical conductivity values range from 6430 to 7700 $\mu\text{mhos/cm}$, indicating moderate to high mineral content, typical for surface waters in semi-arid regions with periodic evaporation and concentration effects.

Total Dissolved Solids (TDS) values were 746 mg/L (SW1) and 925 mg/L (SW2) — both within acceptable limits for surface waters. Total Hardness was observed between 611–877 mg/L, and Chloride concentrations were 652–884 mg/L, indicating the influence of mineral runoff and possibly limited saline intrusion in the region.

Major cations such as calcium, magnesium, sodium, and potassium were detected in expected ranges, with calcium dominating. Sulphate and nitrate concentrations were well within permissible levels, indicating no significant anthropogenic contamination from fertilizers or effluents.

Dissolved Oxygen (DO) levels were 5.3–5.9 mg/L, reflecting satisfactory oxygenation and indicating healthy aquatic conditions. The BOD (<1.0 mg/L) and COD (<4.0 mg/L) values were very low, suggesting absence of organic pollution and no sewage contamination.

Heavy metals (As, Hg, Cd, Pb, Cr, Se, Cu, Zn) were found below detectable limits (BDL) in both samples, confirming no industrial or toxic contamination. Microbiological analysis showed Total Coliforms in the range of 20–35 MPN/100ml and Faecal Coliforms <2.0 MPN/100ml, which are within acceptable limits for surface water bodies not used for direct drinking purposes.

Overall, the results show that the surface water quality in and around the project area is good, with no evidence of significant pollution or contamination.

3.5 Soil Environment

Impacts on land environment from project could be mainly attributed to change in land use pattern (direct and indirect). Accordingly for impact assessment on land component, it is pertinent to study the existing land-use pattern in project area, soil characteristics and details of waste generation from the project activities including the resulting impacts on soil with respect to land application/disposal of solid hazardous wastes and the of the surrounding terrestrial environment.

3.5.1 Baseline Status

For studying soil profile of the region, sampling location was selected to assess the existing soil condition in and around the plant representing various land use conditions. The physical, chemical and heavy metal concentrations were determined. The samples were collected by ramming a core-cutter into the soil up to a depth of 90 cm. Simultaneously, in-situ infiltration test using double ring infiltrometer was carried out at all location to determine the permeability. The present study on the soil profile establishes the baseline characteristics and identifies the incremental concentrations if any, due to the existing and proposed activities.

The sampling locations have been identified with the following objectives:

- To determine the baseline soil characteristics of the study area;
- To determine the impact on soil more importantly from agricultural productivity point of view.

Eight locations within 10 km radius of the project site were selected for soil sampling.

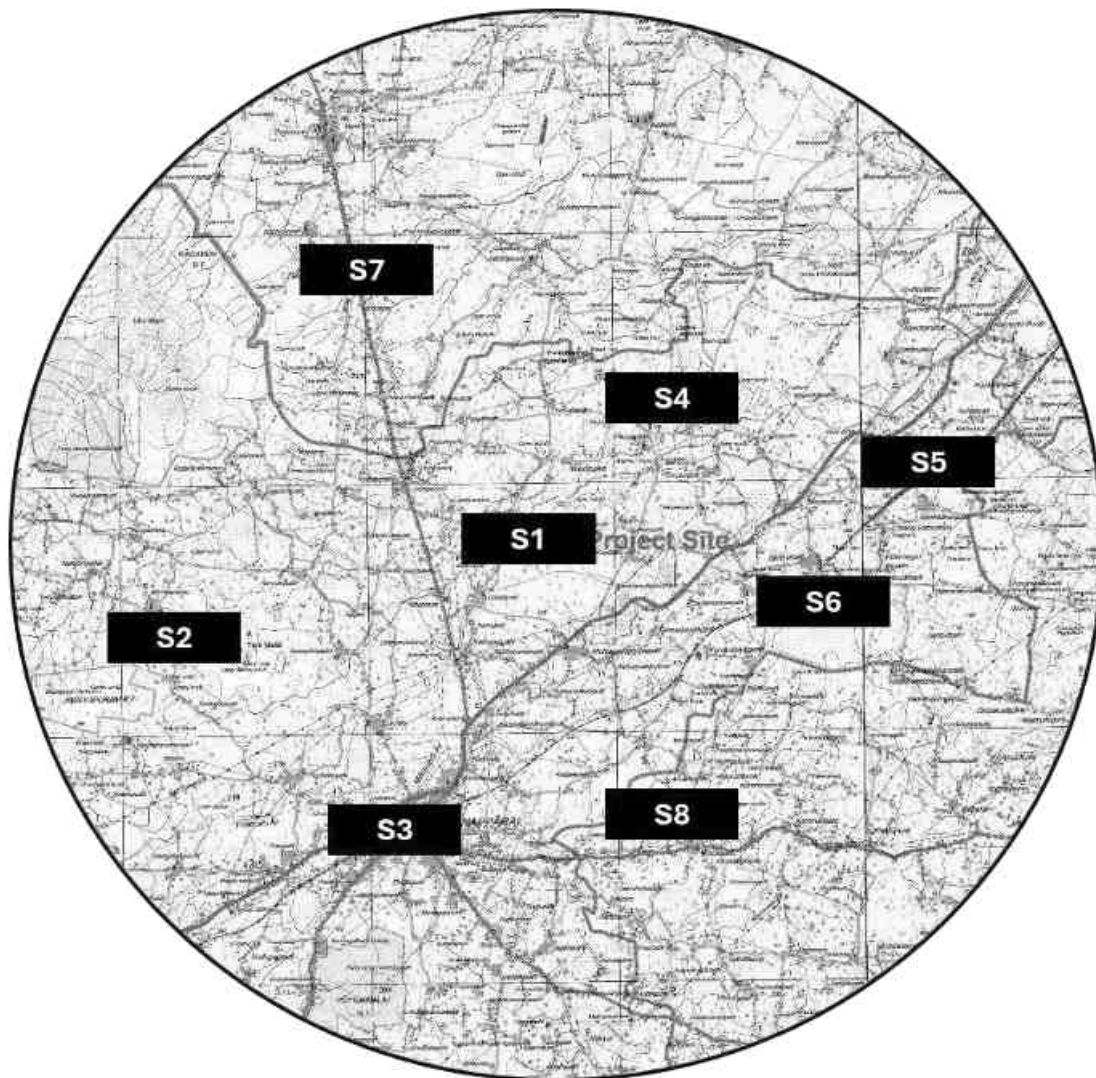


Figure 14 - Location of Soil Monitoring Stations

Table 25 - Details of Soil Monitoring Stations

Code	Location	Latitude	Longitude	Distance from Project Site (km)	Direction
S1	Project Site	10°39'22.25"N	78°26'54.08"E	-	-
S2	Amayapuram	10°37'43.19"N	78°22'47.77"E	8.14	SW
S3	Manapparai	10°36'28.94"N	78°25'23.61"E	5.70	SW
S4	Periapatty	10°40'18.43"N	78°27'43.40"E	2.30	NE
S5	Kalarampatty	10°40'4.71"N	78°29'51.26"E	5.58	NE
S6	Samudram	10°39'9.45"N	78°29'31.59"E	4.76	E
S7	Porundalur	10°42'3.99"N	78°24'49.03"E	6.29	N
S8	Rajalipatty	10°36'33.87"N	78°28'13.44"E	5.68	S

Table 26 - Soil Quality Results

S. No.	Parameter	Unit	S1	S2	S3	S4	S5	S6	S7	S8
1	pH value @ 25°C	--	6.6	6.3	6.7	6.0	5.9	6.1	6.4	6.0
2	Electrical Conductivity @ 25°C	mS/cm	0.85	0.91	0.78	1.02	0.90	0.95	1.12	1.79
3	Organic Carbon	%	1.02	0.83	0.75	1.18	0.70	0.86	0.93	0.72
4	Cation Exchange Capacity	meq/100g	5.3	5.9	6.3	5.7	5.0	5.6	5.3	4.6
5	Colour	--	Light Brown							
6	Clay	%	26	18	20	22	28	20	16	12
7	Silt	%	13	12	11	11	14	15	11	12
8	Sand	%	61	70	69	67	58	65	73	76
9	Soil Type	--	Sandy Loam							
10	Texture	--	Moderately Fine							
11	Cadmium (as Cd)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
12	Infiltration	cm/hr	1.9	1.6	1.8	2.1	2.5	2.3	1.6	1.2
13	Available Nitrogen (as N)	Kg/ha	210	290	296	308	202	212	182	215
14	Available Potassium (as K ₂ O)	Kg/ha	248	243	228	235	220	227	238	234
15	Iron (as Fe)	%	2.15	2.42	2.21	2.61	1.98	2.38	2.00	2.55
16	Manganese (as Mn)	mg/kg	81	75.5	71.5	76.2	69	66	62	79.8
17	Chromium (as Cr)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
18	Lead (as Pb)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
19	Nickel (as Ni)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
20	Copper (as Cu)	mg/kg	6.6	7.1	5.9	6.7	6.4	6.5	6.3	7.1
21	Bulk Density	g/cm ³	1.30	1.40	1.26	1.18	1.34	1.43	1.33	1.38
22	Particle Size	mm	1.8	1.9	1.8	1.6	1.7	1.8	1.8	1.6
23	Permeability Test	cm/hr	3.0	2.8	2.6	2.3	2.5	3.0	2.7	2.2
24	Porosity	%	18.6	18.3	18.0	19.0	19.5	18.7	17.5	15.9
25	Sodium Absorption Ratio	--	3.4	3.0	2.7	2.8	2.5	2.2	1.6	1.7
26	Available Phosphorous (as P ₂ O ₅)	Kg/ha	97.0	93.0	89.2	86.3	94.0	102.0	96.5	99.5
27	Water Holding Capacity	%	25.5	21.0	18.8	19.5	21.8	16.2	17.0	15.0
28	Zinc (as Zn)	mg/kg	3.1	2.7	3.0	3.9	3.8	4.0	2.4	2.5

Soil Quality – Data Interpretation

Physical Properties

- Bulk Density ranges from 1.18 to 1.43 g/cm³, indicating good soil structure and porosity for root growth.
- Water Holding Capacity varies from 15.0% to 25.5%, with Project Site (S1) having the highest.
- Infiltration and Permeability values suggest moderate infiltration rates, supporting balanced moisture retention.

Organic Carbon

The organic carbon content ranges from 0.70% to 1.18%, reflecting moderate to good fertility status. The maximum organic carbon was observed at Periapatty (S4) (1.18%), suggesting good organic matter availability, while Kalarampatty (S5) recorded the lowest (0.70%).

Cation Exchange Capacity (CEC)

The CEC values range from 4.6 to 6.3 meq/100g, which corresponds to moderate nutrient retention capacity. The highest CEC is at Manapparai (S3) (6.3 meq/100g), while the lowest is at Rajalipatty (S8) (4.6 meq/100g).

Soil Texture and Composition

All locations exhibit Sandy Loam texture with varying sand (58–76%), silt (11–15%), and clay (12–28%) fractions, classifying them as moderately fine-textured soils that allow adequate aeration and drainage.

Nutrient Content

- Available Nitrogen ranges from 182 to 308 Kg/ha, indicating moderate fertility. The highest nitrogen is found at Periapatty (S4).
- Available Phosphorus varies from 86.3 to 102 Kg/ha, showing good phosphorus status, highest at Samudram (S6).
- Available Potassium ranges from 220 to 248 Kg/ha, sufficient for crop growth.
- Micronutrients (Fe, Mn, Zn, Cu) are found in trace but adequate concentrations, within the normal range for productive soils.

Heavy Metals

Concentrations of Cd, Cr, Pb, Ni were below detectable limits (BDL) across all sites, indicating no heavy metal contamination in the soil.

Overall, the soil environment within the study area is healthy, non-contaminated, and agriculturally productive, supporting sustainable land use and greenbelt development around the project site.

3.6 Biological Environment

3.6.1 Biological Environment Assessment

A habitat or an area comprises of different kinds of plants and animals within its boundary. The distribution of flora and fauna in the given area represents the biological environment. The biological portion of the environment includes, what is present in the study area, its values, and its responses to impacts description of community uniqueness, the dominant species, and an evaluation of rare or endangered species.

Natural vegetation is mostly a barren land and the bio-diversity of the area is low. Species diversity and food web index of the surrounding area will be negligible. However, the proposed proper re-vegetation techniques and development of green belt around the ultimate pit limit, the impact on the terrestrial environment will be nominal. The unit has earmarked about 33.01% of total area of for developing the Green Belt and Lawns as per the existing Environmental Quality Policy of the Company. The proposed Green Belt will have significant long-term impact during the Operation Phase.

3.6.2 Ecological Survey

An ecological survey of the study area was conducted particularly with reference to recording the existing biological resources. The objectives of the survey were intended to:

- Generate baseline data from field observations from various terrestrial ecosystems,
- Collect secondary data from Government records,
- Compare the data so generated with authentic past records to understand changes,
- Understand the impact of the proposed activity on vegetational structure in the site.

To accomplish the above objectives, a general ecological survey covering an area of 10 km radius area was conducted. The locations were identified for Phyto-sociological aspects to assess the current status. Phyto-sociological studies were carried out by

using least count quadrature method. Trees species were surveyed by taking quadrates of 10m x 10m distributed randomly. Shrub species were surveyed by taking quadrates of 10m x 10m. Herb species were surveyed by taking quadrates of 1m x 1m. The data obtained was further used to estimate Relative Dominance, Relative Density (RD), Relative Frequency (RF) and Importance Value Index (IVI) as per the formula.

Faunal survey covers the Terrestrial Fauna and Avian Fauna. The survey was based on Personal observation, Enquiry with local population and Records available. This survey will include identification of endangered and rare species as per Red Book.

Relative Density (RD): The proportion of individuals of a species in relation to the total number of individuals of all species.

Relative Frequency (RF): The proportion of quadrats or samples in which a species occurs, relative to the total number of quadrats sampled.

Relative Dominance (RD): The proportion of the species' biomass, basal area, or canopy cover in relation to the total for all species

Significance of Important Value Index (IVI)

Ecological Significance: IVI helps identify key species that play an important role in the community structure and ecosystem functioning.

Management and Conservation: Understanding species' importance allows ecologists to prioritize conservation efforts, particularly for those species that are ecologically significant.

Community Structure: It gives insight into the composition and structure of the ecosystem, highlighting the species that dominate or are most influential in shaping the environment.

Comparison Across Communities: IVI allows comparison of species' importance across different ecosystems, sites, or times, making it useful in studies of ecological succession, habitat restoration, or the impact of environmental changes.

Table 27 - List of Flora in the Study Area

S. No.	Scientific name	Common name	Family	Relative Frequency	Relative Dominance	Relative Density	Important Value Index (IVI)
1.	<i>Azadirachta indica</i>	Veppa maram	Meliaceae	0.35	1.5	0.35	2.22
2.	<i>Ficus religiosa</i>	arasa maram	Moraceae	0.98	3.6	0.98	5.50
3.	<i>Ficus benghalensis</i>	Aala maram	Moraceae	0.65	1.5	0.65	2.75
4.	<i>Tamarindus indica</i>	puliya maram	Fabaceae	0.77	2.3	0.77	3.81
5.	<i>Mangifera indica</i>	Maa maram	Anacardiaceae	0.47	2.2	0.47	3.12
6.	<i>Syzygium cumini</i>	naval	Myrtaceae	0.87	2.7	0.87	4.43
7.	<i>Psidium guajava</i>	koyya	Myrtaceae	0.90	2.0	0.90	3.83
8.	<i>Delonix regia</i>	mayil konrai	Fabaceae	0.39	1.5	0.39	2.25
9.	<i>Cassia fistula</i>	sarakkondrai	Fabaceae	0.54	1.4	0.54	2.50
10.	<i>Albizia lebbek</i>	vaagai	Fabaceae	0.82	2.1	0.82	3.77
11.	<i>Albizia saman</i>	thoongu maram	Fabaceae	0.96	3.9	0.96	5.84
12.	<i>Pongamia pinnata</i>	pungam	Fabaceae	0.91	2.7	0.91	4.54
13.	<i>Moringa oleifera</i>	murungai	Moringaceae	0.60	1.4	0.60	2.60
14.	<i>Aegle marmelos</i>	vilvam	Rutaceae	0.51	3.1	0.51	4.08
15.	<i>Borassus flabellifer</i>	panai	Arecaceae	0.84	2.1	0.84	3.79
16.	<i>Cocos nucifera</i>	thengai	Arecaceae	0.43	1.2	0.43	2.04
17.	<i>Calotropis gigantea</i>	erukku	Apocynaceae	0.66	4.3	0.66	5.64
18.	<i>Calotropis procera</i>	vellai erukku	Apocynaceae	0.70	1.7	0.70	3.10
19.	<i>Ricinus communis</i>	amanakku	Euphorbiaceae	0.77	2.4	0.77	3.94
20.	<i>Jatropha curcas</i>	kattamanakku	Euphorbiaceae	0.94	2.6	0.94	4.42
21.	<i>Euphorbia tirucalli</i>	siththi	Euphorbiaceae	0.35	0.8	0.35	1.50
22.	<i>Euphorbia antiquorum</i>	kattathi	Euphorbiaceae	0.74	2.9	0.74	4.34
23.	<i>Phyllanthus emblica</i>	nellikkai	Phyllanthaceae	0.88	2.0	0.88	3.73
24.	<i>Phyllanthus amarus</i>	keezhanelli	Phyllanthaceae	0.63	1.4	0.63	2.69
25.	<i>Mitragyna parvifolia</i>	kaadumanjal	Rubiaceae	0.55	1.6	0.55	2.74
26.	<i>Wrightia tinctoria</i>	pala indigo	Apocynaceae	0.45	2.3	0.45	3.16
27.	<i>Morinda citrifolia</i>	noni	Rubiaceae	0.92	3.4	0.92	5.19
28.	<i>Carissa carandas</i>	kalakkai	Apocynaceae	0.59	2.0	0.59	3.22

S. No.	Scientific name	Common name	Family	Relative Frequency	Relative Dominance	Relative Density	Important Value Index (IVI)
29.	<i>Hemidesmus indicus</i>	nannari	Apocynaceae	0.79	4.3	0.79	5.91
30.	<i>Ocimum tenuiflorum</i>	thulasi	Lamiaceae	0.72	4.3	0.72	5.76
31.	<i>Ocimum basilicum</i>	karunthulasi	Lamiaceae	0.38	2.7	0.38	3.49
32.	<i>Azima tetracantha</i>	sirukurinji	Salvadoraceae	0.86	5.1	0.86	6.81
33.	<i>Dodonaea viscosa</i>	virali	Sapindaceae	0.44	1.4	0.44	2.28
34.	<i>Cissus quadrangularis</i>	pirandai	Vitaceae	0.94	4.8	0.94	6.64
35.	<i>Cynodon dactylon</i>	arugampul	Poaceae	0.69	1.9	0.69	3.25
36.	<i>Bambusa arundinacea</i>	moongil	Poaceae	0.66	1.9	0.66	3.22
37.	<i>Aristida mutabilis</i>	sirupul	Poaceae	0.55	3.3	0.55	4.41
38.	<i>Chloris barbata</i>	pulladi	Poaceae	0.96	4.2	0.96	6.13
39.	<i>Coix lacryma-jobi</i>	kanmani arisi	Poaceae	0.62	1.6	0.62	2.82
40.	<i>Cymbopogon citratus</i>	elumichai poondu	Poaceae	0.81	2.8	0.81	4.39
41.	<i>Dactyloctenium aegyptium</i>	kuruvaipul	Poaceae	0.36	3.0	0.36	3.69
42.	<i>Setaria verticillata</i>	kuthirai pul	Poaceae	0.77	4.6	0.77	6.16
43.	<i>Pennisetum glaucum</i>	kambu	Poaceae	0.71	2.0	0.71	3.44
44.	<i>Sorghum bicolor</i>	cholan	Poaceae	0.46	2.0	0.46	2.92
45.	<i>Eleusine indica</i>	koorai pul	Poaceae	0.65	1.4	0.65	2.72
46.	<i>Aerva lanata</i>	sirupilai	Amaranthaceae	0.83	2.3	0.83	4.00
47.	<i>Achyranthes aspera</i>	nayuruvi	Amaranthaceae	0.43	1.6	0.43	2.40
48.	<i>Amaranthus viridis</i>	arai keera	Amaranthaceae	0.61	4.5	0.61	5.70
49.	<i>Amaranthus spinosus</i>	mullukeera	Amaranthaceae	0.88	3.9	0.88	5.63
50.	<i>Boerhavia diffusa</i>	mukkai	Nyctaginaceae	0.74	6.0	0.74	7.51
51.	<i>Trianthema portulacastrum</i>	sharunnai	Aizoaceae	0.37	2.4	0.37	3.13
52.	<i>Portulaca oleracea</i>	paruppukeera	Portulacaceae	0.72	4.7	0.72	6.15
53.	<i>Sesbania grandiflora</i>	agathi	Fabaceae	0.53	1.9	0.53	3.00
54.	<i>Sesbania sesban</i>	kaattu agathi	Fabaceae	0.93	3.2	0.93	5.04
55.	<i>Tephrosia purpurea</i>	kozhinjil	Fabaceae	0.68	1.8	0.68	3.13

S. No.	Scientific name	Common name	Family	Relative Frequency	Relative Dominance	Relative Density	Important Value Index (IVI)
56.	<i>Crotalaria verrucosa</i>	blue thumbai	Fabaceae	0.60	4.3	0.60	5.53
57.	<i>Crotalaria juncea</i>	sanappu	Fabaceae	0.44	3.2	0.44	4.04
58.	<i>Mimosa pudica</i>	thotta sinungi	Fabaceae	0.76	1.7	0.76	3.24
59.	<i>Acacia nilotica</i>	karuvelam	Fabaceae	0.85	2.4	0.85	4.11
60.	<i>Acacia leucophloea</i>	vaahai	Fabaceae	0.66	4.3	0.66	5.60
61.	<i>Prosopis juliflora</i>	seemai karuvelam	Fabaceae	0.40	1.7	0.40	2.46
62.	<i>Bauhinia variegata</i>	mandharai	Fabaceae	0.78	3.0	0.78	4.59
63.	<i>Bauhinia racemosa</i>	aathi	Fabaceae	0.50	3.6	0.50	4.63
64.	<i>Pterocarpus marsupium</i>	vengai	Fabaceae	0.98	2.5	0.98	4.43
65.	<i>Pterocarpus santalinus</i>	sivappu chandanam	Fabaceae	0.73	3.7	0.73	5.13
66.	<i>Dalbergia latifolia</i>	karungatti	Fabaceae	0.68	1.9	0.68	3.23
67.	<i>Dalbergia sissoo</i>	sisso	Fabaceae	0.61	2.9	0.61	4.07
68.	<i>Abrus precatorius</i>	kunri	Fabaceae	0.81	2.1	0.81	3.75
69.	<i>Vachellia farnesiana</i>	mulluvagai	Fabaceae	0.56	1.4	0.56	2.53
70.	<i>Melia dubia</i>	malai vembu	Meliaceae	0.87	2.0	0.87	3.71
71.	<i>Swietenia mahagoni</i>	mahogani	Meliaceae	0.36	2.9	0.36	3.64
72.	<i>Azadirachta excelsa</i>	malai veppu	Meliaceae	0.75	1.8	0.75	3.33
73.	<i>Santalum album</i>	chandanam	Santalaceae	0.53	2.2	0.53	3.21
74.	<i>Tectona grandis</i>	thekku	Lamiaceae	0.90	2.1	0.90	3.92
75.	<i>Gmelina arborea</i>	kumil	Lamiaceae	0.70	5.1	0.70	6.46
76.	<i>Premna serratifolia</i>	munnai	Lamiaceae	0.59	3.8	0.59	5.01
77.	<i>Vitex negundo</i>	notchi	Lamiaceae	0.49	2.9	0.49	3.90
78.	<i>Leucas aspera</i>	thumbai	Lamiaceae	0.80	4.4	0.80	5.95
79.	<i>Ocimum gratissimum</i>	karpooora thulasi	Lamiaceae	0.55	2.7	0.55	3.84
80.	<i>Lawsonia inermis</i>	maruthani	Lythraceae	0.85	4.0	0.85	5.69
81.	<i>Lagerstroemia speciosa</i>	kadukkai poo	Lythraceae	0.38	1.7	0.38	2.42
82.	<i>Woodfordia fruticosa</i>	vathanarai	Lythraceae	0.78	3.2	0.78	4.75

S. No.	Scientific name	Common name	Family	Relative Frequency	Relative Dominance	Relative Density	Important Value Index (IVI)
83.	<i>Punica granatum</i>	madhulai	Lythraceae	0.48	1.8	0.48	2.79
84.	<i>Hibiscus rosa-sinensis</i>	sembaruthi	Malvaceae	0.92	3.3	0.92	5.17
85.	<i>Hibiscus tiliaceus</i>	poovarasu	Malvaceae	0.67	2.3	0.67	3.67
86.	<i>Thespesia populnea</i>	poovarasu maram	Malvaceae	0.58	1.9	0.58	3.05
87.	<i>Abutilon indicum</i>	thuthi	Malvaceae	0.50	1.6	0.50	2.58
88.	<i>Sida cordifolia</i>	kurunthotti	Malvaceae	0.83	2.5	0.83	4.15
89.	<i>Bombax ceiba</i>	ilavam	Malvaceae	0.54	1.5	0.54	2.60
90.	<i>Sterculia foetida</i>	nettilingam	Malvaceae	0.88	2.4	0.88	4.16
91.	<i>Cordia dichotoma</i>	nandiyavattai	Boraginaceae	0.37	1.0	0.37	1.71
92.	<i>Heliotropium indicum</i>	theligam	Boraginaceae	0.73	1.8	0.73	3.31
93.	<i>Ipomoea carnea</i>	neelamari	Convolvulaceae	0.52	1.3	0.52	2.29
94.	<i>Ipomoea fistulosa</i>	neelamandharai	Convolvulaceae	0.95	2.2	0.95	4.14
95.	<i>Ipomoea aquatica</i>	vallaarai keera	Convolvulaceae	0.64	1.4	0.64	2.73
96.	<i>Evolvulus alsinoides</i>	vishnukranthi	Convolvulaceae	0.61	1.3	0.61	2.53
97.	<i>Calycopteris floribunda</i>	thiruvattai	Combretaceae	0.46	1.0	0.46	1.90
98.	<i>Terminalia arjuna</i>	marudha maram	Combretaceae	0.80	1.6	0.80	3.25
99.	<i>Terminalia bellirica</i>	thaandrikai	Combretaceae	0.57	1.1	0.57	2.26
100.	<i>Terminalia chebula</i>	kadukkai	Combretaceae	0.84	1.6	0.84	3.31
101.	<i>Quisqualis indica</i>	rangoon malar	Combretaceae	0.40	0.7	0.40	1.54
102.	<i>Anogeissus latifolia</i>	vaagai	Combretaceae	0.76	1.4	0.76	2.89
103.	<i>Grewia asiatica</i>	manjaal	Malvaceae	0.50	0.9	0.50	1.87
104.	<i>Grewia tiliifolia</i>	koondhal	Malvaceae	0.93	1.6	0.93	3.46
105.	<i>Ziziphus mauritiana</i>	ilanthai	Rhamnaceae	0.69	1.2	0.69	2.55
106.	<i>Ziziphus oenoplia</i>	siru ilanthai	Rhamnaceae	0.58	1.0	0.58	2.12
107.	<i>Flacourtia indica</i>	vilangu	Salicaceae	0.49	0.8	0.49	1.75
108.	<i>Casearia tomentosa</i>	saambal	Salicaceae	0.79	1.2	0.79	2.81
109.	<i>Putranjiva roxburghii</i>	putranjivi	Putranjivaceae	0.57	0.9	0.57	2.02
110.	<i>Breynia vitis-idaea</i>	sirupulai	Phyllanthaceae	0.86	1.3	0.86	3.01

S. No.	Scientific name	Common name	Family	Relative Frequency	Relative Dominance	Relative Density	Important Value Index (IVI)
111.	<i>Suregada angustifolia</i>	churappu	Euphorbiaceae	0.39	0.6	0.39	1.35
112.	<i>Mallotus philippensis</i>	kamala	Euphorbiaceae	0.72	1.0	0.72	2.45
113.	<i>Croton bonplandianus</i>	kattamayam	Euphorbiaceae	0.52	0.7	0.52	1.77
114.	<i>Alstonia scholaris</i>	ezhilam pala	Apocynaceae	0.95	1.3	0.95	3.19
115.	<i>Thevetia peruviana</i>	yellow arali	Apocynaceae	0.67	0.9	0.67	2.23
116.	<i>Nerium oleander</i>	arali	Apocynaceae	0.62	0.8	0.62	2.05
117.	<i>Tabernaemontana divaricata</i>	nandhiyavattai	Apocynaceae	0.47	0.6	0.47	1.55
118.	<i>Rauvolfia serpentina</i>	sarpagandhi	Apocynaceae	0.82	1.0	0.82	2.67
119.	<i>Plumeria alba</i>	perungambal	Apocynaceae	0.56	0.7	0.56	1.82
120.	<i>Catharanthus roseus</i>	nithyakalyani	Apocynaceae	0.91	1.1	0.91	2.92
121.	<i>Ipomoea sepiaria</i>	urmikodi	Convolvulaceae	0.41	0.5	0.41	1.32
122.	<i>Aristolochia indica</i>	eswaramooli	Aristolochiaceae	0.75	0.9	0.75	2.37
123.	<i>Tinospora cordifolia</i>	seendhil	Menispermaceae	0.51	0.6	0.51	1.60
124.	<i>Cissus vitiginea</i>	irusudi	Vitaceae	0.94	1.1	0.94	2.94
125.	<i>Momordica charantia</i>	paavakkai	Cucurbitaceae	0.71	0.8	0.71	2.20
126.	<i>Cucumis sativus</i>	vellarikkai	Cucurbitaceae	0.64	0.7	0.64	1.97
127.	<i>Luffa acutangula</i>	peerkangai	Cucurbitaceae	0.44	0.5	0.44	1.35
128.	<i>Trichosanthes cucumerina</i>	podalangai	Cucurbitaceae	0.83	0.9	0.83	2.54
129.	<i>Curcuma longa</i>	manjal	Zingiberaceae	0.54	0.6	0.54	1.64
130.	<i>Zingiber officinale</i>	inji	Zingiberaceae	0.89	0.9	0.89	2.69
131.	<i>Costus speciosus</i>	kostum	Costaceae	0.39	0.4	0.39	1.19
132.	<i>Musa paradisiaca</i>	vaazhai	Musaceae	0.79	0.8	0.79	2.36
133.	<i>Cyperus rotundus</i>	korai	Cyperaceae	0.48	0.5	0.48	1.43
134.	<i>Cyperus esculentus</i>	thinaikizhangu	Cyperaceae	0.92	0.9	0.92	2.72
135.	<i>Scirpus grossus</i>	kuthirai vaalai	Cyperaceae	0.69	0.7	0.69	2.03
136.	<i>Typha angustifolia</i>	neer thalai	Typhaceae	0.63	0.6	0.63	1.84
137.	<i>Nelumbo nucifera</i>	thamara	Nelumbonaceae	0.45	0.4	0.45	1.33

S. No.	Scientific name	Common name	Family	Relative Frequency	Relative Dominance	Relative Density	Important Value Index (IVI)
138.	<i>Nymphaea nouchali</i>	alli	Nymphaeaceae	0.81	0.7	0.81	2.35
139.	<i>Alternanthera sessilis</i>	ponnanganni	Amaranthaceae	0.55	0.5	0.55	1.61
140.	<i>Boerhavia repens</i>	mukkirattai	Nyctaginaceae	0.84	0.7	0.84	2.42
141.	<i>Clerodendrum inerme</i>	perukurinji	Lamiaceae	0.41	0.4	0.41	1.17
142.	<i>Justicia adhatoda</i>	adathodai	Acanthaceae	0.74	0.6	0.74	2.11
143.	<i>Andrographis paniculata</i>	nilavembu	Acanthaceae	0.51	0.4	0.51	1.46
144.	<i>Ruellia tuberosa</i>	thuthi pasi	Acanthaceae	0.94	0.8	0.94	2.66
145.	<i>Holarrhena pubescens</i>	veppalai	Apocynaceae	0.66	0.6	0.66	1.88
146.	<i>Cassia auriculata</i>	avaram	Fabaceae	0.61	0.5	0.61	1.72
147.	<i>Senna alata</i>	peru avaram	Fabaceae	0.42	0.3	0.42	1.18
148.	<i>Syzygium aromaticum</i>	grambu maram	Myrtaceae	0.82	0.7	0.82	2.28
149.	<i>Melastoma malabathricum</i>	karinkaadu poo	Melastomataceae	0.55	0.4	0.55	1.53
150.	<i>Hygrophila auriculata</i>	neer mulli	Acanthaceae	0.87	0.7	0.87	2.41

Table 28 - List of Fauna in the Study Area

S. No.	Scientific Name	Common Name	Family
Mammals			
1.	<i>Macaca radiata</i>	Bonnet macaque	Cercopithecidae
2.	<i>Semnopithecus entellus</i>	Northern plains langur	Cercopithecidae
3.	<i>Funambulus palmarum</i>	Indian palm squirrel	Sciuridae
4.	<i>Herpestes edwardsii</i>	Indian grey mongoose	Herpestidae
5.	<i>Herpestes smithii</i>	Ruddy mongoose	Herpestidae
6.	<i>Canis aureus indicus</i>	Indian jackal	Canidae
7.	<i>Vulpes bengalensis</i>	Bengal fox	Canidae
8.	<i>Lepus nigricollis</i>	Black-naped hare	Leporidae
9.	<i>Tatera indica</i>	Indian gerbil	Muridae
10.	<i>Bandicota bengalensis</i>	Indian mole rat	Muridae
11.	<i>Mus booduga</i>	Little Indian field mouse	Muridae
12.	<i>Rattus rattus</i>	House rat	Muridae
13.	<i>Pteropus giganteus</i>	Indian flying fox	Pteropodidae
14.	<i>Cynopterus sphinx</i>	Short-nosed fruit bat	Pteropodidae
15.	<i>Pipistrellus tenuis</i>	Indian pipistrelle	Vespertilionidae
16.	<i>Suncus murinus</i>	Asian house shrew	Soricidae
17.	<i>Felis chaus</i>	Jungle cat	Felidae
18.	<i>Viverricula indica</i>	Small Indian civet	Viverridae
19.	<i>Sus scrofa</i>	Wild boar	Suidae
20.	<i>Hystrix indica</i>	Indian porcupine	Hystriidae
21.	<i>Rousettus leschenaultii</i>	Fulvous fruit bat	Pteropodidae
Birds			
22.	<i>Ardeola grayii</i>	Pond heron	Ardeidae
23.	<i>Egretta garzetta</i>	Little egret	Ardeidae
24.	<i>Egretta intermedia</i>	Intermediate egret	Ardeidae
25.	<i>Bubulcus ibis</i>	Cattle egret	Ardeidae
26.	<i>Ardea purpurea</i>	Purple heron	Ardeidae
27.	<i>Ardea cinerea</i>	Grey heron	Ardeidae
28.	<i>Charadrius dubius</i>	Little ringed plover	Charadriidae
29.	<i>Tringa nebularia</i>	Common greenshank	Scolopacidae
30.	<i>Tringa glareola</i>	Wood sandpiper	Scolopacidae
31.	<i>Actitis hypoleucos</i>	Common sandpiper	Scolopacidae
32.	<i>Pavo cristatus</i>	Indian peafowl	Phasianidae
33.	<i>Francolinus pondicerianus</i>	Grey francolin	Phasianidae
34.	<i>Columba livia</i>	Rock pigeon	Columbidae
35.	<i>Streptopelia decaocto</i>	Eurasian collared dove	Columbidae
36.	<i>Psittacula krameri</i>	Rose-ringed parakeet	Psittaculidae
37.	<i>Cacomantis merulinus</i>	Plaintive cuckoo	Cuculidae
38.	<i>Centropus sinensis</i>	Greater coucal	Cuculidae
39.	<i>Tyto alba</i>	Barn owl	Tytonidae
40.	<i>Athene brama</i>	Spotted owlet	Strigidae

S. No.	Scientific Name	Common Name	Family
41.	<i>Upupa epops</i>	Hoopoe	Upupidae
42.	<i>Merops orientalis</i>	Green bee-eater	Meropidae
43.	<i>Coracias benghalensis</i>	Indian roller	Coraciidae
44.	<i>Dicrurus macrocercus</i>	Black drongo	Dicruridae
45.	<i>Acridotheres tristis</i>	Common myna	Sturnidae
46.	<i>Pycnonotus cafer</i>	Red-vented bulbul	Pycnonotidae
47.	<i>Pycnonotus luteolus</i>	White-browed bulbul	Pycnonotidae
48.	<i>Orthotomus sutorius</i>	Tailorbird	Cisticolidae
49.	<i>Turdus merula</i>	Indian blackbird	Turdidae
50.	<i>Motacilla alba</i>	White wagtail	Motacillidae
51.	<i>Motacilla maderaspatensis</i>	Indian pied wagtail	Motacillidae
52.	<i>Passer domesticus</i>	House sparrow	Passeridae
53.	<i>Pericrocotus cinnamomeus</i>	Small minivet	Campephagidae
54.	<i>Lanius schach</i>	Long-tailed shrike	Laniidae
55.	<i>Milvus migrans</i>	Black kite	Accipitridae
56.	<i>Haliastur indus</i>	Brahminy kite	Accipitridae
57.	<i>Circus aeruginosus</i>	Marsh harrier	Accipitridae
58.	<i>Falco tinnunculus</i>	Kestrel	Falconidae
59.	<i>Falco subbuteo</i>	Hobby falcon	Falconidae
60.	<i>Dendrocitta vagabunda</i>	Rufous treepie	Corvidae
61.	<i>Corvus splendens</i>	House crow	Corvidae
62.	<i>Corvus macrorhynchos</i>	Jungle crow	Corvidae
63.	<i>Copsychus saularis</i>	Oriental magpie robin	Muscicapidae
64.	<i>Anastomus oscitans</i>	Asian openbill	Ciconiidae
65.	<i>Mycteria leucocephala</i>	Painted stork	Ciconiidae
66.	<i>Threskiornis melanocephalus</i>	Black-headed ibis	Threskiornithidae
67.	<i>Pelecanus philippensis</i>	Spot-billed pelican	Pelecanidae
68.	<i>Sterna aurantia</i>	River tern	Laridae
69.	<i>Alauda gulgula</i>	Oriental skylark	Alaudidae
70.	<i>Eudynamys scolopaceus</i>	Asian koel	Cuculidae
Reptiles			
71.	<i>Calotes versicolor</i>	Oriental garden lizard	Agamidae
72.	<i>Hemidactylus frenatus</i>	Common house gecko	Gekkonidae
73.	<i>Hemidactylus brookii</i>	Brook's gecko	Gekkonidae
74.	<i>Ophisops leschenaultii</i>	Snake-eyed lizard	Lacertidae
75.	<i>Eutropis carinata</i>	Keeled skink	Scincidae
76.	<i>Naja naja</i>	Indian cobra	Elapidae
77.	<i>Bungarus caeruleus</i>	Common krait	Elapidae
78.	<i>Daboia russelii</i>	Russell's viper	Viperidae
79.	<i>Echis carinatus</i>	Saw-scaled viper	Viperidae
80.	<i>Lycodon aulicus</i>	Common wolf snake	Colubridae

S. No.	Scientific Name	Common Name	Family
81.	<i>Ptyas mucosa</i>	Rat snake	Colubridae
82.	<i>Amphiesma stolatum</i>	Buff striped keelback	Colubridae
83.	<i>Xenochrophis piscator</i>	Checkered keelback	Colubridae
84.	<i>Boiga trigonata</i>	Common cat snake	Colubridae
Amphibians			
85.	<i>Duttaphrynus melanostictus</i>	Common Indian toad	Bufonidae
86.	<i>Hoplobatrachus tigerinus</i>	Indian bullfrog	Dicroglossidae
87.	<i>Hoplobatrachus crassus</i>	Jerdon's bullfrog	Dicroglossidae
88.	<i>Fejervarya caperata</i>	Wrinkled frog	Dicroglossidae
89.	<i>Sphaerotheca breviceps</i>	Indian burrowing frog	Dicroglossidae
90.	<i>Hylarana temporalis</i>	Bronzed frog	Ranidae
91.	<i>Uperodon systoma</i>	Marbled balloon frog	Microhylidae
92.	<i>Minervarya agricola</i>	Agricultural frog	Dicroglossidae
93.	<i>Polypedates maculatus</i>	Common tree frog	Rhacophoridae
94.	<i>Rhacophorus lateralis</i>	Small tree frog	Rhacophoridae
Butterflies & Insects			
95.	<i>Papilio polytes</i>	Common Mormon	Papilionidae
96.	<i>Papilio demoleus</i>	Lime butterfly	Papilionidae
97.	<i>Graphium agamemnon</i>	Tailed jay	Papilionidae
98.	<i>Catopsilia pomona</i>	Lemon emigrant	Pieridae
99.	<i>Catopsilia pyranthe</i>	Mottled emigrant	Pieridae
100.	<i>Eurema hecabe</i>	Common grass yellow	Pieridae
101.	<i>Eurema brigitta</i>	Small grass yellow	Pieridae
102.	<i>Pieris canidia</i>	Indian cabbage white	Pieridae
103.	<i>Danaus chrysippus</i>	Plain tiger	Nymphalidae
104.	<i>Danaus genutia</i>	Striped tiger	Nymphalidae
105.	<i>Euploea core</i>	Common crow	Nymphalidae
106.	<i>Junonia lemonias</i>	Lemon pansy	Nymphalidae
107.	<i>Junonia almana</i>	Peacock pansy	Nymphalidae
108.	<i>Melanitis leda</i>	Common evening brown	Nymphalidae
109.	<i>Hypolimnys misippus</i>	Danaid eggfly	Nymphalidae
110.	<i>Zizina otis</i>	Lesser grass blue	Lycaenidae
111.	<i>Lampides boeticus</i>	Pea blue	Lycaenidae
112.	<i>Jamides celeno</i>	Common cerulean	Lycaenidae
113.	<i>Leptotes plinius</i>	Zebra blue	Lycaenidae
114.	<i>Chilades lajus</i>	Lime blue	Lycaenidae
115.	<i>Acraea violae</i>	Tawny coster	Nymphalidae
116.	<i>Tarucus nara</i>	Striped blue	Lycaenidae
117.	<i>Ceratitis capitata</i>	Fruit fly	Tephritidae

3.7 Topographical Studies

3.7.1 General

The 10 km study area surrounding the SIPCOT Industrial Park in Manapparai represents a typical semi-arid plains environment of south-central Tamil Nadu, influenced strongly by both natural physiographic characteristics and long-standing human land-use practices. The landscape is composed of broad undulating plains interspersed with isolated rocky uplands, agricultural fields, village habitations, man-made irrigation tanks, and seasonal watercourses. The region has evolved over centuries through a combination of natural geomorphic processes and anthropogenic modifications, particularly the establishment of extensive tank irrigation systems that continue to define both the hydrology and socio-economic fabric of local communities.

The area's topographical features directly influence drainage, groundwater occurrence, vegetation patterns, agricultural productivity, and settlement locations. Despite its semi-arid climate, the region sustains agriculture and habitation through efficient use of rainfall, surface storage, and groundwater. The study area does not exhibit extreme topographical variation, making it conducive for industrial development within SIPCOT, while still supporting the ecological and socio-economic context of surrounding villages.

3.7.2 Terrain and Elevation

The terrain of the study area can be broadly classified as gently undulating plains with subtle elevation differences that gradually shift from one zone to another without abrupt changes in relief. Elevations typically range between 150 m and 210 m above mean sea level, with the central and eastern portions—where SIPCOT Manapparai is located—lying at relatively uniform elevations of around 160–170 m. These flat to moderately sloping surfaces are ideal for industrial layouts and infrastructure development because they require minimal land leveling or contour modification.

Towards the western and southwestern sides of the study area, minor upland features and low rocky outcrops are observed. These residual hill formations, rising up to about

200–210 m, form part of the ancient crystalline terrain typical of southern Tamil Nadu. They contribute to localized slope variations but remain non-threatening to development activities. Their presence subtly influences micro-drainage, wind movement, and vegetation density in those pockets. The overall slope gradient of the study area trends towards the eastern and southeastern directions, facilitating effective runoff movement during monsoon rainfall and preventing water stagnation in most parts.

3.7.3 Drainage System

The drainage system of the area is shaped by a combination of natural streams, shallow seasonal channels, interlinked ponds, and large irrigation tanks, forming a complex hydrological network that is both natural and human-created. The region falls under the minor sub-basins associated with tributaries of the Koraiyar and ultimately the Cauvery river basin, although no major perennial rivers flow through the immediate 10 km radius. Instead, the dominant hydrological behavior is governed by ephemeral streams that become active primarily during the northeast monsoon.

These channels, often shallow and broad, carry monsoonal runoff towards the east and southeast, feeding tanks such as the Manapparai Tank, Samudram Tank, and numerous village ponds. The drainage pattern displays a sub-dendritic form, shaped by the underlying geology and soil characteristics. The network of tanks acts as a vital buffer system, regulating runoff, mitigating localized flooding, and recharging groundwater. These water bodies are central to agricultural irrigation and thus play a significant socio-economic role. The intricate interconnection between tanks and drains reflects the region's traditional water management heritage and continues to improve resilience against drought.

3.7.4 Soil and Agriculture

The soils of the study area are predominantly derived from weathered granite and gneiss formations, yielding red loamy soils, red sandy soils, and scattered patches of black cotton soils. These soils generally exhibit moderate fertility and are well-suited for

a range of agricultural activities that depend on monsoon rainfall and supplemental irrigation. Texturally, the soils vary from sandy loam in the upper slopes to clay loam in the lower agricultural basins. Organic matter content tends to be moderate to low, a common characteristic of semi-arid regions. However, regular cultivation practices and replenishment through organic inputs help maintain soil productivity.

Agriculture remains a primary livelihood in the study area, with farmers cultivating paddy, millets, pulses, oilseeds, and seasonal vegetables. Irrigated pockets rely on tanks and borewells, whereas dryland farming occurs in areas farther from water sources. The soils' ability to retain moisture after monsoon rains plays an important role in crop success, especially for groundnut, maize, and pulses. The agricultural landscape also contributes to local biodiversity by sustaining hedgerow vegetation, agro-forestry species, and seasonal fauna.

3.7.5 Water Bodies and Lakes

The study area hosts a network of significant water bodies that function as essential hydrological and socio-economic assets. The most prominent among them are the Manapparai Lake and Samudram Lake, both of which serve as large seasonal reservoirs that accumulate monsoon runoff. These tanks not only supply irrigation water but also support livestock, act as recharge sources for local aquifers, and contribute to the ecological diversity of the region by providing habitat for aquatic and semi-aquatic species.

In addition to these large tanks, smaller ponds and village ooranis are distributed throughout settlements such as Periapatty, Porundalur, Kalarampatty, and Rajalipatty. These water bodies also vary in storage capacity, retention period, and ecological characteristics. Their presence ensures that surface water availability is distributed across the region, reducing dependence on any single source. Dry-season water levels remain low in many tanks due to high evaporation rates and limited rainfall, but they nonetheless remain critical recharge points in the hydrological cycle.

3.7.6 Geology

Geologically, the area forms part of the Southern Granulite Terrain, consisting predominantly of ancient crystalline rocks dating back to the Archaean era. The major rock formations include charnockites, granite gneiss, hornblende-biotite gneiss, quartz veins, and pegmatite intrusions. This crystalline basement is exposed in several locations and forms the foundation for the region's geomorphic and hydrogeological features.

The depth of weathering varies considerably, ranging from shallow weathered mantles to deeper profiles of 10–15 m in some places. These weathered profiles are crucial for groundwater storage in an otherwise hard-rock terrain. Mechanical weathering and structural weaknesses such as joints, fractures, and foliation planes facilitate groundwater movement and extraction. The geological setting also determines mineral availability, soil type formation, and landform evolution.

3.7.7 Geomorphology

The geomorphology of the study area is characterized by a combination of gently undulating plains, pediments, residual hills, shallow buried pediments, and valley fills. The plains, which occupy the majority of the landscape, are formed through prolonged weathering and erosional processes acting on the underlying crystalline bedrock. Pediments, which form transitional slopes between plains and uplands, are marked by thin soil cover and scattered rock fragments.

Residual hills and inselbergs stand as remnants of ancient landforms that resisted weathering over long periods. These features contribute to local elevation variability, microclimate differences, and habitat diversity. The tank-fed agricultural zones are anthropogenic geomorphic features developed historically to optimize rainwater harvesting, and they continue to influence land use patterns. Overall, the geomorphology supports moderate groundwater potential, sustainable agriculture, and low-risk industrial development.

3.7.8 Hydrogeology

Groundwater in the region occurs predominantly within the weathered zone and the underlying fractured and jointed crystalline rocks. The aquifers are typically unconfined to semi-confined, with groundwater movement controlled by the degree of weathering, fracture density, and structural discontinuities. Depth to water varies seasonally, with post-monsoon levels ranging from 5–20 m bgl and pre-monsoon levels dropping to 10–25 m bgl due to extraction and natural depletion.

Recharge is primarily through rainfall infiltration, tank seepage, and aquifer interconnections. Since the area relies heavily on groundwater for both domestic and agricultural uses, the aquifer system plays a vital socio-economic role. Groundwater yield is moderate but reliable when managed sustainably. The presence of several large tanks improves recharge efficiency, enhancing groundwater availability in the vicinity of these storage structures.

3.7.9 Mineral Resources

The region does not possess major economic mineral deposits; however, the geology supports small-scale extraction of construction materials. Granite, charnockite, and related stone materials are occasionally quarried for use in building and road construction. Gravel deposits and lateritic material are also found in limited quantities and are utilized for minor civil works. Clay deposits occur in selected pockets and support traditional brick manufacturing activities. There is no evidence of large-scale mining or environmentally sensitive mineral extraction within the study area, ensuring minimal mining-induced disruption to topography or ecology.

3.7.11 Climate and Weather

The study area experiences a semi-arid tropical climate marked by hot summers, moderate winters, and distinct monsoon seasons. Summers are typically intense, with temperatures rising above 38°C, while winters remain pleasant with minimum temperatures around 20–22°C. Rainfall averages between 820 and 900 mm annually, with the northeast monsoon contributing the majority of precipitation from October to December.

Humidity remains moderate through the year, influenced by wind patterns and seasonal variability. Winds predominantly flow from the southwest and southeast, gaining strength during the pre-monsoon months. Extreme weather events are relatively infrequent, with occasional heat waves and droughts being the primary climatic risks. The overall climatic conditions strongly shape agricultural productivity, water availability, and ecological dynamics.

3.7.12 Human Settlements and Infrastructure

The study area encompasses a mix of rural settlements and semi-urban centers such as Manapparai town, along with several villages including Amayapuram, Samudram, Periapatty, Porundalur, Rajalipatty, and Kalarampatty. Settlement patterns are closely tied to water availability, agricultural land distribution, and road connectivity. Manapparai serves as the commercial and administrative hub, offering healthcare facilities, markets, educational institutions, and transportation infrastructure.

Road connectivity is well-established through the NH-38 (Trichy–Madurai highway) and various district roads linking villages with the SIPCOT Industrial Park. Rail connectivity through Manapparai Railway Station facilitates regional logistics. Water supply to habitations is supported by a combination of borewells, overhead tanks, and community ponds, while SIPCOT maintains dedicated infrastructure for industrial utilities. The socio-economic environment is predominantly agrarian, supplemented by small-scale trade, services, and growing industrial employment.

3.7.13 Seismicity

According to the Bureau of Indian Standards (IS 1893), the study area falls under Seismic Zone II, categorizing it as a region of low seismic risk. The area does not contain active faults or major lineaments indicative of high seismic vulnerability. Historical records show no significant earthquakes affecting this part of Tiruchirappalli district. Nonetheless, industrial structures within SIPCOT must comply with national structural design codes to ensure safety against minor seismic events. The low seismicity enhances the suitability of the region for industrial establishments and large-scale infrastructure development.

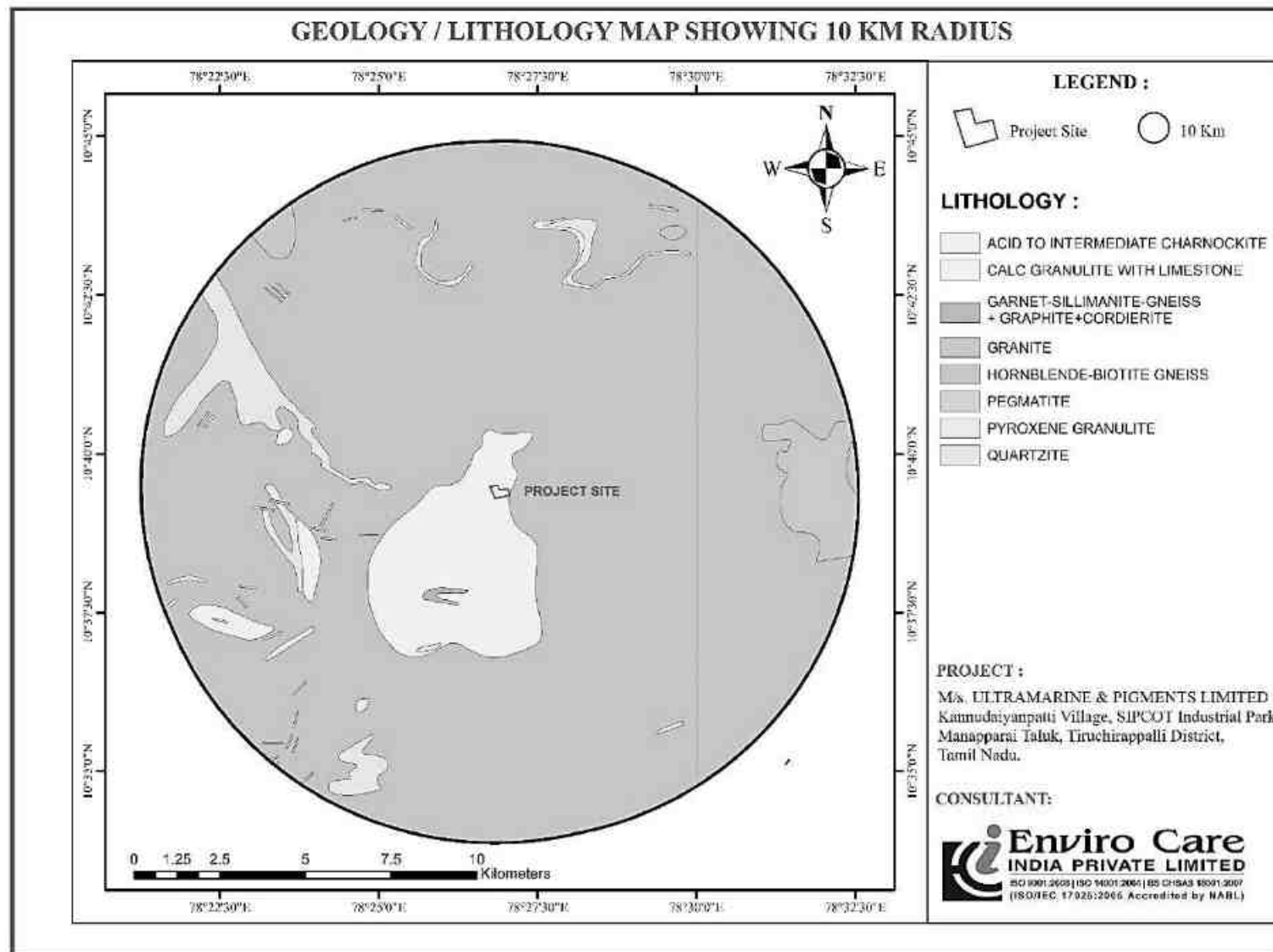


Figure 15 - Geology Map of the Study Area

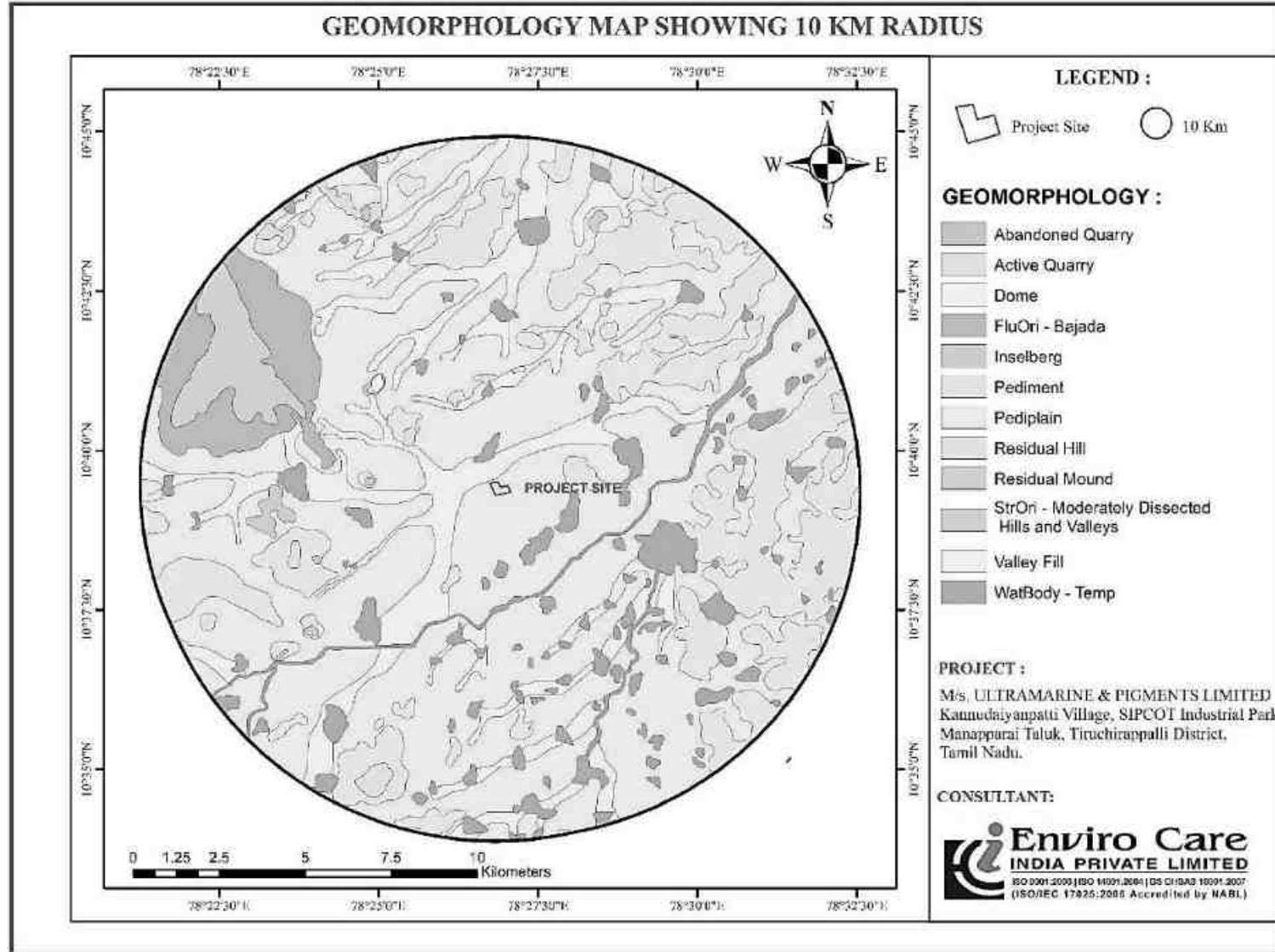


Figure 16 - Geomorphology Map of the Study Area

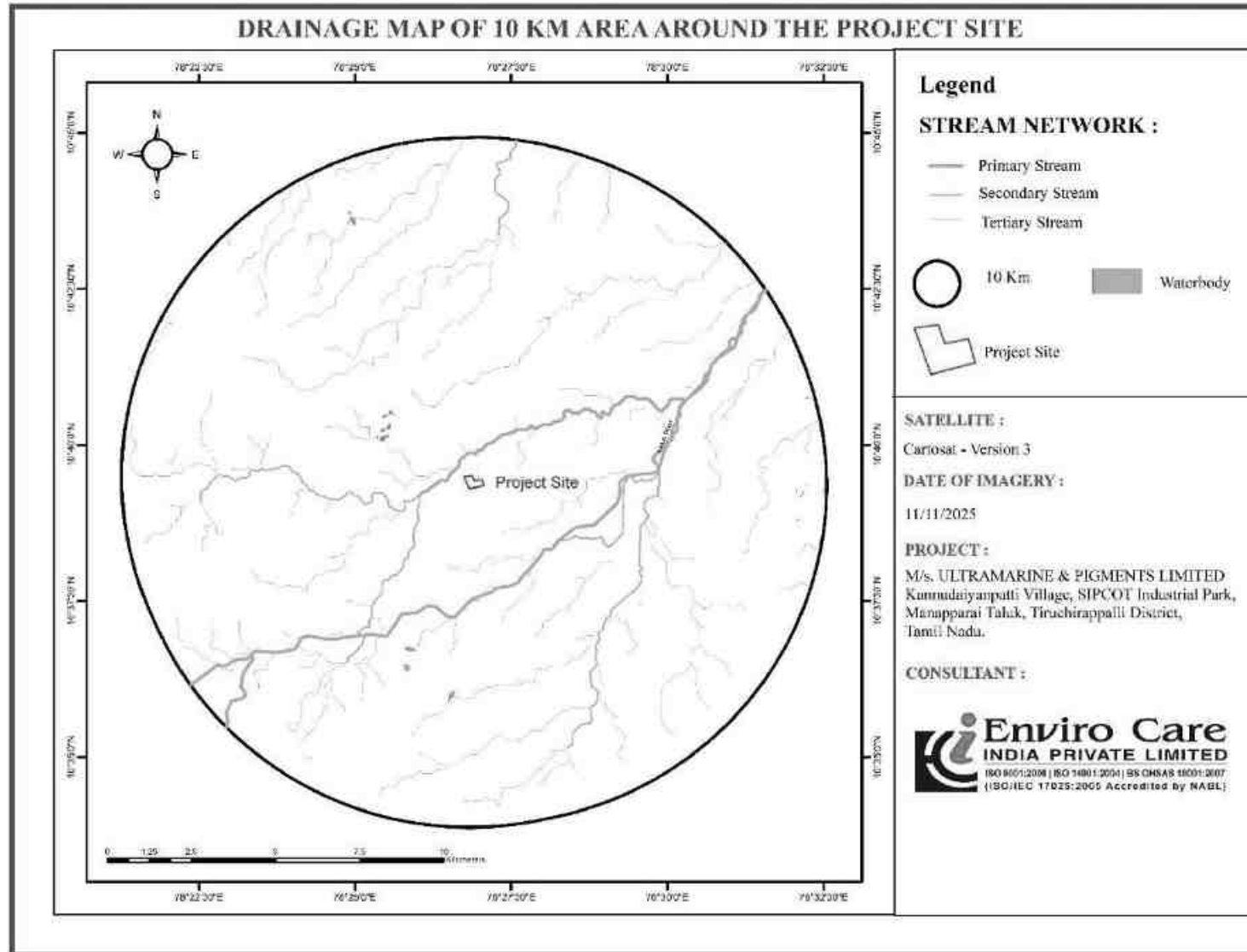


Figure 17 - Drainage Map of the Study Area

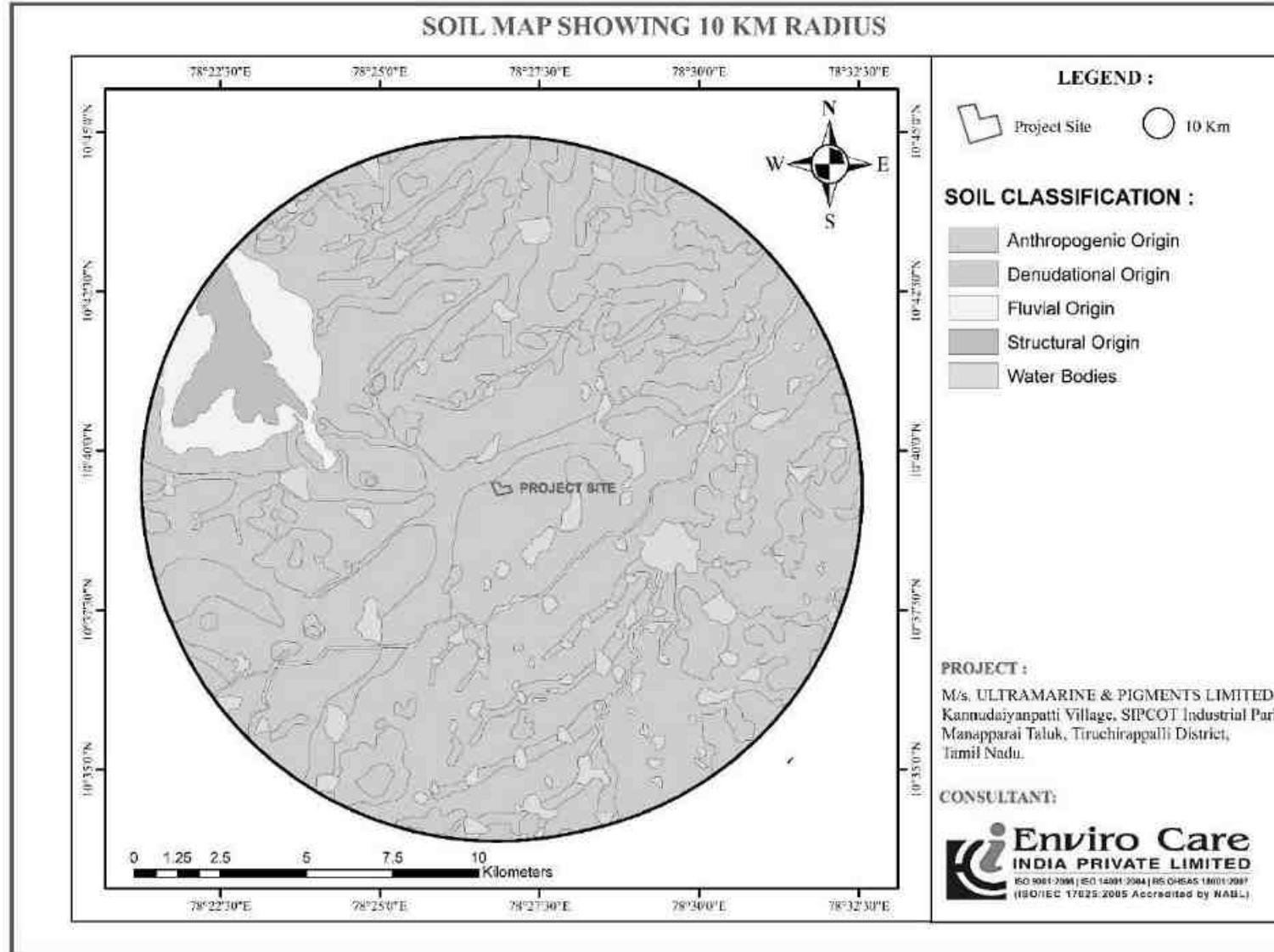


Figure 18 - Soil Map of the Study Area

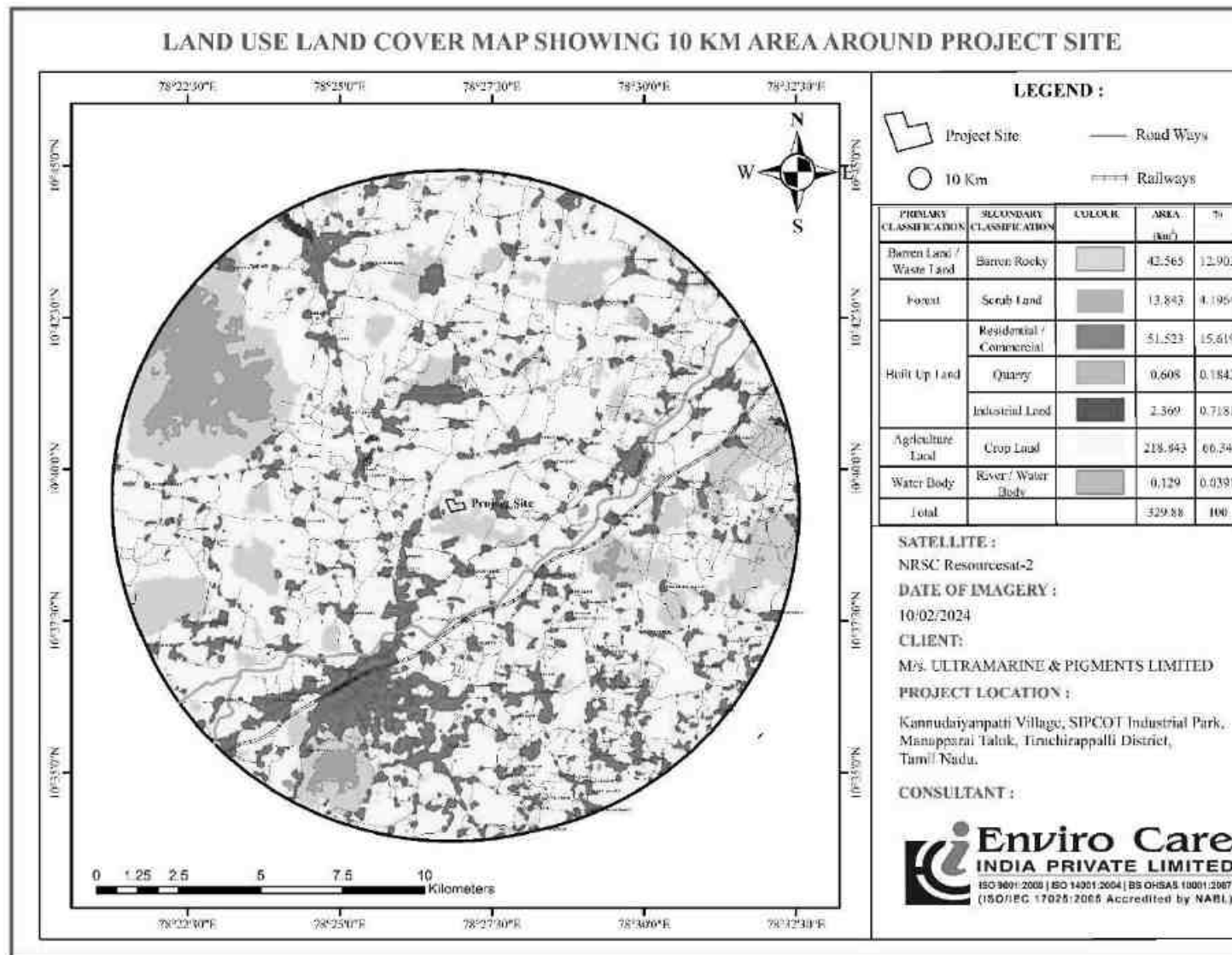


Figure 19 - Land Use Land Cover Map of the Study Area

3.8 Land Use / Land Cover

Table 29 - Land Use/Land Cover of the Study Area (10 km radius)

S. No.	Primary Classification	Secondary Classification	Area (Sq.km)	Percentage (%)
1	Barren Land / Waste Land	Barren Rocky	42.57	12.9
2	Forest Land	Scrub Land	13.84	4.2
3	Built-Up Land	Residential / Commercial	51.52	15.62
		Mining	0.61	0.18
		Industrial Land	2.37	0.72
4	Agricultural Land	Crop Land	218.84	66.34
5	Water Body	River / Lakes	0.13	0.04
TOTAL			329.88	100.00

The above table presents a classification of land use across various categories,

Barren land or waste land, specifically barren rocky areas, covers 42.57 square kilometers, accounting for 12.90% of the total area.

Forest land, categorized as scrub land, occupies 13.84 square kilometers, which is 4.2% of the total. Built-up land, including residential and commercial areas, spans 51.52 square kilometers, representing 15.62%.

Additionally, there are minor contributions from mining and industrial land, covering 0.61 square kilometers (0.18%) and 2.37 square kilometers (0.72%), respectively.

Agricultural land, primarily crop land, is the most significant category, encompassing 218.84 square kilometers, 66.34% of the total area.

Lastly, water bodies, including rivers and lakes, cover 0.13 square kilometers, making up 0.04%. The total area analyzed is 329.88 square kilometers, which sums to 100%.

3.9 Socio-Economic Environment

3.9.1 General

The assessment of socio-economic environment forms an integral part of an EIA study. Socio-Economic status of the population is an indicator for the development of the region. Any developmental project of any magnitude will have a bearing on the living conditions and on the economic base of population in particular and the region as a whole. Similarly, the proposed project site will have its share of socio-economic influence in the study area. The section delineates the overall appraisal of society relevant attributes. The data collection for evaluation of impact of proposed project site on socio-economic aspects in the study area has been done through primary household survey and through the analysis of secondary data available for study area.

3.9.2 Methodology

The methodology adopted in assessment of socio-economic condition is as given below;

- ❖ To assess socio-economic conditions of the Population.
- ❖ Analysis of the identified social attributes like population distribution, availability of public utilities etc., through Census of India 2011.
- ❖ Primary household survey to assess the present status of population of the study area.

3.9.3 Sources of Information

As per the scope of this study, the information on socio-economic aspects has been gathered and compiled from several secondary sources. These include Taluk Office, Collectorate, Agriculture Department, Irrigation Department, Central Ground Water Board, Directorate of Census Operation, Tamil Nadu etc. The demographic data has mainly been compiled from the Census of India 2011. The socio-economic details are briefly described in following sections. This section includes the present status of the socio-economic environment in the study area. To determine the baseline socio-economic pattern, at and around the project site, the required data have been obtained from the published data.

Socio-economic base line data were collected for the following indicators:

- ❖ Demographic Structure
- ❖ Economic Structure
- ❖ Availability of Basic Amenities

The major demographic and economic structure of the study area are classified into population, literacy rate and workers details.

List of Villages Selected for Population Study around the study area (10 km radius),

1. Amayapuram
2. Poigaipatti
3. Sathirapatti
4. Madampatti
5. Kannudaiyanpatti
6. Sooliapatti
7. Samudram
8. Nallampillai
9. Thoppampatti
10. Chithanatham

Table 30 - Population Status of Selected Villages

AMAYAPURAM			
Particulars	Total	Male	Female
Total No. of Houses	1,725	-	-
Population	7,471	3,717	3,754
Child (0-6)	864	444	420
Schedule Caste	1,368	691	677
Schedule Tribe	0	0	0
Literacy	67.94 %	79.80 %	56.30 %
POIGAIPATTI			
Particulars	Total	Male	Female
Total No. of Houses	1,637	-	-
Population	6,596	3,296	3,300
Child (0-6)	716	387	329
Schedule Caste	721	372	349
Schedule Tribe	0	0	0
Literacy	73.59 %	83.36 %	64.02 %

SATHIRAPATTI			
Particulars	Total	Male	Female
Total No. of Houses	210	-	-
Population	834	437	397
Child (0-6)	83	49	34
Schedule Caste	116	62	54
Schedule Tribe	0	0	0
Literacy	71.77 %	79.64 %	63.36 %
MADAMPATTI			
Particulars	Total	Male	Female
Total No. of Houses	201	-	-
Population	898	444	454
Child (0-6)	142	77	65
Schedule Caste	106	50	56
Schedule Tribe	0	0	0
Literacy	64.81 %	75.20 %	55.01 %
KANNUDAYANPATTI			
Particulars	Total	Male	Female
Total No. of Houses	2,798	-	-
Population	11,667	5,804	5,863
Child (0-6)	1,269	634	635
Schedule Caste	2,049	1,045	1,004
Schedule Tribe	9	3	6
Literacy	77.51 %	86.56 %	68.55 %
SOOLIAPATTI			
Particulars	Total	Male	Female
Total No. of Houses	252	-	-
Population	1,176	562	614
Child (0-6)	137	68	69
Schedule Caste	95	49	46
Schedule Tribe	0	0	0
Literacy	74.69 %	88.66 %	62.02 %
SAMUDRAM			
Particulars	Total	Male	Female
Total No. of Houses	811	-	-
Population	3,676	1,870	1,806
Child (0-6)	500	263	237
Schedule Caste	1,083	542	541
Schedule Tribe	0	0	0
Literacy	69.52 %	81.39 %	57.36 %
NALLAMPILLAI			
Particulars	Total	Male	Female
Total No. of Houses	1,331	-	-
Population	5,702	2,846	2,856
Child (0-6)	709	372	337
Schedule Caste	736	355	381

Schedule Tribe	2	1	1
Literacy	66.13 %	75.18 %	57.24 %
THOPPAMPATTI			
Particulars	Total	Male	Female
Total No. of Houses	1,259	-	-
Population	5,553	2,779	2,774
Child (0-6)	659	321	338
Schedule Caste	1,742	901	841
Schedule Tribe	0	0	0
Literacy	66.14 %	76.24 %	55.95 %
CHITHANATHAM			
Particulars	Total	Male	Female
Total No. of Houses	395	-	-
Population	1,698	842	856
Child (0-6)	225	109	116
Schedule Caste	427	205	222
Schedule Tribe	0	0	0
Literacy	67.75 %	80.90 %	54.73 %

Table 31 - Working Population of the Selected Villages

AMAYAPURAM			
Description	Total	Male	Female
Total Workers	4330	2307	2023
Main Workers	4110	2219	1891
Main Workers Cultivators	1362	691	671
Agriculture Labourer	1908	886	1022
Household Industries	35	17	18
Other Workers	805	625	180
Marginal Workers	220	88	132
Non-Working Persons	3141	1410	1731
POIGAIPATTI			
Description	Total	Male	Female
Total Workers	3189	1911	1278
Main Workers	2693	1737	956
Main Workers Cultivators	583	346	237
Agriculture Labourer	897	473	424
Household Industries	97	33	64
Other Workers	1116	885	231
Marginal Workers	496	174	322
Non-Working Persons	3407	1385	2022

SATHIRAPATTI			
Description	Total	Male	Female
Total Workers	480	266	214
Main Workers	421	250	171
Main Workers Cultivators	91	43	48
Agriculture Labourer	135	55	80
Household Industries	5	3	2
Other Workers	190	149	41
Marginal Workers	59	16	43
Non-Working Persons	354	171	183
MADAMPATTI			
Description	Total	Male	Female
Total Workers	493	260	233
Main Workers	407	242	165
Main Workers Cultivators	120	64	56
Agriculture Labourer	111	48	63
Household Industries	15	6	9
Other Workers	161	124	37
Marginal Workers	86	18	68
Non-Working Persons	405	184	221
KANNUDAYANPATTI			
Description	Total	Male	Female
Total Workers	5109	3270	1839
Main Workers	4671	3022	1649
Main Workers Cultivators	794	528	266
Agriculture Labourer	1143	498	645
Household Industries	97	52	45
Other Workers	2637	1944	693
Marginal Workers	438	248	190
Non-Working Persons	6558	2534	4024
SOOLIAPATTI			
Description	Total	Male	Female
Total Workers	516	320	196
Main Workers	448	308	140
Main Workers Cultivators	84	79	5
Agriculture Labourer	182	68	114
Household Industries	3	3	0
Other Workers	179	158	21
Marginal Workers	68	12	56
Non-Working Persons	660	242	418

SAMUDRAM			
Description	Total	Male	Female
Total Workers	1841	1078	763
Main Workers	1565	946	619
Main Workers Cultivators	194	140	54
Agriculture Labourer	601	281	320
Household Industries	3	2	1
Other Workers	767	523	244
Marginal Workers	276	132	144
Non-Working Persons	1835	792	1043
NALLAMPILLAI			
Description	Total	Male	Female
Total Workers	3251	1688	1563
Main Workers	3133	1630	1503
Main Workers Cultivators	867	503	364
Agriculture Labourer	1801	827	974
Household Industries	17	10	7
Other Workers	448	290	158
Marginal Workers	118	58	60
Non-Working Persons	2451	1158	1293
THOPPAMPATTI			
Description	Total	Male	Female
Total Workers	3150	1629	1521
Main Workers	3117	1613	1504
Main Workers Cultivators	959	472	487
Agriculture Labourer	1738	830	908
Household Industries	22	15	7
Other Workers	398	296	102
Marginal Workers	33	16	17
Non-Working Persons	2403	1150	1253
CHITHANATHAM			
Description	Total	Male	Female
Total Workers	746	373	373
Main Workers	697	346	351
Main Workers Cultivators	131	71	60
Agriculture Labourer	374	177	197
Household Industries	33	16	17
Other Workers	159	82	77
Marginal Workers	49	27	22
Non-Working Persons	952	469	483

CHAPTER IV

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 Introduction

This chapter assesses the likely environmental impacts due to the proposed manufacturing of *Inorganic Pigments (5500 TPA)* and *Complex Inorganic Colored Pigments (1350 TPA)* by M/s. *Ultramarine & Pigments Limited* at Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu. The project site covers 32.72 acres, of which 10.80 acres (33.01 %) will be developed as greenbelt. Impacts during both construction and operation phases are evaluated for air, water, land, noise, ecology, socio-economics, solid/hazardous wastes, and occupational health. Mitigation measures are proposed to ensure compliance with CPCB and MoEF&CC standards.

4.2 Air Environment

Construction Phase

During the construction stage, air emissions will primarily result from site clearance, earthwork, material handling, and vehicular movement. These activities are expected to generate fugitive dust (SPM / PM₁₀) and minor exhaust from diesel-powered machinery. The impacts are temporary and localized, confined mainly to the project site and immediate surroundings.

Operation Phase

In the operational stage, major air emission sources include the pigment process kiln, the 6 TPH boiler, thermic fluid heater, drying units, dust collectors, and a 1100 kVA DG set. The fuels used will be LPG/LNG/PNG (2000 TPA), Superior Kerosene Oil (50 TPA), and Diesel (500 L/hr). Combustion of these fuels will release particulate matter, sulphur dioxide, nitrogen oxides, and traces of carbon monoxide. Process emissions may contain pigment dust or acidic vapours depending on the pigment formulation.

All stacks are designed for effective dispersion: kiln – 55 m height with wet scrubber; boiler – 30 m; DG set – 30 m with acoustic enclosure; thermic fluid heater – 12 m; drying

and dust collection systems – bag filter + wet scrubber with 15 m stacks. The project's air emission management is expected to maintain ambient air quality within NAAQS limits.

Mitigation Measures

Dust suppression through water sprinkling and covering of transport vehicles will control construction-phase emissions. During operation, high-efficiency scrubbers and bag filters will control PM and acid gases. Stack emission monitoring will be conducted quarterly for PM, SO₂, and NO_x. Paved internal roads, closed-loop material handling, and dense peripheral greenbelt will further reduce fugitive emissions.

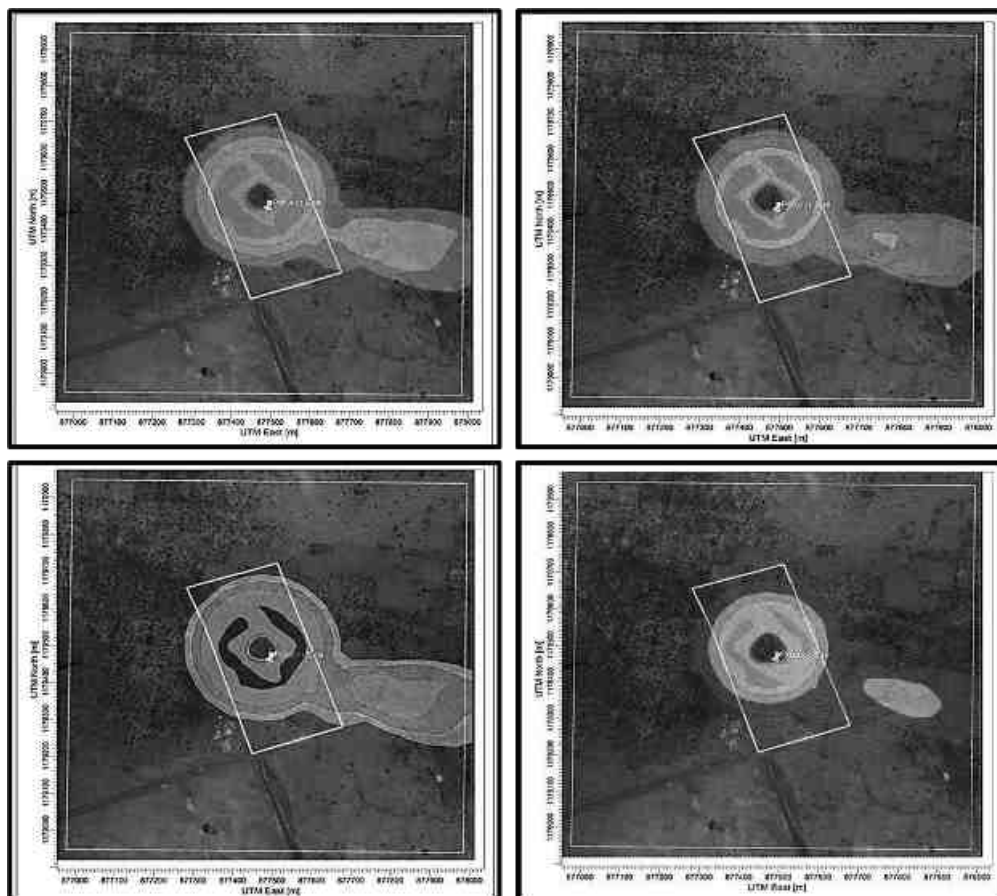


Figure 20 - Maximum GLC of the Pollutants

Table 32 - Total Incremental Load

Description	Background Value µg/m3	Incremental GLC µg/m3	Total Predicted GLC µg/m3
PM10	46.70	2.12	48.82
PM2.5	23.35	1.07	24.42
SO2	7.00	0.49	7.49
NOX	13.30	0.89	14.19

4.3 Water Environment

Construction Phase

Water use during construction will be limited to domestic consumption, curing, and dust control, supplied by SIPCOT. Wastewater will arise mainly from labor camps and will be treated through septic tanks and soak pits. There will be no direct discharge to nearby surface water bodies.

Operation Phase

During operation, total water demand will be 355 KLD (fresh 101 KLD, recycled 254 KLD). Water will be used in process operations, boiler feed, cooling, and domestic needs. About 23 KLD of sewage and 248 KLD of industrial effluent will be generated. The sewage will be treated in a 25 KLD STP, and treated water reused for greenbelt irrigation. The effluent will be treated in a 300 KLD ETP comprising primary, secondary, and tertiary treatment units followed by an Agitated Thin Film Dryer (ATFD). The recovered water will be reused in process operations, achieving Zero Liquid Discharge (ZLD). The ATFD salt will be reused as raw material or sent to authorized users.

Mitigation Measures

All wastewater collection systems will be leak-proof and lined. The ETP and STP will be operated continuously with online pH, TDS, and flow monitoring. Rainwater from roof and non-process areas will be routed through stormwater drains and harvested. No untreated effluent will be discharged outside the plant premises.

4.4 Land Environment

Construction Phase

Site grading, leveling, and temporary storage of materials may cause minor soil erosion and compaction. Excavated topsoil will be preserved for later landscaping and greenbelt use. The area lies within SIPCOT's industrial land, so no land-use conversion is involved.

Operation Phase

The land will be used for process units, utilities, greenbelt, roads, and open spaces. Solid wastes will include broken refractory (70 TPM), HDPE bags (0.6 TPM), ATFD salt (100 TPM), and STP sludge (0.04 TPM). All operations will occur on paved or concreted areas to prevent soil contamination.

Mitigation Measures

Stabilization of exposed soil, lined drains, and vegetative cover will prevent erosion. Solid wastes will be reused or disposed of through authorized vendors. Hazardous waste storage areas will be concreted with spill containment. Greenbelt development on 33 % of the area will enhance soil stability and micro-climate.

4.5 Noise Environment

Construction Phase

Noise will arise from vehicular movement and construction machinery such as cranes, concrete mixers, and compactors. These impacts are short-term and limited to working hours.

Operation Phase

During operation, noise-generating sources include the kiln, boiler, compressors, pumps, and DG set. Continuous operation may cause localized elevation of noise levels near process units.

Mitigation Measures

All equipment will be fitted with silencers and anti-vibration pads. The DG set will have an acoustic enclosure to comply with CPCB limits. Workers will use ear protection, and greenbelt buffers will reduce off-site noise. Periodic noise monitoring will ensure adherence to 75 dB(A) for industrial areas.

4.6 Ecology and Biodiversity

Construction Phase

The site is within an existing industrial park with no significant flora or fauna. Temporary disturbances to soil microfauna may occur but will be negligible.

Operation Phase

No wastewater or emissions will be released outside the plant; hence no adverse ecological impact is expected. The nearest unnotified reserve forests—Veeramalai, Amayapuram, and Poigai Malai—are beyond 5 km, outside the zone of influence.

Mitigation Measures

A greenbelt covering 10.80 acres (33 %) with native species will be established along the boundary and internal roads. This will enhance local biodiversity, provide habitat for

birds, and act as a pollution sink. Continuous maintenance and survival audits will be undertaken annually.

4.7 Socio-Economic Environment

Construction Phase

Temporary employment will be generated for skilled and unskilled labor. Local procurement of materials and services will enhance income opportunities in nearby villages.

Operation Phase

During regular operation, about 80 people will be employed directly and many indirectly through logistics and maintenance services. The project will contribute to the regional economy through taxes and improved infrastructure.

Mitigation Measures

Priority will be given to local employment and skill development. The company will undertake CSR activities focusing on health, education, and sanitation in nearby villages. Safe working and living conditions for workers will be ensured at all times.

4.8 Solid and Hazardous Waste Management

Construction Phase

Construction wastes such as debris, scrap metal, and packaging material will be generated in small quantities. These will be segregated and recycled wherever possible.

Operation Phase

Process wastes include refractory scrap, HDPE bags, ATFD salt, and STP sludge. Hazardous wastes such as pigment washing scum (12 TPM), ETP sludge (24 TPM), used oil (0.10 TPM), and oil-containing residues (0.05 TPM) will arise periodically. All hazardous materials will be stored in impervious, roofed areas with proper labelling and disposed of to TNPCB-authorized recyclers or TSDF.

Mitigation Measures

Segregation at source, reuse of ATFD salt as raw material, and recovery of recyclable wastes will minimize generation. Compliance with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 will be ensured. Records will be maintained in Form-3, and annual returns submitted to TNPCB.

4.9 Occupational Health and Safety

Construction Phase

Occupational risks relate to working at heights, material handling, and equipment operation. Workers will be provided with PPE such as helmets, gloves, boots, and safety harnesses. Adequate first-aid, potable water, and sanitation will be ensured.

Operation Phase

Health risks include exposure to pigments, chemicals, dust, and heat. All process areas will have proper ventilation, local exhaust systems, and automated material transfer. Health check-ups will be organized twice annually.

Mitigation Measures

A dedicated EHS cell will implement occupational safety plans and monitor compliance with the Factories Act. Fire-fighting systems, gas detectors, and emergency assembly points will be provided. Training programs on hazard communication, chemical handling, and PPE usage will be conducted regularly.

4.10 Traffic Study

4.10.1 Construction Phase

During the construction phase of the proposed industrial project at SIPCOT Industrial Park, Manapparai, additional traffic movement will occur due to transportation of construction materials, machinery, equipment, and manpower. Heavy motor vehicles carrying cement, steel, aggregates, sand, and fabricated structures will access the site through existing SIPCOT internal roads and connected district roads. Light motor vehicles and two-wheelers used by construction workers and supervisory staff will also contribute to local traffic volumes.

4.10.2 Operational Phase

During the operational phase, traffic generation will be associated with the regular functioning of the industry, including inbound movement of raw materials and fuels, outbound transportation of finished products, and daily commuting of employees. Heavy commercial vehicles will operate at planned intervals, while employee movement will primarily involve light motor vehicles, two-wheelers, and organized staff transport.

4.10.3 Existing Traffic Scenario

- The proposed project is located in **SIPCOT Industrial Park, Manapparai**, which is an industrial area with moderate vehicular movement.
- **Types of vehicles** currently using the nearby roads include: trucks, light commercial vehicles, buses, two-wheelers, and private cars.
- **Traffic frequency:** Peak hours (8–10 AM and 5–7 PM) see moderate congestion, while non-peak hours have light traffic. National Highway NH-83 and State Highway SH-71 provide connectivity to Trichy and neighboring industrial hubs.

4.10.4 Additional Traffic Due to Proposed Project

- **Construction Phase:**
 - Movement of construction machinery, delivery of raw materials (cement, steel, sand, etc.), and transportation of labor.
 - Approximately 15–20 trucks per day for material transport and 50–60 light vehicles per day for labor and supervisory staff.
- **Operation Phase:**
 - Transport of raw materials such as sulphur, china clay, sodium carbonate, and pigment intermediates.
 - Dispatch of finished pigments to customers.
 - Estimated additional traffic: 10–12 trucks/day for raw materials, 8–10 trucks/day for product dispatch, and 80 staff vehicles per day.

4.10.5 Parking Arrangement

- Adequate internal parking is provided within the project premises for employees and visitor vehicles.
- Separate parking zones are allocated for trucks and two-wheelers to ensure smooth movement of material handling vehicles.

Table 33 - Types of vehicles expected to enter and exit the project site

S. No.	Vehicle Type	Purpose	Estimated Frequency	Phase
1	Heavy Trucks / Tippers	Transport of raw materials (China Clay, Sulphur, Sodium Carbonate, etc.)	10–12 trips/day	Operation
2	Heavy Trucks / Tippers	Transport of finished pigments to customers	8–10 trips/day	Operation
3	Concrete Mixers	Construction activities (cement, concrete delivery)	5–8 trips/day	Construction
4	Water Tankers	Dust suppression, construction water supply	2–4 trips/day	Construction
5	Dumpers / Excavators	Earthwork and site leveling	5–6 trips/day	Construction
6	Light Commercial Vehicles (LCVs) / Vans	Transport of chemicals, minor raw materials, tools	5–10 trips/day	Both Phases
7	Staff Cars / Two-wheelers	Employee transport	80 vehicles/day	Operation
8	Buses / Mini-buses	Transport of construction labor	3–5 trips/day	Construction
9	DG Set Fuel Tanker Trucks	Diesel supply for DG sets	1–2 trips/week	Operation
10	Waste Disposal Trucks	Transport of solid and hazardous waste to authorized vendors	2–3 trips/week	Operation

4.10.6 Traffic Mitigation Measures

To ensure safe and efficient traffic movement during both construction and operation phases, appropriate traffic management measures will be implemented.

Minimal key measures include:

- Scheduling movement of heavy vehicles during non-peak traffic hours.
- Provision of clearly defined entry and exit points within the project premises.
- Development of internal traffic circulation and parking arrangements to avoid on-road parking.
- Installation of traffic signage, speed control measures, and safety markings at access points.
- Regular maintenance of internal roads in coordination with SIPCOT authorities.
- Awareness and safety training for drivers and transport personnel.

4.11 Toxic Fumes Anticipated Due to the Project Activities

The proposed manufacturing facility for Inorganic Pigments and Complex Inorganic Coloured Pigments involves high-temperature processing, chemical reactions, drying, and material handling operations, which may result in the generation of gaseous emissions and fumes if not adequately controlled. The anticipated toxic fumes and emissions from various project activities have been identified based on the nature of raw materials, process chemistry, fuel usage, and auxiliary operations.

Table 34 - Toxic Fumes Anticipated Due to the Project Activity

S. No.	Project Activity / Source	Toxic Fumes / Emissions Anticipated	Nature of Emission	Control & Mitigation Measures
1	Raw material handling (China clay, silica, metal oxides, pigments)	Particulate Matter (PM)	Fugitive dust containing inorganic particulates	Enclosed material handling systems, dust collectors with bag filters, regular housekeeping
2	Pigment manufacturing and calcination (kiln process)	Particulate Matter (PM), SO ₂ , NO _x	Process and combustion-related emissions	Wet scrubber connected to 55 m high stack; optimized combustion conditions
3	Use of sulphur and sulphur-containing compounds	Sulphur Dioxide (SO ₂)	Acidic gaseous emission	Wet scrubber system with alkaline scrubbing medium
4	Chemical reactions involving hydrogen chloride gas and nitric acid	Hydrogen Chloride (HCl) fumes, acidic mist	Acid vapours (intermittent, localized)	Closed reactors, local exhaust ventilation, wet scrubbers
5	Drying and grinding operations	Particulate Matter (PM) containing metal oxides	Process dust	Dust collectors with bag filters and wet scrubbers; enclosed equipment
6	Boiler operation (6 TPH)	PM, SO ₂ , NO _x , CO	Combustion flue gases	Stack of 30 m height; use of cleaner fuels and regular maintenance
7	Thermic Fluid Heater	PM, NO _x	Combustion emissions	Stack of 12 m height; efficient combustion control
8	DG Set (1100 kVA – emergency use)	PM, NO _x , CO	Intermittent combustion emissions	Stack of 30 m height; acoustic enclosure; operation only during power failure
9	Material transfer and packaging	Fugitive dust (PM)	Localized dust emissions	Covered conveyors, dust suppression, PPE for workers
10	Overall plant operations	No VOCs, no organic toxic fumes	—	Process is inorganic in nature; no generation of VOCs or persistent organic pollutants

4.12 Impact on Soil, Soil Biota and Vegetation

Table 35 - Impact Level on Soil, Soil Biota and Vegetation

S. No.	Environmental Component	Anticipated Project-Related Impact	Impact Level	Justification
1	Soil Quality	No adverse impact	Negligible	No discharge of untreated effluent onto land. Effluent is treated in ETP followed by ATFD, achieving Zero Liquid Discharge (ZLD)
2	Soil Contamination by POPs	Nil	None	The project does not involve generation, use, or release of Persistent Organic Pollutants
3	Soil Contamination by Heavy Metals	Controlled	Low	Metal oxides used in process are handled in closed systems; ETP sludge and process residues are securely stored and disposed through authorized TSDF
4	Soil pH and Fertility	No significant change	Negligible	No acidic or alkaline effluents are discharged to land; treated sewage used only for greenbelt irrigation
5	Soil Erosion	No impact	Negligible	Entire site is within a developed SIPCOT industrial estate with paved roads and storm water drainage
6	Soil Biota (Micro-organisms, Earthworms)	No adverse impact	Negligible	Absence of toxic organic pollutants and controlled waste management prevents disturbance to soil microbial activity
7	Agricultural Soil in Surrounding Areas	No impact	None	Adequate buffer distance, greenbelt development (33%), and controlled air emissions prevent deposition on nearby agricultural lands
8	Vegetation within Plant Premises	Positive impact	Beneficial	Development of greenbelt over 33% of the total area improves soil structure and nutrient cycling
9	Vegetation in Surrounding Area	No adverse impact	Negligible	Air emissions are within prescribed limits and dispersion modeling confirms compliance at plant boundary
10	Risk of Bioaccumulation in Plants	Nil	None	Absence of POPs and prevention of soil contamination eliminate risks of uptake by vegetation

The proposed project **will not result in any significant adverse impact** on soil quality, soil biota, or vegetation. Implementation of Zero Liquid Discharge (ZLD), secure handling of solid and hazardous wastes, effective air pollution control measures, and development of a substantial greenbelt ensure protection of soil ecosystems. Overall, the project is environmentally compatible with the existing land use of the SIPCOT industrial area.

4.13 Impact on Climate Change

The proposed project is not expected to have any significant adverse impact on climate change. Greenhouse gas emissions associated with the project are limited due to the use of cleaner fuel (LPG/LNG/PNG), energy-efficient process design, absence of coal or furnace oil, and compliance with emission standards.

Table 36 - Impact Level on Climate Change

S. No.	Aspect	Anticipated Impact	Impact Level	Justification
1	Greenhouse Gas (GHG) Emissions – CO ₂	Marginal increase	Low	CO ₂ emissions arise primarily from combustion of LPG/LNG/PNG in boiler, kiln, and thermic fluid heater; LPG/LNG/PNG is a clean-burning fuel with lower carbon intensity compared to coal or furnace oil
2	Methane (CH ₄) Emissions	Negligible	Negligible	No anaerobic waste handling or organic decomposition processes; LPG/LNG/PNG combustion generates insignificant CH ₄
3	Nitrous Oxide (N ₂ O) Emissions	Very low	Negligible	High-efficiency combustion systems and controlled operating temperatures limit N ₂ O formation
4	Indirect Emissions (Scope-2)	Limited	Low	Electricity requirement (1000 kWh) is sourced from TNEB; no captive fossil-fuel-based power generation proposed
5	Contribution to Regional Climate Change	Insignificant	Negligible	Emissions are localized, well within regulatory limits, and do not influence regional climate patterns
6	Impact of Land Use Change on Carbon Sink	Minimal	Negligible	Project is located in a designated industrial estate; no conversion of forest or agricultural land involved
7	Carbon Sequestration Potential	Positive	Beneficial	Development of 33.01% greenbelt area enhances carbon sequestration and micro-climatic regulation
8	Climate Resilience	Positive	Beneficial	Rainwater harvesting, ZLD system, and water recycling reduce stress on freshwater resources under climate variability

Furthermore, development of an extensive greenbelt, adoption of rainwater harvesting measures, and implementation of Zero Liquid Discharge (ZLD) enhance the project's climate resilience and sustainability.

4.14 Impact on Wildlife, Mammals, Fishes and Possibilities of Behavioral Change

The proposed project is located within SIPCOT Industrial Park, Manapparai, which is a notified industrial park. No notified wildlife sanctuaries, national parks, eco-sensitive zones, or protected forests are present within the immediate influence zone. However, a few unnotified reserve forests and small water bodies occur within a 10 km radius. Faunal diversity in the study area mainly comprises common and adaptable species of mammals, birds, reptiles, and fishes typical of dry deciduous and semi-arid landscapes.

4.14.1 Major Pollutants Considered

The pollutants anticipated from the project include:

- Particulate Matter (PM₁₀ and PM_{2.5})
 - Sulphur Dioxide (SO₂)
 - Oxides of Nitrogen (NO_x)
 - Carbon Monoxide (CO)
 - Trace acidic gases (HCl) from limited chemical handling
- No Persistent Organic Pollutants (POPs) or bioaccumulative toxic compounds are proposed to be emitted during normal operations.

4.14.2 Impact on Terrestrial Wildlife and Mammals

Most terrestrial mammals in the study area (such as rodents, small carnivores, and herbivores) are highly adaptable species accustomed to human-modified environments. Emissions are controlled through wet scrubbers, bag filters, and adequate stack heights, ensuring pollutant concentrations remain well within CPCB standards. Therefore, no long-term or irreversible impact on wildlife populations is anticipated.

Table 37 - Likely Impacts on Terrestrial Wildlife and Mammals

Aspect	Likely Impact	Significance
Airborne particulates	Temporary respiratory irritation at very close proximity	Low
SO ₂ and NO _x	Minor stress due to odour or irritation at elevated concentrations	Low
Noise from operations	Avoidance behaviour near plant boundary	Low
Habitat fragmentation	Not applicable (industrial estate setting)	Negligible

4.14.3 Impact on Birds and Avifauna

- Short-term avoidance behaviour may occur due to operational noise and movement of vehicles.
- Dust deposition on foliage may marginally affect foraging efficiency in the immediate vicinity.
- No nesting or breeding habitats of threatened avifauna are located near the project site.

Overall Impact:

Low and localized; birds are expected to reoccupy nearby areas once acclimatized.

4.14.4 Impact on Aquatic Life and Fishes

The project follows a Zero Liquid Discharge (ZLD) concept. There is no direct or indirect discharge into nearby ponds or surface water bodies. Hence, no adverse impact on fishes or aquatic organisms is envisaged.

4.14.5 Possibility of Behavioral Changes in Fauna

Table 38 - Behavioral Response of Fauna

Faunal Group	Behavioral Response	Duration
Small mammals	Temporary avoidance near site boundary	Short-term
Birds	Change in perching or foraging patterns	Short-term
Reptiles	Minimal disturbance	Negligible
Fishes	No behavioral change anticipated	Not applicable

Behavioral changes, if any, will be localized, reversible, and non-lethal, primarily linked to noise and human activity rather than chemical toxicity.

4.14.6 Mitigation and Conservation Measures

- Maintenance of 33% greenbelt with native tree species to act as a buffer and micro-habitat
- Strict compliance with emission norms
- No effluent discharge outside premises
- Controlled night lighting to minimize avifaunal disturbance
- Prohibition of hunting, trapping, or harm to wildlife within premises
- Awareness training for employees on biodiversity conservation

Considering the nature of emissions, effective pollution control systems, absence of sensitive ecological receptors in the immediate vicinity, and the industrial setting of the project location, **no significant adverse impact on wildlife, mammals, fishes, or their behavioural patterns is anticipated.** Any minor behavioural changes are expected to be temporary, localized, and reversible, with no long-term ecological consequences.

4.15 CO₂ Emissions and Action Plan for Containing Emissions

4.15.1 Sources of CO₂ Emissions

Carbon dioxide (CO₂) emissions from the proposed project will primarily arise from fuel combustion and indirect energy consumption. No process-related chemical reactions generating CO₂ as a primary by-product are involved in pigment manufacturing.

Table 39 - Nature of CO₂ Emission

S. No.	Source	Fuel / Activity	Nature of CO ₂ Emission
1	Boiler (6 TPH)	LPG/LNG/PNG	Direct combustion emission
2	Kiln process	LPG/LNG/PNG	Direct combustion emission
3	Thermic Fluid Heater	LPG/LNG/PNG	Direct combustion emission
4	DG Set (1100 kVA)	Diesel (emergency only)	Standby combustion emission
5	Electricity consumption	Grid power (TNEB)	Indirect CO ₂ emission
6	Vehicular movement	Diesel-powered trucks	Indirect emission

Note: LPG/LNG/PNG is a relatively clean fuel with **lower CO₂ emission factor** compared to coal, furnace oil, or pet coke.

4.15.2 Nature and Significance of CO₂ Emissions

- CO₂ is a non-toxic greenhouse gas and does not cause localized health impacts.
- Emissions are dispersive in nature and contribute marginally to global greenhouse gas inventory.
- The project does not involve carbon-intensive fuels such as coal or pet coke.
- DG set operation is restricted to power failure conditions only, minimizing emissions.

4.15.3 CO₂ Containment and Reduction Measures

Fuel and Process Efficiency Measures

- Exclusive use of LPG/LNG/PNG for boiler, kiln, and thermic fluid heater operations.
- Adoption of high-efficiency burners and optimized combustion control.
- Periodic tuning of burners to maintain optimal air-fuel ratio.
- Insulated pipelines and process equipment to minimize heat loss.

Energy Efficiency and Demand Reduction

- Use of energy-efficient motors, pumps, and drives.
- Installation of Variable Frequency Drives (VFDs) wherever feasible.
- Preventive maintenance schedule to ensure peak energy performance.
- Load optimization and reduction of idle running time of equipment.

Renewable Energy and Indirect Emission Reduction

- Procurement of power from TNEB, which includes renewable energy in its grid mix.
- Provision to integrate rooftop solar power for lighting and auxiliary loads in future.
- Use of LED lighting and energy-efficient fixtures throughout the plant.

Carbon Sequestration and Offset Measures

- Development of 33% greenbelt area (10.80 acres) with native and fast-growing tree species.
- Greenbelt species selected for high carbon sequestration potential, dust trapping, and microclimate regulation.
- Estimated annual CO₂ sequestration from greenbelt contributes to partial offset of operational emissions.
- Regular monitoring and maintenance of greenbelt to ensure long-term carbon sink function.

The CO₂ emissions from the proposed project are limited and controlled, primarily due to the use of clean fuel (LPG/LNG/PNG), efficient process design, and limited DG set operation. Through energy efficiency measures, renewable energy integration, and extensive greenbelt development, the project demonstrates a proactive approach to CO₂ containment and climate change mitigation, aligning with national climate action goals.

4.16 Anticipated Greenhouse Gas Emissions and Mitigation Strategies

Greenhouse gases (GHGs) such as **CO₂**, **CH₄**, and **N₂O** contribute to global warming and climate change. In the context of the proposed project, the major sources of GHG emissions are fuel combustion, electricity consumption, and vehicular movements. Process-related chemical reactions do not generate significant GHGs. The project has adopted measures to minimize, monitor, and mitigate emissions, ensuring environmental sustainability.

Table 40 - Sources of GHG Emissions

S. No.	Source	Activity / Fuel	GHG Type	Remarks
1	Kiln Process	LPG/LNG/PNG combustion	CO ₂	Primary direct emission; controlled by wet scrubbers and proper combustion
2	Boiler (6 TPH)	LPG/LNG/PNG combustion	CO ₂	Stack emissions; minimized by efficient burner control
3	Thermic Fluid Heater	LPG/LNG/PNG	CO ₂	Controlled through process optimization
4	DG Set (1100 kVA, standby)	Diesel	CO ₂ , NO _x	Operated only during power failure; minimal impact
5	Electricity Consumption	Grid power (TNEB)	CO ₂ (indirect)	TNEB grid includes partial renewable energy
6	Transport of raw materials & products	Diesel / Petrol vehicles	CO ₂ , CH ₄ , N ₂ O	Impact minimized through optimized transport scheduling

Note: LPG/LNG/PNG has lower carbon intensity than coal, pet coke, or furnace oil, thus reducing direct GHG emissions.

4.16.1 Anticipated Quantities of GHG Emissions

- **CO₂ emissions:** Primarily from LPG/LNG/PNG combustion for kiln, boiler, and thermic fluid heater operations.
- **CH₄ and N₂O emissions:** Negligible due to clean fuel and absence of biomass/coal combustion.
- **Indirect emissions:** From electricity usage, estimated based on TNEB grid emission factor (~0.82 tCO₂/MWh).

Annual CO₂ emission estimate (Approx.):

- Kiln, Boiler, TFH LPG/LNG/PNG consumption: **~50–60 tCO₂/year**
- DG set (emergency use): **~2–5 tCO₂/year**
- Electricity consumption: **~730–750 tCO₂/year** (based on 1000 kWh/day, 330 days/year)

4.16.2 Mitigation Strategies

Fuel & Process Optimization

- Use of LPG/LNG/PNG exclusively, avoiding carbon-intensive fuels.
- Efficient burner design and proper combustion control in kiln, boiler, and TFH.
- Periodic maintenance of equipment to maintain energy efficiency.

Energy Efficiency

- Use of energy-efficient motors, pumps, and drives.
- Integration of Variable Frequency Drives (VFDs) in process equipment.
- Preventive maintenance to reduce idle power consumption.

Renewable Energy and Offsets

- Provision for rooftop solar panels for auxiliary energy consumption.
- 33% greenbelt development (10.8 acres) to act as CO₂ sink.
- Selection of fast-growing, high biomass tree species for enhanced sequestration.

Transport & Logistics

- Optimized scheduling of raw material supply and product dispatch to minimize vehicular emissions.
- Preference for fuel-efficient vehicles and pooling of shipments.

Monitoring

- Continuous fuel consumption monitoring for emission tracking.
- Periodic energy audits to identify reduction opportunities.
- Inclusion of GHG emission data in annual environmental statements.

4.17 Impact of Transportation of Raw Materials & Finished Products

Mode of Transportation Proposed

All raw materials, finished products, and wastes for the proposed pigment manufacturing project will be transported exclusively by road using covered trucks and tankers. No rail, rail-cum-road, or conveyor-based transport is proposed.

Table 41 - Environmental Impacts due to Road Transportation

Environmental Component	Anticipated Impact	Nature of Impact	Mitigation Measures
Ambient Air Quality	Emission of PM, NO _x , SO ₂ from vehicular movement	Minor, localized, reversible	Use of covered vehicles, PUC-certified trucks, optimized trip scheduling
Noise Environment	Noise from movement of heavy vehicles	Minor, short-term	Day-time transport, speed control, avoidance of honking near habitations
Traffic Congestion	Increase in vehicular movement near site	Low	Staggered entry/exit, use of internal parking and queuing area
Road Safety	Risk of accidents due to heavy vehicle movement	Low	Trained drivers, signage, speed limits within premises

Environmental Component	Anticipated Impact	Nature of Impact	Mitigation Measures
Soil & Roadside Environment	Spillage of raw materials	Negligible	Covered trucks, emergency spill kits, immediate cleanup procedures
Community & Habitation	Disturbance to nearby villages	Minimal	Routing via NH-83/SH-71, avoiding village roads

4.17.1 Evaluation of Alternative Transportation Options

1. Rail Transport

- Nearest railway station (Manapparai) is approximately 6 km from the project site.
- No dedicated rail siding or cargo handling infrastructure exists within SIPCOT Industrial Park.
- Additional road transport would still be required for first- and last-mile connectivity.
- High cost and logistical constraints for handling diverse raw materials in smaller batches.

Conclusion: Rail transport is **not technically or economically feasible**.

2. Rail-cum-Road Transport

- Would involve double handling of materials (rail to truck), increasing:
 - ✓ Dust generation
 - ✓ Fuel consumption
 - ✓ Handling losses
- Not suitable for batch-wise pigment production requiring flexible logistics.

Conclusion: Rail-cum-road transport offers **no environmental advantage** over direct road transport.

3. Conveyor-cum-Rail Transport

- Suitable only for bulk, single-material handling (e.g., coal, ore).
- Project involves multiple raw materials with varied physical properties.
- Long conveyor installation outside premises is not permissible and not practical.

Conclusion: Conveyor-based transport is **not applicable** to this project.

Table 42 - Justification for Road-Only Transportation

Parameter	Justification
Distance	Project site is well connected to NH-83 and SH-71
Material Type	Multiple raw materials in controlled quantities
Flexibility	Batch operations require flexible logistics
Environmental Impact	Minor, localized, and manageable
Regulatory Compliance	SIPCOT-approved internal road infrastructure

4.17.2 Mitigation and Management Measures

- All vehicles will be covered and leak-proof
- Use of PUC-certified, BS-VI compliant vehicles
- Staggered transport schedules to avoid peak hours
- Internal parking and turning radius provided within premises
- No night-time movement of heavy vehicles near habitations
- Regular road sweeping and dust suppression near entry/exit points

Considering the location within a notified industrial park, absence of rail siding, diversified raw material profile, and limited transportation quantities, exclusive road transport is the most feasible, environmentally acceptable, and efficient option. The anticipated impacts are minor and localized, and will be effectively mitigated through appropriate management measures.

CHAPTER V

ANALYSIS OF ALTERNATIVES

5.1 Introduction

The analysis of alternatives is an integral part of the Environmental Impact Assessment process, intended to examine various feasible options for site selection and technology adoption for the proposed project. The objective of this analysis is to identify an alternative that achieves the project objectives while minimizing potential environmental, social, and health impacts. This chapter presents a systematic evaluation of alternative technologies and alternative sites considered during the planning stage of the proposed project, followed by a justification for the selected option based on technical, environmental, economic, and regulatory considerations.

The alternatives assessed in this chapter include evaluation of different process technologies and potential project locations. The “no project” alternative has also been considered implicitly while assessing the necessity and benefits of the proposed development.

5.2 Alternatives Technologies

During the conceptualization and planning stage, various technological options were evaluated for the proposed industrial activity with respect to operational efficiency, environmental performance, resource consumption, and compliance with prevailing environmental regulations. Conventional process technologies with higher energy consumption, uncontrolled emissions, and limited scope for pollution abatement were examined but not preferred due to their higher environmental footprint.

The selected technology is based on proven industrial practices and incorporates modern process controls to ensure optimal performance and consistency in operations. Emphasis has been placed on adopting energy-efficient systems, cleaner fuel usage, and reliable pollution control mechanisms. The use of LPG/LNG/PNG as fuel for the boiler has been chosen due to its cleaner combustion characteristics, resulting in lower particulate matter, sulphur dioxide, and secondary pollutant formation compared to solid or liquid fossil fuels.

Advanced air pollution control systems such as scrubbers, bag filters, and dust collection units have been integrated with the process to ensure compliance with CPCB and TNPCB emission standards. Water-efficient processes and recycling of treated wastewater have been incorporated to reduce freshwater demand and minimize wastewater discharge. The selected technology does not involve any new or untested processes, thereby minimizing the risk of technological failure and ensuring long-term operational reliability.

Overall, the selected technological alternative offers an optimal balance between productivity, environmental protection, operational safety, and regulatory compliance, making it the most suitable option for the proposed project.

5.3 Analysis of Alternative Site

The selected site is located within SIPCOT Industrial Park, Manapparai, Tiruchirappalli District, which is a government-notified industrial estate developed specifically for organized industrial growth. The location within a notified industrial estate ensures conformity with designated land use zoning, availability of common infrastructure, and adherence to planned industrial development norms, thereby reducing the likelihood of land-use conflicts and environmental stress.

From an environmental perspective, the project site is located outside ecologically sensitive and legally protected areas such as wildlife sanctuaries, national parks, coastal regulation zones, and notified forest lands within the stipulated buffer distances. Adequate separation from major rivers, canals, and drinking water sources is maintained. However, certain unnotified reserve forests and water bodies are present within a 10 km radius of the site, including

- Veeramalai Reserve Forest at a distance of about 5.62 km towards the northwest,
- Amayapuram Reserve Forest at around 5.73 km towards the west,
- Poigai Malai Reserve Forest at around 8.02 km towards the southwest.

Additionally, a pond near Samudram is located at about 4.67 km towards the southeast, and Vengaikurichi Kulam is situated at approximately 9 km towards the southwest.

These features are sufficiently distant from the project boundary, and with the proposed pollution control and environmental management measures, no adverse impacts on these receptors are anticipated.

The selected site benefits from well-developed infrastructure within the industrial park, including internal and approach roads, storm water drainage systems, power supply, and assured water availability. The plot area is adequate to accommodate essential project components such as process units, air pollution control systems, effluent treatment facilities, hazardous waste storage areas, and a green belt covering a minimum of 33% of the total plot area, as stipulated by regulatory requirements. Availability of such infrastructure significantly reduces the need for additional land development and associated environmental disturbances.

CHAPTER VI

ENVIRONMENTAL MONITORING PROGRAM

6.0 General

This Chapter includes the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules). The details include summary matrix of environmental monitoring during construction and operation stage; requirement of monitoring facilities and frequency, location, parameters of monitoring; compilation and analysis of data; comparison with base line data and compliance to accepted norms and reporting system and plantation monitoring program.

6.1 Environmental Management System

Standards are stipulated by various regulatory agencies to limit the emission of pollutants in air and water. Similarly, a mandatory practice is recommended for preparing an Environment Statement each year in order to encourage the industries to allow efficient use of resources in their production processed and reduce the quantities of waste per unit of product. This in itself is not sufficient since this does not provide an assurance that its Environmental performance not only meets, will continue to meet, legislative and policy requirements.

Hence Environmental Management System (EMS) are suggested at the industry level for ensuring that the activities, products and services of the region conform to the carrying capacity (Supportive and Assimilative capacity) of the Environment. Since this is more in line with the quality systems, it is proposed to develop one as outlined in the following sub sections. The EMS- its set-up, role and responsibilities – is given below.

6.2 Formation of Environmental Management System

The environmental management system for the unit will enable it to maximize its beneficial effects and minimize its adverse effects with emphasis on prevention. It will:

- Identify and evaluate the environmental effects arising from the unit's activities;

- Identify and evaluate the environmental effects arising from incidents, accidents and potential emergency situations;
- Identify the relevant legislative and regulatory requirements;
- Enable priorities to be identified and pertinent environmental objectives and targets to be set;
- Facilitate planning, control, monitoring, auditing and review of activities to ensure that the policy is complied with; and
- Allow periodic evaluation to suit changing circumstances so that it remains relevant.

6.3 Implementation Schedule of Mitigation Measures

The top management of the unit is committed to develop its activities in an environmentally sound manner and supports all efforts in achieving this objective. In pursuance of this, formal environmental management system shall be established during the operating phase of the plant which shall carry out periodic environmental review, covering the following four areas:

- Legislative and regulatory requirements;
- Evaluation and registration of significant parameters and their environmental impacts;
- Review of environmental management practices and procedures being proposed; and
- Assessment of feedback from investigation of previous environmental incidents and non-compliance with legislation, regulations or existing policies and procedures.

The environmental review shall address the following:

- The nature and extent of problems and deficiencies;
- The priorities to be accorded to rectify them; and
- An improvement program designed to ensure that the personnel and material resources required are identified and made available.

Environment Management Records

The plant shall establish and maintain a system of records to demonstrate compliance with the environmental management systems and the extent of achievement of the environmental objectives and targets. In addition to the other records (legislative, audit and review reports), management records shall address the following:

- Details of failure in compliance and corrective action;
- Details of complaints and follow-up action
- Appropriate contractor and supplier information;
- Inspection and maintenance reports;
- Monitoring data; and
- Environmental training records

Environmental Management Reviews

The senior management shall periodically review the Environmental Management System (EMS) to ensure its suitability and effectiveness. The need for possible changes in the environmental policy and objectives for continuous improvement shall be ascertained and revisions made accordingly.

Implementation Schedule of Mitigation Measures

The mitigation measures suggested in Chapter – 4 shall be implemented so as to reduce the impact on environment due to the operations of the project. In order to facilitate easy implementation of mitigation measures, the phased priority of implementation is given in the below Table.

Table 43 - Implementation Schedule

S. No.	Recommendations	Time Requirement	Schedule
1	Air Pollutions Control Measure	Before Commissioning of respective units	Immediate
2	Water Pollution control measures	Before Commissioning of the unit	Immediate
3	Noise Control Measures	Along with the commissioning of the unit	Immediate
4	Ecological Preservation and up gradation	Stage wise implementation	Immediate & Progressive

6.4 Environmental Monitoring

- (a) A technical plan which spells out in detail the methodologies for measurement, the required frequencies of measurement, the planned location of measurement, data storage and analysis, reporting schedules and emergency procedures, and
- (b) Detailed budgets and procurement schedules for, necessary equipment and supplies, technical and administrative manpower.

The environmental monitoring for the proposed plant operations shall be conducted as follows:

- Air quality;
- Water and wastewater quality;
- Noise levels;
- Soil Quality; and
- Greenbelt Development.

Table 44 - Other environment related monitoring activities required

S. No.	Monitoring particulars	Frequency
1	Keep track of the green belt to monitor the survival rate of plantation and to confirm that the growth is adequate and on expected lines.	Once a month
2	Monitor and review of safety performance of the unit with specific reference to incidents/accidents which have impact on the environment like spillages which can result in air pollution, water pollution, soil contamination.	Once a month
3	Monitor the drainage system in the unit to prevent entry of storm water to the ETP and vice versa.	Once a Quarter
4	Monitor drains carrying storm water or wastewater for ensuring timely cleaning.	Once a Quarter
5	Noise generating equipment monitored for increase in noise levels to initiate corrective action.	Once a month
6	Monitor hazardous waste storage sites to ensure good housekeeping to avoid cross contamination.	Once a month
7	Monitor raw material consumption, water consumption, wastewater generation per unit mass/volume of product to ensure that they remain within expected norms and to take action for further reduction.	Daily
8	Monitor training imparted to the workforce to ensure that the workmen are adequately trained in matters which have relevance to the impact on environmental attributes like handling of hazardous waste, handling of pyrophoric chemicals.	Once a month
9	Review by top management on the environment monitoring compliance every month to avoid slippages and to take corrective and preventive action.	Once a month

6.5 Environmental Monitoring Cell

A Centralized environmental monitoring cell will be established for monitoring of important and crucial environmental parameters which are of immense importance to assess the status of environment during industry operation. With the knowledge of baseline conditions, the monitoring program can serve as an indicator for any deterioration in environmental conditions due to operation of the plant, and helps in planning suitable mitigatory steps that of control of pollution since the efficiency of control measures can only be determined by monitoring.

The following routine monitoring program will be implemented under the post-project monitoring in the proposed project. The Monitoring program proposed to be implemented is given below.

6.6 Post Project Monitoring Schedule

Environmental Monitoring Program

The environment, safety and health monitoring program in the factory are as follows:

Table 45 - Environmental Monitoring

Particulars	Parameter	Frequency of Monitoring
Stack Emissions	SPM, SO ₂ , NO _x , CO	Once in a month
Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	Once in a month
Waste water	pH, TDS	Continuous
Noise monitoring	Noise Levels	Monthly (Industrial Noise) Seasonal (Ambient Noise)
Ecology	Vegetation density and Biodiversity	Once a year
Safety and Occupational Health	--	Once a year

6.7 Monitoring Equipment & Consumables

A well-equipped laboratory (NABL Certified) with consumable items will be provided for the monitoring of Environmental parameters. The following equipment will be provided for the monitoring of Environmental parameters.

6.8 Work Zone Monitoring Arrangements for Hazardous Chemicals

The work zone monitoring strategy is designed in line with Factories Act, 1948 and CPCB guidelines, and will be an integral part of the Occupational Health & Safety Management System of the plant.

6.8.1 Hazardous Chemicals Requiring Monitoring

The key hazardous chemicals handled in the facility include:

- Hydrogen Chloride (HCl) gas
- Nitric acid and phosphoric acid
- Metal oxides (Chromium oxide, Antimony trioxide, Vanadium pentoxide, Nickel compounds, Manganese compounds)
- Dust from pigments and raw material handling
- Combustion-related emissions from kiln, boiler, and thermic fluid heater

These substances may pose risks through inhalation, dermal contact, and accidental release, necessitating continuous and periodic monitoring within work zones.

6.8.2 Work Zone Monitoring Strategy

Work zone monitoring will be carried out through a combination of continuous monitoring, periodic sampling, and health surveillance-linked assessments as described below:

Area Monitoring

- Fixed gas detectors will be installed in critical locations such as kiln areas, acid handling zones, pigment mixing sections, and ETP chemical dosing areas.
- Continuous monitoring will be carried out for acid vapours (HCl), corrosive fumes, and particulate matter.
- Audible and visual alarms will be triggered automatically if concentrations exceed predefined safe limits.

Personal Exposure Monitoring

- Personal air sampling devices will be used for workers engaged in high-risk operations such as kiln charging, pigment handling, acid dosing, and maintenance activities.

- Exposure levels will be compared with Permissible Exposure Limits (PEL) prescribed by ACGIH and Indian Factories Rules.

Dust Monitoring

- Regular monitoring of respirable and total suspended particulate matter will be carried out in pigment production, drying, and packing sections.
- Effectiveness of dust collectors, bag filters, and wet scrubbers will be periodically evaluated through work zone measurements.

Frequency of Monitoring

- **Continuous:** Gas detection for acid vapours and leak-prone areas
- **Monthly:** Dust and particulate monitoring in process and material handling areas
- **Quarterly:** Comprehensive work zone exposure assessment by NABL-accredited laboratories
- **After Maintenance / Process Change:** Special monitoring to assess altered exposure risks

Control and Preventive Measures Linked to Monitoring

- Engineering controls such as closed systems, local exhaust ventilation (LEV), scrubbers, and enclosures will be strengthened based on monitoring results.
- Administrative controls including job rotation, restricted access, and work-rest cycles will be implemented where exposure levels approach threshold limits.
- Mandatory use of appropriate Personal Protective Equipment (PPE) such as respirators, acid-resistant gloves, face shields, and protective clothing will be enforced in identified zones.

Data Recording and Compliance

- All work zone monitoring data will be documented and maintained as part of statutory records under the Factories Act.
- Monitoring results will be reviewed by the Environment Management Cell (EMC) and plant safety officer on a regular basis.

- Any deviation from permissible exposure limits will trigger immediate corrective and preventive actions.
- Reports will be made available to regulatory authorities during inspections and audits.

Table 46 - Work Zone Monitoring Plan

S. No.	Description	Work Zone / Source Area	Monitoring Method	Frequency	Control & Corrective Measures
1	Hydrogen Chloride (HCl) vapours	Acid handling areas, kiln feed zone	Fixed gas detectors and area sampling	Continuous with alarm	Closed transfer systems, scrubbers, emergency shutdown, PPE
2	Acid fumes (HNO ₃ , H ₃ PO ₄)	Chemical storage and dosing areas	Area air sampling	Quarterly	Local exhaust ventilation (LEV), corrosion-resistant enclosures
3	Metal oxide dust (Cr, Ni, Mn, Sb compounds)	Kiln discharge, milling and mixing sections	Personal exposure monitoring	Quarterly	Process enclosure, job rotation, respirators
4	Combustion gases (SO ₂ , NO _x , CO)	Boiler, thermic fluid heater, kiln areas	Stack & area monitoring	Quarterly	Fuel quality control, proper combustion, APC systems

Emergency Response Integration

The work zone monitoring system will be integrated with the On-site Emergency and Disaster Management Plan, ensuring:

- Early detection of accidental releases
- Immediate evacuation and isolation of affected areas
- Rapid response by trained emergency teams

The proposed work zone monitoring arrangements ensure proactive identification, control, and mitigation of occupational exposure to hazardous chemicals. By adopting continuous monitoring systems, periodic exposure assessments, and strict compliance with occupational safety standards, the project will safeguard worker health while maintaining regulatory compliance throughout its operational life.

CHAPTER VII

ADDITIONAL STUDIES

7.0 General

For the proposed industrial project at SIPCOT Industrial Park, Manapparai, the Additional Studies have been carried out to assess potential risks, safety considerations, and other project-specific concerns associated with construction and operational activities. Given the nature of the proposed manufacturing processes, use of fuels, handling of chemicals, and generation of wastes, it is necessary to evaluate potential hazards, accident scenarios, and emergency preparedness measures in a systematic manner.

The Additional Studies presented in this chapter demonstrate the proponent's commitment to adopting best industry practices, complying with applicable safety and environmental regulations, and minimizing risks to human health, surrounding communities, and the environment throughout the life cycle of the project.

7.1 Risk Assessment Study

7.1.1 Introduction

Risk assessment is a systematic process for identifying potential hazards associated with industrial activities and evaluating the likelihood and consequences of accidental events that could impact human health, property, and the environment. For the proposed industrial project at SIPCOT Industrial Park, Manapparai, the risk assessment study has been carried out to identify credible accident scenarios during construction and operation phases, assess their potential impacts, and recommend appropriate preventive and mitigation measures. The study focuses on risks associated with fuel handling, process operations, emissions, storage of raw materials and chemicals, utilities, and transportation activities.

Given that the project falls under Category B1 and is located within a notified industrial estate with adequate infrastructure and regulatory controls, the overall risk potential is considered moderate and manageable through proper engineering design and operational controls.

7.1.2 Objectives of the Risk Assessment

The primary objectives of the risk assessment study are to identify hazardous materials and operations involved in the project, evaluate possible accident scenarios and their consequences, assess risks to workers, nearby population, and the environment, and recommend suitable risk mitigation, safety systems, and emergency preparedness measures. The study also aims to demonstrate that the proposed project can be operated safely in compliance with applicable statutory requirements.

7.1.3 Hazard Analysis

Hazard analysis involves systematic identification and evaluation of hazards associated with the handling, storage, processing, and disposal of hazardous chemicals and energy sources used in the proposed project. The analysis considers **process conditions, material properties, operating parameters, equipment integrity, and human interaction** to assess potential accident scenarios.

The proposed project involves:

- High-temperature operations (kilns, TFH)
- LPG-fired boiler
- Acid handling (nitric acid, phosphoric acid)
- Metal oxides and pigments
- Pressurized systems
- Dust-generating operations

Each of these activities presents distinct **thermal, chemical, physical, and mechanical hazards**.

Table 47 - Identification of Hazard Sources

Process / Unit	Hazard Source	Nature of Hazard
Kiln	High temperature (>900°C)	Fire, burns, radiant heat
Boiler (LPG fired)	LPG leakage	Fire, jet fire, explosion
Thermic Fluid Heater	Hot oil leakage	Pool fire
Acid storage tanks	Corrosive chemicals	Toxic exposure, burns
Pigment drying & handling	Fine particulate matter	Dust explosion, inhalation
ATFD	High pressure & temperature	Rupture, thermal exposure
Electrical systems	High voltage	Fire, electrocution

The proposed project involves the use of fuels such as LPG/LNG/PNG for boilers and thermal fluid heaters, limited quantities of diesel for DG sets, and superior kerosene oil (SKO) for specific operational needs. Raw materials and process chemicals associated with pigment manufacturing include inorganic compounds, mineral-based inputs, and auxiliary chemicals. Hazardous wastes such as pigment scum, ETP sludge, used oil, and ATFD salts are generated during operation and handled as per Hazardous and Other Wastes (Management and Transboundary Movement) Rules.

Major process units with inherent risk potential include the kiln system, boiler, thermal fluid heater, raw material handling systems, fuel storage and supply systems, effluent treatment facilities, and material storage areas.

Table 48 - Potential Hazards

Activity	Hazard Type	Nature of Hazard
Kiln operation	Thermal	Fire, burn injury
Boiler & TFH	Fire / Explosion	LPG leakage, ignition
Chemical handling	Chemical	Toxic exposure, corrosion
Acid storage	Chemical	Spillage, inhalation
Dust handling	Physical	Respiratory exposure
Electrical systems	Electrical	Shock, short circuit
Material handling	Mechanical	Injury from moving parts

Table 49 - Hazardous Chemicals and Threshold Comparison

Chemical	Quantity Stored (TPA)	MSIHC Threshold (TPA)	MAH Status
Hydrogen Chloride Gas	10.5	25	Below Threshold
Nitric Acid (60%)	175	200	Below Threshold
LPG (Boiler Fuel)	As per daily consumption	15 (storage)	Below Threshold
Chromium Compounds	<200	500	Below Threshold
Nickel Compounds	<10	50	Below Threshold

The proposed project does **not fall under MAH category**, but risk assessment is conducted as per good engineering practice.

7.1.5 Risk During Construction Phase

During the construction phase, risks are primarily associated with civil works, erection of heavy equipment, electrical installations, and movement of construction vehicles. Potential hazards include accidents due to improper handling of construction machinery, falls from height, electrical shocks, fire hazards from temporary electrical connections, and traffic-related incidents.

These risks are temporary in nature and confined to the construction period. With proper implementation of construction safety management practices, use of personal protective equipment, adherence to standard operating procedures, and supervision by trained personnel, construction-phase risks can be effectively minimized.

7.1.6 Risk During Operational Phase

Fuel Handling and Storage Risks

The use of LPG/LNG/PNG as primary fuel presents risks related to gas leakage, fire, and explosion if not handled properly. Potential accident scenarios include leakage from pipelines, valves, or storage systems, leading to formation of flammable gas clouds and ignition due to nearby ignition sources. However, the likelihood of such events is low due to the use of closed piping systems, pressure regulators, safety valves, gas detectors, and automatic shut-off mechanisms.

Diesel storage for DG sets poses fire hazards due to flammable nature of the fuel. Risks include leakage during storage or transfer and ignition due to sparks or hot surfaces. These risks are controlled through proper tank design, secondary containment, fire protection systems, and safe operating procedures.

Process Operation Risks

Kiln operations involve high temperatures and handling of hot materials, which pose risks of thermal burns, fire hazards, and equipment failure. Boiler and thermal fluid heater operations involve pressurized systems and high-temperature fluids, with potential risks such as tube rupture, overheating, or leakage. These risks are mitigated through robust equipment design, pressure relief systems, temperature and pressure monitoring, regular inspection, and preventive maintenance.

Pigment manufacturing processes involve handling of fine powders, which may pose dust inhalation risks and, in rare cases, dust explosion hazards if adequate housekeeping and dust control measures are not implemented. The use of enclosed material handling systems, dust collectors, and proper ventilation significantly reduces these risks.

Emission and Exposure Risks

Air emissions from the kiln, boiler, and thermal fluid heater include particulate matter, sulfur dioxide, nitrogen oxides, and trace gases. Inadequate control of emissions may result in occupational exposure or environmental impacts. However, the project proposes adequate air pollution control systems such as bag filters, wet scrubbers, and tall stacks designed as per CPCB guidelines, ensuring emissions remain within permissible limits and dispersion is adequate.

Occupational exposure risks are further mitigated through use of personal protective equipment, local exhaust ventilation, and periodic health monitoring of workers.

Effluent and Waste Management Risks

Effluent treatment systems, including ETP and ATFD, involve handling of chemical-laden wastewater and high-salinity streams. Potential risks include leakage, overflow, or improper handling of sludge and salts. These risks are controlled through proper system design, bunded tanks, automated monitoring, and compliance with zero liquid discharge practices.

Handling and storage of hazardous wastes such as ETP sludge and used oil may pose risks of spillage and contamination if not managed properly. Designated storage areas with impervious flooring, covered sheds, and labeled containers are proposed to mitigate these risks.

7.1.7 Fire & Explosion Index

The Fire and Explosion Index (F&EI) is a recognized hazard evaluation tool used to quantify the potential fire and explosion severity of process units handling flammable or combustible materials. The index helps in:

- Classifying fire and explosion risk
- Estimating damage potential
- Identifying need for mitigation measures

For the proposed project, F&EI has been calculated for:

- LPG / LNG / PNG (used as fuel)
- Diesel storage and handling system (DG set and backup fuel)

Table 50 - Fire & Explosion Index (LPG / LNG / PNG)

S. No.	Parameter	Description / Basis	Value
1	Type of Material	LPG / LNG / PNG (Highly flammable gas)	—
2	Flash Point	Below –40 °C	—
3	Auto Ignition Temperature	450–540 °C	—
4	Material Factor (MF)	As per Dow F&EI (Flammable gases)	21
5	General Process Hazards (F1)	Pressure, leakage potential, drainage, congestion	0.80
6	General Hazard Factor (1 + F1)	—	1.80
7	Special Process Hazards (F2)	Fuel inventory, ignition sources, static, hot surfaces	0.85
8	Special Hazard Factor (1 + F2)	—	1.85
9	Fire & Explosion Index (F&EI)	$MF \times (1 + F1) \times (1 + F2)$	≈ 70
10	Hazard Classification	As per Dow classification	Moderate Risk
11	Estimated Damage Radius	Based on F&EI	20 – 30 m
12	Likely Impact	Localized fire/explosion within premises	—
13	Off-site Impact	Not anticipated	Nil

Table 51 - Fire & Explosion Index (Diesel)

S. No.	Parameter	Description / Basis	Value
1	Type of Material	Diesel (Combustible liquid)	—
2	Flash Point	> 55 °C	—
3	Auto Ignition Temperature	~210 °C	—
4	Material Factor (MF)	As per Dow F&EI (Combustible liquid)	10
5	General Process Hazards (F1)	Atmospheric storage, handling operations	0.40
6	General Hazard Factor (1 + F1)	—	1.40
7	Special Process Hazards (F2)	Hot surfaces, ignition sources	0.45
8	Special Hazard Factor (1 + F2)	—	1.45
9	Fire & Explosion Index (F&EI)	$MF \times (1 + F1) \times (1 + F2)$	≈ 20
10	Hazard Classification	As per Dow classification	Light Risk
11	Estimated Damage Radius	Based on F&EI	< 10 m
12	Likely Impact	Minor localized fire	—
13	Off-site Impact	Not anticipated	Nil

Table 52 - Comparative Summary of Fire & Explosion Risk

Fuel Type	Material Factor	F&EI Value	Risk Category	Damage Potential
LPG / LNG / PNG	21	~70	Moderate	Localized equipment damage
Diesel	10	~20	Light	Minor fire exposure

Table 53 - F&EI Analysis

Aspect	Observation
Highest Risk Fuel	LPG / LNG / PNG
Overall Fire Risk Level	Acceptable with controls
Off-site Consequence	Nil
Adequacy of Safety Measures	Satisfactory
Compliance Status	Meets industrial safety norms

Based on the Fire & Explosion Index evaluation, it is concluded that the proposed project does not pose any unacceptable fire or explosion risk, provided the identified engineering and administrative controls are effectively implemented. Among the fuels proposed, LPG/LNG/PNG represents the highest relative fire and explosion potential; however, the associated risk is assessed as **moderate and manageable**, considering the controlled operating conditions, limited fuel inventory, and the provision of adequate safety systems.

7.1.8 Maximum Credible Accident (MCA) Analysis

The Maximum Credible Accident (MCA) analysis demonstrates that all foreseeable accident scenarios associated with the proposed project are localized, controllable, and confined within the plant premises. With the incorporation of adequate engineering controls, operational safeguards, and emergency response mechanisms, the risks are maintained within acceptable limits and comply with applicable statutory and regulatory requirements.

7.1.8.1 Identification of Maximum Credible Accident Scenarios

The scenarios are selected based on credible failures such as pipeline rupture, hose failure, equipment malfunction, or operational lapses rather than worst-case hypothetical events. Major hazards identified include fire, explosion, chemical spillage, and dust explosion, primarily related to LPG handling, acid storage, thermic fluid systems, and pigment processing areas. All scenarios are localized within plant premises due to limited storage quantities and controlled operations.

Table 54 - Identification of Maximum Credible Accident Scenarios

MCA No.	Process / Area	Hazardous Material / Energy Source	Credible Accident Scenario
MCA-1	Boiler area	LPG/LNG/PNG	Leakage from LPG/LNG/PNG pipeline followed by immediate ignition leading to jet fire
MCA-2	Boiler & LPG/LNG/PNG handling area	LPG/LNG/PNG	Delayed ignition of leaked LPG/LNG/PNG causing vapor cloud explosion (VCE)
MCA-3	Acid storage area	Nitric acid / Phosphoric acid	Storage tank rupture or transfer hose failure leading to acid spill
MCA-4	Thermic Fluid Heater (TFH)	Hot thermic fluid oil	Leakage of hot oil and ignition resulting in pool fire
MCA-5	Drying & pigment handling area	Fine pigment dust	Dust explosion due to accumulation and ignition source
MCA-6	Kiln process area	Fuel supply to kiln	Fuel line leakage leading to localized fire

7.1.8.2 MCA Scenario-wise Event Sequence

This demonstrates how an initial failure (e.g., leakage, rupture, or accumulation) can escalate if not controlled, leading to consequences such as fire, explosion, or toxic exposure. The event sequence analysis helps in identifying critical intervention points,

where engineering controls, alarms, or emergency response actions can effectively prevent escalation. The sequences confirm that accidents would manifest rapidly, enabling prompt detection and response.

Table 55 - Scenario-wise Event Sequence

MCA No.	Initiating Event	Intermediate Events	Final Outcome
MCA-1	LPG/LNG/PNG pipeline failure	Gas release → ignition	Jet fire
MCA-2	LPG/LNG/PNG leak without ignition	Gas accumulation → delayed ignition	Vapor cloud explosion
MCA-3	Tank corrosion / overfilling	Acid spill → vapor release	Localized toxic exposure
MCA-4	TFH oil leakage	Contact with hot surface	Pool fire
MCA-5	Dust accumulation	Static discharge / spark	Dust explosion
MCA-6	Fuel line rupture	Immediate ignition	Localized fire

7.1.8.3 Consequence Analysis of MCA Scenarios

The primary impacts include thermal radiation, overpressure effects, chemical exposure, and fire-related damage, while secondary impacts may involve temporary operational disruption or localized equipment damage. Importantly, the analysis indicates that all potential impacts are confined to specific operational zones within the facility, with no anticipated propagation beyond the site boundary. This reflects the adequacy of layout planning, segregation of hazardous areas, and safety distances.

Table 56 - Consequence Analysis of MCA Scenarios

MCA No.	Primary Impact	Secondary Impact	Likely Affected Area
MCA-1	Thermal radiation	Equipment damage	Boiler area (on-site)
MCA-2	Overpressure wave	Structural damage	Confined within plant
MCA-3	Chemical burns	Soil contamination	Acid storage zone
MCA-4	Heat and smoke	Temporary shutdown	TFH area
MCA-5	Pressure surge	Worker injury	Drying section
MCA-6	Fire exposure	Equipment damage	Kiln area

7.1.8.4 Indicative Impact Parameters for Key MCA Scenarios

This study provides quantitative indicative values of key impact parameters such as thermal radiation intensity and overpressure levels, based on standard industrial risk assessment references (CPCB, CCPS, and NFPA guidelines). These values are used to evaluate potential effects on personnel, structures, and equipment. The assessment shows that severe impact thresholds are limited to close-proximity exposure, while

radiation and pressure levels reduce rapidly with distance. This confirms that life-threatening or structural impacts are unlikely beyond immediate operational areas.

Table 57 - Indicative Impact Parameters for Key MCA Scenarios

Scenario	Impact Parameter	Indicative Value	Effect
LPG/LNG/PNG jet fire	Thermal radiation	12.5 kW/m ²	Severe burns
LPG/LNG/PNG jet fire	Thermal radiation	4.0 kW/m ²	Pain after short exposure
VCE	Overpressure	0.1 bar	Glass/window damage
VCE	Overpressure	0.02 bar	Human discomfort
Pool fire	Thermal radiation	< 4 kW/m ²	Minor heat stress
Dust explosion	Pressure rise	Low	Localized damage

7.1.8.5 Probability and Severity Assessment

This assessment evaluates each MCA scenario using a qualitative risk ranking approach, combining likelihood of occurrence and severity of consequences. Due to controlled storage quantities, automation, preventive maintenance, and operational discipline, the probability of occurrence for all scenarios is assessed as low to very low. Although certain scenarios have high consequence potential (e.g., fire or explosion), the overall risk ranking remains low to medium, which is considered acceptable under the ALARP (As Low As Reasonably Practicable) principle.

Table 58 - Probability and Severity Assessment

MCA No.	Probability	Severity	Risk Ranking
MCA-1	Low	High	Medium
MCA-2	Very Low	High	Medium
MCA-3	Low	Medium	Medium
MCA-4	Low	Medium	Medium
MCA-5	Low	High	Medium
MCA-6	Low	Medium	Low

7.1.8.6 Off-site Impact Assessment

This study specifically addresses regulatory concerns regarding off-site impacts. The assessment confirms that none of the identified MCA scenarios would result in impacts beyond the project boundary. Factors contributing to this include limited hazardous

material inventory, open plant layout facilitating dispersion, rapid isolation systems, and bunded chemical storage. Consequently, no impact on nearby habitations, public infrastructure, or sensitive environmental receptors is anticipated, and off-site emergency planning is not required.

Table 59 - Off-site Impact Assessment

MCA No.	Off-site Impact	Reason
MCA-1	NIL	Limited LPG inventory and rapid isolation
MCA-2	NIL	Open layout and dispersion
MCA-3	NIL	Low volatility and bunded storage
MCA-4	NIL	Confined pool fire
MCA-5	NIL	Indoor localized event
MCA-6	NIL	Immediate shutdown and isolation

7.1.8.7 Summary of MCA Analysis

It confirms that the number of credible accident scenarios is limited and manageable, the nature of hazards is well understood, and the maximum impact distances are restricted to on-site areas. With the proposed safety systems, emergency preparedness measures, and compliance with MSIHC Rules, the residual risk level is acceptable. The analysis concludes that the proposed project does not pose significant risk to human health or the environment.

Table 60 - Summary of MCA Analysis

Aspect	Observation
Number of MCA scenarios	6
Nature of hazards	Fire, explosion, toxic exposure
Maximum impact distance	Within plant boundary
Off-site risk	Not anticipated
Overall risk level	Acceptable (ALARP)
Need for evacuation beyond site	Not required

7.1.9 Emergency Preparedness and Response

An on-site emergency management plan will be developed to address potential emergencies such as fire, gas leakage, chemical spill, or equipment failure. The plan will define roles and responsibilities, emergency communication systems, evacuation procedures, and coordination with local authorities and emergency services. Periodic

mock drills will be conducted to ensure preparedness and effectiveness of the emergency response system.

The risk assessment study indicates that the proposed project at SIPCOT Industrial Park, Manapparai, involves manageable and well-controlled risks typical of medium-scale industrial operations. With the adoption of appropriate engineering design, operational safeguards, pollution control measures, and emergency preparedness systems, the likelihood and consequences of accidental events are minimal. The project can be safely implemented and operated without posing significant risk to workers, the surrounding community, or the environment.

7.1.10 Event Tree Analysis

Event Tree Analysis (ETA) is a forward-logic risk assessment technique used to evaluate the possible outcomes following an initiating event, considering the success or failure of safety barriers and control systems. ETA helps in understanding accident progression, estimating consequence severity, and verifying the adequacy of engineering and administrative safeguards.

For the proposed pigment manufacturing facility, ETA has been conducted for all credible initiating events involving hazardous chemicals, fuels, and energy systems such as LPG, acids, thermic fluid, kiln operations, boiler systems, dust handling, and storage tanks.

Assumptions Used for Event Tree Analysis

- Hazardous material inventories are limited and controlled
- Plant is designed as per Factories Act, MSIHC Rules, OISD, NFPA
- Safety systems such as gas detectors, scrubbers, interlocks, pressure relief valves, emergency shutoffs are provided
- Operators are trained and emergency response procedures are in place
- All scenarios consider maximum credible events, not worst-case catastrophic failures

Event Tree Logic Structure

Each event tree follows the sequence:

1. Initiating Event
2. Detection System Response
3. Isolation / Mitigation System Response
4. Ignition or Escalation Possibility
5. Final Outcome / Consequence

Each branch represents **success (S)** or **failure (F)** of safety barriers.

A. Event Tree Analysis – LPG/LNG/PNG Leakage (Fuel for Kiln/Boiler)

Initiating Event

Leakage of LPG from pipeline or valve due to gasket failure or improper coupling.

Table 61 - Event Tree Table: LPG /LNG/PNG Leakage Scenario

Sequence	Gas Detection System	Emergency Isolation Valve	Ignition Source Present	Final Outcome
1	Success	Success	No	Leak isolated, no impact
2	Success	Failure	No	Gas dispersion, controlled release
3	Success	Failure	Yes	Flash fire (localized)
4	Failure	Failure	Yes	Jet fire
5	Failure	Failure	No	Gas cloud dispersion

In most credible sequences, early detection and isolation prevent escalation. Only in the unlikely event of simultaneous detection and isolation failure with ignition, a localized jet fire may occur, confined to the fuel handling area.

B. Event Tree Analysis – Acid Storage Tank Leakage

Initiating Event

Leakage from acid storage tank or transfer pipeline due to corrosion or mechanical failure.

Table 62 - Event Tree Table: Acid Leakage Scenario

Sequence	Leak Detection / Visual Observation	Secondary Containment	Neutralization System	Final Outcome
1	Success	Success	Success	Spill contained and neutralized
2	Success	Success	Failure	Contained spill, manual cleanup
3	Failure	Success	Failure	Localized soil contamination
4	Failure	Failure	Failure	Minor chemical exposure risk

Due to bunded storage and neutralization facilities, acid spills remain confined. No off-site migration is anticipated. Effects are limited to local soil and floor surfaces.

C. Event Tree Analysis – Thermic Fluid Heater (TFH) Leakage

Initiating Event

Leakage of hot thermic fluid due to seal failure or overheating.

Table 63 - Event Tree Table: TFH Leakage Scenario

Sequence	Temperature Interlock	Leak Detection	Ignition Source	Final Outcome
1	Success	Success	No	Safe shutdown
2	Success	Failure	No	Oil spill, no fire
3	Failure	Failure	Yes	Pool fire
4	Failure	Failure	No	Hot oil exposure

The most severe credible outcome is a localized pool fire, which can be effectively controlled using foam and dry chemical extinguishers. Radiation impact remains within equipment area.

D. Event Tree Analysis – Dust in Drying Section

Initiating Event

Accumulation of fine pigment dust due to bag filter failure.

Table 64 - Event Tree Table: Dust Scenario

Sequence	Dust System	Dust Collection	Housekeeping	Ignition Source	Final Outcome
1	Success	Success	Adequate	No	Normal operation
2	Failure	Success	Adequate	No	Dust accumulation
3	Failure	Failure	Poor	Yes	Dust flash fire
4	Failure	Failure	Poor	No	Suspended dust cloud

With proper bag filters, housekeeping, and earthing, the probability of dust explosion is extremely low. Any flash fire would be short-duration and localized.

E. Event Tree Analysis – Boiler Tube Rupture

Initiating Event

Sudden rupture of boiler tube due to pressure fluctuation.

Table 65 - Event Tree Table: Boiler Failure Scenario

Sequence	Pressure Relief Valve	Operator Response	Fire Occurrence	Final Outcome
1	Success	Immediate	No	Safe venting
2	Success	Delayed	No	Steam release
3	Failure	Delayed	Yes	Fire incident
4	Failure	Failure	Yes	Equipment damage

Boiler systems are equipped with pressure safety valves and interlocks, ensuring that rupture events do not escalate into catastrophic failures.

F. Event Tree Analysis – ETP Chemical Handling Spill

Initiating Event

Spillage during handling of chemicals like lime or polymers.

Table 66 - Event Tree Table: ETP Spill Scenario

Sequence	Spill Detection	PPE Usage	Cleanup Response	Final Outcome
1	Immediate	Proper	Immediate	No impact
2	Delayed	Proper	Delayed	Minor exposure
3	Delayed	Improper	Delayed	Skin/eye irritation

Description

ETP-related incidents pose occupational hazards only, with no environmental or off-site consequences.

Overall Interpretation of Event Tree Analysis

- Majority of accident sequences terminate at safe or controlled outcomes
- Severe outcomes require multiple safety barrier failures, which have very low probability
- Impacts are localized and manageable
- No scenario leads to off-site emergency conditions

Conclusion of Event Tree Analysis

The Event Tree Analysis confirms that the proposed project is designed with adequate layers of protection, including detection, isolation, mitigation, and emergency response systems. Even under unfavorable conditions, the consequences remain restricted within plant premises, ensuring safety of workers, public, and environment. The residual risk level is acceptable and compliant with regulatory norms.

7.1.11 Storage and Handling of Hazardous Chemicals

The proposed project involves storage and handling of hazardous chemicals such as acids, metal oxides, oxidizers, and fuel. Improper handling may pose risks including fire, chemical exposure, spillage, and occupational health impacts. A systematic risk assessment and action plan has been developed to identify hazards, evaluate risks, and incorporate engineering controls, administrative measures, and emergency preparedness systems.

Table 67 - Action Plan for Handling of Hazardous Chemicals

S. No.	Hazardous Chemical / Activity	Nature of Hazard	Risk Level	Safety & Control Measures Proposed	Emergency / Monitoring Measures
1	Concentrated Nitric Acid	Corrosive, oxidizing	Medium	Acid-resistant storage tanks, dyke walls, HDPE pipelines	Spill kits, eye wash & safety showers
2	Hydrogen Chloride Gas	Toxic, corrosive fumes	Medium	Cylinder storage in ventilated area, leak detectors	Gas detectors, emergency scrubber
3	Sulphur	Fire and dust hazard	Low	Covered storage, controlled handling	Fire extinguishers, housekeeping
4	Metal oxides (Cr ₂ O ₃ , V ₂ O ₅ , NiCO ₃ , Sb ₂ O ₃)	Toxic dust inhalation	Medium	Enclosed handling, bag filters, PPE	Periodic air monitoring
5	Tar Pitch	Fire and thermal hazard	Medium	Temperature-controlled storage, spark-proof area	Fire hydrant system
6	Fuel (LPG/LNG/PNG & Diesel)	Fire and explosion	Medium	Approved tanks, flame arresters, earthing	Gas leak detection, mock drills
7	Kiln charging operations	Heat and dust exposure	Medium	Mechanized feeding, interlocks	Work zone monitoring
8	Chemical transfer & dosing	Spill and exposure	Medium	Closed transfer systems, secondary containment	SOPs and trained operators
9	Waste chemical storage	Toxic exposure	Low	Labeled containers, covered hazardous waste area	Manifest system & inspection
10	Maintenance activities	Accidental exposure	Low	Permit-to-work system	Safety supervision

With the proposed storage infrastructure, safety systems, and emergency preparedness measures, the risks associated with storage and handling of hazardous chemicals will be adequately controlled and maintained within acceptable limits, ensuring protection of workers, plant facilities, and the surrounding environment.

7.1.12 Arrangements for Ensuring Health and Safety of Workers

The proposed project involves handling of toxic and hazardous materials such as metal oxides, acids, gases, and pigments, which may pose occupational health and safety risks if not properly managed.

Table 68 - Health & Safety Arrangements for Workers Handling Toxic Materials

S. No.	Aspect	Arrangements / Measures Proposed
1	Engineering Controls	Enclosed material handling systems, closed reactors, local exhaust ventilation (LEV), bag filters, wet scrubbers, automated dosing systems
2	Workplace Ventilation	Adequate natural and mechanical ventilation in raw material handling, kiln, drying and pigment processing areas
3	Exposure Control	Dust suppression systems, sealed transfer lines, minimization of manual handling
4	Personal Protective Equipment (PPE)	Chemical-resistant gloves, safety goggles, face shields, respirators, protective clothing, safety shoes
5	Safe Storage & Handling	Segregated chemical storage, compatible material storage, proper labeling, MSDS availability at site
6	Standard Operating Procedures (SOPs)	SOPs for handling, transfer, storage and emergency response for toxic materials
7	Health Surveillance	Pre-placement and periodic medical examinations including lung function tests, audiometry, vision tests and general health check-ups (to be implemented during operation)
8	Training & Awareness	Induction and periodic training on chemical hazards, safe handling practices and emergency procedures
9	Emergency Facilities	Eye wash stations, safety showers, first-aid facilities, spill kits at handling locations
10	Emergency Response System	On-site Emergency Plan, trained emergency response team, mock drills
11	Monitoring & Compliance	Regular workplace air monitoring, PPE compliance checks, safety audits
12	Supervision & Safety Management	Safety officer appointment, Environment Management Cell (EMC) oversight

The proposed health and safety arrangements ensure that workers engaged in handling toxic materials are adequately protected through preventive engineering measures, strict operational controls, continuous monitoring, and medical surveillance. These measures will minimize occupational exposure, prevent health impacts, and ensure compliance with statutory requirements throughout the operational phase of the project.

7.2 Disaster Management Plan

7.2.1 Introduction

The Disaster Management Plan (DMP) has been prepared to identify potential emergency scenarios associated with the proposed manufacturing of inorganic and complex inorganic pigments at SIPCOT Industrial Park, Manapparai, and to establish a structured and coordinated response mechanism. The objective of the DMP is to minimize the impact of emergencies on human life, property, and the environment through effective preparedness, response, and recovery measures.

The proposed project involves handling of fuels such as LPG/LNG/PNG, SKO, and diesel, operation of kiln, boiler, thermic fluid heater, effluent treatment facilities, and storage of hazardous and non-hazardous wastes. Although the project will be operated with adequate safety systems and pollution control measures, the possibility of accidental events cannot be entirely ruled out. Hence, a comprehensive DMP is essential to ensure preparedness and quick response to emergencies.

7.2.2 Identification of Potential Disaster Scenarios

Based on the nature of activities and materials handled, the following potential emergency scenarios have been identified:

Fire incidents due to leakage or ignition of LPG/LNG/PNG, diesel, or SKO in storage or pipelines; explosion or flash fire associated with fuel handling systems; overheating or malfunction of kiln, boiler, or thermic fluid heater; accidental release of acidic vapours or process gases during pigment manufacturing; spillage of chemicals or hazardous waste during handling or storage; electrical fires due to short circuits; and transportation-related accidents within or outside the plant premises.

Natural disasters such as earthquakes, cyclones, extreme rainfall, or flooding, though of low probability in the project area, are also considered in emergency planning.

7.2.3 On-Site Emergency Management System

An on-site emergency management system will be established to respond promptly and effectively to any emergency situation arising within the plant premises.

Emergency Control Centre (ECC)

An Emergency Control Centre will be designated within the plant, equipped with communication facilities, emergency contact lists, site layout maps, Material Safety Data Sheets (MSDS), firefighting equipment inventory, and emergency procedures. The ECC will function as the command centre during emergencies.

Emergency Response Team (ERT)

A trained Emergency Response Team comprising personnel from operations, maintenance, safety, security, and administration will be constituted. The ERT will be responsible for initial emergency response, evacuation, firefighting, first aid, and coordination with external agencies.

7.2.4 Roles and Responsibilities

Roles and Responsibilities – Project Proponent / Industry Management

The Occupier / Plant Head shall have overall responsibility for disaster preparedness, implementation of the DMP, and coordination with statutory authorities. The management will ensure availability of adequate safety infrastructure, trained manpower, emergency equipment, and regular review of emergency preparedness.

The Environment, Health and Safety (EHS) Head will be responsible for hazard identification, risk assessment, training programs, mock drills, updating emergency procedures, and compliance with statutory safety requirements.

The Maintenance Head will ensure mechanical integrity of equipment, pipelines, storage systems, safety interlocks, and emergency shutdown systems.

The Security Officer will control access, assist in evacuation, restrict entry of unauthorized persons during emergencies, and coordinate with police and fire services.

7.2.5 Roles and Responsibilities – Internal Emergency Functionaries

Incident Controller (IC):

The Incident Controller, usually the senior-most shift in-charge, will take immediate control of the situation at the incident site, initiate emergency shutdown if required, assess the severity, and communicate with the Emergency Control Centre.

Site Main Controller (SMC):

The Site Main Controller, generally the Plant Head or his nominee, will assume overall command during major emergencies, coordinate internal response, and decide on escalation to off-site authorities.

Fire and Safety Team:

Responsible for firefighting operations, rescue activities, containment of spills, and ensuring use of appropriate personal protective equipment.

Medical and First Aid Team:

Responsible for providing first aid, coordinating medical assistance, and arranging transport of injured personnel to nearby hospitals.

7.2.6 Roles and Responsibilities – External Authorities**District Collector / District Disaster Management Authority (DDMA):**

Acts as the overall coordinating authority for off-site emergencies, mobilizes district-level resources, and ensures public safety if an emergency extends beyond plant boundaries.

Fire and Rescue Services:

Provide professional firefighting support, rescue operations, and technical expertise during major fire or explosion incidents.

Police Department:

Responsible for traffic control, crowd management, securing the affected area, and assisting evacuation if required.

Tamil Nadu Pollution Control Board (TNPCB):

Monitors environmental implications of the incident, advises on pollution control measures, and ensures compliance with environmental regulations.

Local Hospitals and Health Department:

Provide medical treatment to affected persons and assist in emergency medical response.

7.2.7 Emergency Communication and Evacuation

A clear emergency communication system will be established using alarms, public address systems, and internal communication networks. Emergency contact numbers of internal coordinators and external agencies will be prominently displayed. Clearly marked evacuation routes and assembly points will be provided within the plant premises, and periodic drills will ensure employee familiarity with evacuation procedures.

7.2.8 Fire Protection and Safety Infrastructure

The plant will be equipped with adequate fire detection and firefighting systems, including hydrant networks, portable fire extinguishers, fire alarms, flame and gas detectors, and emergency shutdown systems. Storage areas for fuels and hazardous materials will be provided with secondary containment, ventilation, and access control.

7.2.9 Training, Mock Drills, and Review

Regular training programs will be conducted for employees on emergency response, use of firefighting equipment, and safe handling of chemicals. Mock drills will be conducted at least twice a year to test the effectiveness of the DMP and identify areas for improvement. The DMP will be reviewed periodically and updated based on operational changes or regulatory requirements.

The Disaster Management Plan has been designed to ensure a high level of preparedness and effective response to potential emergency situations associated with the proposed project. With robust safety systems, trained personnel, and coordination with external authorities, the risk to human health, property, and the environment will be minimized. The implementation of this DMP reflects the project proponent's commitment to safe and sustainable industrial operations.

7.3 Action Plan for Rainwater Harvesting

7.3.1 Sources of Rainwater Collection

Rainwater harvesting at the plant site will be implemented through the following two major components:

Rooftop Rainwater Harvesting

Rainwater falling on the rooftops of industrial sheds, utility buildings, warehouses, administrative blocks, and other paved roof structures will be collected through a network of gutters and down-take pipes. The collected water will be routed through:

- First-flush arrangements to remove initial contaminants
- Filtration units consisting of sand, gravel, and charcoal
- Conveyance pipelines leading to recharge structures and the proposed RWH pond

Rooftop rainwater, being relatively clean, will be prioritized for direct storage and reuse within the plant after filtration.

Storm Water Runoff Harvesting

Storm water generated from internal roads, paved areas, open yards, and landscaped zones will be collected through a properly designed storm water drainage network. The drains will be provided with:

- Silt traps and oil–grease traps at strategic locations
- Sedimentation chambers to remove suspended solids
- Diversion structures to route excess runoff to recharge pits and the RWH pond

This approach ensures prevention of surface runoff losses and avoids waterlogging within the premises.

7.3.2 Proposed 100 KL Rainwater Harvesting Pond

A dedicated rainwater harvesting pond of 100 KL capacity is proposed within the plant premises as a key component of the water conservation strategy.

Design Features

- The pond will be located at a low-lying area within the site to facilitate gravity flow
- The pond will be provided with a lined bottom (HDPE / clay lining) to prevent seepage losses where storage is prioritized

- Peripheral embankments with gentle slopes will be stabilized with vegetation to prevent erosion
- An inlet chamber with filtration media will be provided to ensure clean inflow
- An overflow arrangement will be connected to recharge pits to facilitate groundwater recharge during heavy rainfall events

7.3.3 Utilization of Stored Rainwater

Rainwater stored in the RWH pond will be utilized for the following non-potable purposes:

- Greenbelt development and landscape irrigation
- Utility water requirements such as floor washing and dust suppression
- Makeup water for cooling systems, wherever feasible
- Supplementary water for ETP/STP operations, as applicable

This reuse will directly reduce freshwater intake from SIPCOT water supply.

7.3.4 Integration with Storm Water Drainage System

The storm water drainage system will be hydraulically designed to segregate rainwater from effluent streams. No industrial effluent or sewage will be allowed to mix with storm water drains. Proper gradients will be maintained to ensure free flow, and periodic desilting will be carried out to maintain efficiency.

7.3.5 Operation and Maintenance Plan

- Regular cleaning of rooftops, gutters, and downpipes prior to monsoon
- Periodic inspection and replacement of filter media
- Desilting of storm water drains and sedimentation chambers
- Monitoring of water levels in the RWH pond and recharge pits
- Maintenance responsibility assigned to the Environment / Utilities department

The proposed rainwater harvesting action plan, including rooftop collection, storm water harvesting, recharge structures, and a 100 KL RWH pond, demonstrates the project proponent's commitment to water conservation and sustainable resource management. The system will be implemented during the initial phase of project development and operated throughout the project life, ensuring long-term environmental benefits and compliance with TOR conditions.

7.4 Possibilities of Biomagnification

Table 69 - Potentiality of Biomagnification

S. No.	Substance / Pollutant	Source in Project	Potential for Biomagnification	Justification
1	Persistent Organic Pollutants (POPs)	Not used / generated	Nil	The project does not involve organic synthesis, chlorinated compounds, or persistent organic chemicals
2	Heavy Metals (Cr, Ni, Mn, Zn, Sb, Fe)	Inorganic pigment raw materials	Low	Metals are present in stable oxide or salt forms, not in bioavailable or organic forms that readily biomagnify
3	Acidic Gases (SO ₂ , NO _x , HCl)	Boiler, kiln, TFH combustion	Nil	These are non-persistent inorganic gases that do not accumulate in biota
4	Particulate Matter (PM)	Material handling, combustion sources	Negligible	Particulates settle locally and are controlled by APC systems; no persistence or food-chain accumulation
5	Effluent constituents	Treated effluent under ZLD	Nil	Effluent is treated in ETP with ATFD achieving Zero Liquid Discharge , preventing entry into aquatic food chains
6	Solid and Hazardous Waste	Process residues, ETP sludge	Nil	All wastes are stored safely and disposed through authorized vendors, eliminating environmental exposure pathways

Biomagnification occurs primarily with persistent, lipophilic organic compounds that resist degradation and accumulate through trophic levels. The proposed project is entirely inorganic in nature, with no use or generation of POPs, organic solvents, pesticides, or persistent organic chemicals.

Although certain metal oxides are used as raw materials, they are present in chemically stable, insoluble forms, and strict containment, air pollution control measures, ZLD system, and authorized waste disposal prevent their release into soil or aquatic ecosystems. Therefore, no viable exposure pathway exists for bioaccumulation or biomagnification.

Based on the nature of raw materials, process chemistry, emission controls, and waste management practices, the proposed project **does not pose any risk of biomagnification** in terrestrial or aquatic ecosystems.

7.5 Carbon Sequestration Strategies Adopted

The project incorporates effective carbon sequestration strategies primarily through the development of a substantial greenbelt covering 33.01% of the total land area, use of native vegetation, enhancement of soil organic carbon, and efficient water management practices. These measures collectively offset a portion of project-related greenhouse gas emissions and contribute positively to local climate moderation and ecological sustainability.

Table 70 - Carbon Sequestration Measures

S. No.	Carbon Sequestration Measure	Description	Expected Outcome
1	Development of Greenbelt (33.01% of Project Area)	A greenbelt covering 10.80 acres (4.37 ha) will be developed within the project premises using native, fast-growing, and dust-tolerant tree species with high carbon uptake potential	Long-term carbon sequestration through biomass accumulation and improvement of local micro-climate
2	Multi-Tier Plantation Strategy	Three-tier plantation comprising trees, shrubs, and ground cover will be adopted along the periphery, internal roads, and vacant spaces	Enhanced carbon capture efficiency and reduction of fugitive dust and heat island effect
3	Selection of Native and Climate-Resilient Species	Indigenous species adapted to dry deciduous and scrub ecosystems of Tamil Nadu will be preferred	Higher survival rate, sustained carbon storage, and reduced maintenance inputs
4	Soil Carbon Enhancement	Use of treated STP sludge as manure in greenbelt areas	Improvement in soil organic carbon and nutrient content
5	Rainwater Harvesting and Moisture Retention	Collection and utilization of rooftop and stormwater runoff; proposed 100 KL rainwater harvesting pond	Improved plant growth and increased biomass productivity supporting carbon sequestration
6	Prevention of Land Degradation	Project located in a designated industrial estate with no deforestation or agricultural land conversion	Avoidance of loss of existing carbon sinks
7	Energy Efficiency Measures	Adoption of efficient kilns, boilers, and thermic fluid heaters with cleaner fuel (LPG/LNG/PNG)	Indirect reduction of carbon footprint complementing sequestration efforts
8	Greenbelt Maintenance and Monitoring	Regular monitoring of plant survival, growth rate, and replacement of saplings	Sustained carbon sequestration throughout the project lifecycle

7.6 Occupational Health & Safety

The proposed project involves handling of chemicals, high-temperature operations (kiln, boiler, thermic fluid heater), material handling, and mechanical operations. Recognizing the potential occupational hazards associated with these activities, a comprehensive Occupational Health & Safety (OHS) management system will be implemented to ensure a safe and healthy working environment for all employees and contract workers.

Table 71 - Identification of Occupational Hazards

S. No.	Activity / Area	Potential Occupational Hazards
1	Raw material handling	Dust inhalation, chemical exposure, manual handling injuries
2	Kiln operations	High temperature exposure, thermal burns, hot gases
3	Boiler and TFH operation	Fire hazards, pressure-related risks
4	Pigment processing and drying	Dust exposure, respiratory irritation
5	Effluent Treatment Plant	Exposure to chemicals, slippery surfaces
6	Utilities and electrical systems	Electrical shock, arc flash
7	Material storage	Spillage, accidental exposure
8	Maintenance activities	Mechanical injuries, confined space hazards

7.6.1 Occupational Health & Safety Control Measures

Engineering Controls

- Enclosed process systems and material transfer points to minimize dust and fumes
- Local exhaust ventilation (LEV) systems at dust and fume generation sources
- Installation of wet scrubbers and bag filters to control airborne contaminants
- Proper insulation of high-temperature equipment
- Pressure relief valves, flame arrestors, and interlocks for boilers and TFH

Administrative Controls

- Preparation and implementation of **Standard Operating Procedures (SOPs)** for all critical operations
- Permit-to-work system for hot work, confined space entry, and maintenance activities
- Restricted access to hazardous areas
- Display of safety signages and emergency instructions

Table 72 - Details Personal Protective Equipment (PPE)

S. No.	Area / Activity	PPE Provided
1	Raw material handling	Dust masks / respirators, gloves, safety shoes
2	Kiln & boiler area	Heat-resistant gloves, face shields, helmets
3	Chemical handling	Chemical-resistant gloves, goggles, aprons
4	Maintenance works	Safety harness, helmets, gloves
5	General plant area	Safety shoes, helmets

PPE usage shall be mandatory and regularly monitored.

Table 73 - Fund Allocation for Occupational Health & Safety

S. No.	Component	Cost (Crores)	Purpose
1	Personal Protective Equipment (PPE)	0.12	Procurement and periodic replacement of PPE for contract and casual workers
2	Medical Surveillance & Health Check-ups	0.09	Pre-employment and periodic medical examinations, health records
3	Safety Training & Capacity Building	0.07	Induction training, refresher courses, safety signage and awareness materials
4	Emergency Preparedness & Fire Safety	0.10	Fire-fighting systems, emergency equipment, mock drills
5	Safety Monitoring & Audits	0.06	Safety officer deployment, third-party safety audits
6	Welfare Facilities	0.06	Drinking water, sanitation, rest areas, washing facilities
Total		0.50	

7.6.2 Occupational Health Surveillance

- Pre-employment and periodic medical examinations for all workers
- Special health monitoring for employees exposed to dust, chemicals, and heat
- Lung function tests, vision tests, audiometry, and skin examinations
- Maintenance of individual health records

7.6.3 Training and Awareness

- Induction safety training for all employees and contract workers
- Periodic refresher training on:
 - Safe handling of chemicals
 - Fire safety and emergency response
 - Use of PPE
 - First aid and emergency evacuation
- Mock drills conducted at regular intervals

7.6.4 Emergency Preparedness and Response

- On-site Emergency Management Plan (EMP) in place
- Fire detection and firefighting systems including hydrants, extinguishers, and alarms
- Trained emergency response team
- Availability of first-aid facilities and trained first-aiders
- Coordination with nearby hospitals and emergency services

7.6.5 Occupational Health & Safety Management System

- Formation of a **Safety Committee** with worker representation
- Appointment of qualified **Safety Officer**
- Periodic safety audits and inspections
- Reporting, investigation, and corrective action for near-miss and accident incidents
- Continuous improvement through management review

7.6.6 Details of Existing Occupational Health & Safety Hazards

The proposed project is yet to commence construction and operational activities. Therefore, no existing occupational health and safety hazards or exposure data are presently available, as no workforce is currently deployed at the site.

However, based on the nature of proposed processes, raw materials, utilities, and operations, the potential occupational hazards have been identified, and control measures are proposed to ensure that exposure levels remain within the prescribed Permissible Exposure Limits (PEL) as per Factories Act, 1948, CPCB guidelines, and applicable Indian Standards.

Anticipated Occupational Hazards, Exposure Levels & Control Measures

1. Chemical Exposure

Potential hazards:

- Acid fumes (HCl, nitric acid vapours)
- Metal oxide dust (iron oxide, chromium oxide, zinc oxide, manganese compounds)
- Ammonia traces

Exposure control approach:

- Enclosed processing systems
- Local Exhaust Ventilation (LEV) at points of generation

- Wet scrubbers for process vents
- PPE: respirators, chemical-resistant gloves, goggles

Compliance commitment:

- Workplace air monitoring will be conducted periodically
- Exposure levels will be maintained within prescribed PELs

2. Dust Exposure

Potential hazards:

- Inhalable and respirable dust from material handling, drying, milling, and packing operations

Control measures:

- Bag filters and dust collectors
- Water spraying at material transfer points
- Covered conveyors and storage areas
- Mandatory use of dust masks / respirators

PEL compliance:

- Dust concentrations will be maintained within limits specified under CPCB norms

3. Noise Exposure

Sources:

- Kiln operations
- Boiler
- Compressors and material handling equipment
- DG set (emergency operation)

Control measures:

- Acoustic enclosures for DG sets
- Silencers for vents
- Preventive maintenance of rotating equipment
- Provision of ear plugs / ear muffs

PEL compliance:

- Noise levels will be maintained below 85 dB(A) for 8-hour exposure

4. Heat Stress

Sources:

- Kiln, boiler, and thermic fluid heater operations

Control measures:

- Thermal insulation of hot surfaces
- Ventilation and exhaust systems

- Job rotation and adequate rest breaks
- Provision of drinking water and cooling arrangements

5. Physical & Ergonomic Hazards

Hazards:

- Manual handling of materials
- Slips, trips, and falls
- Moving machinery parts

Control measures:

- Mechanized handling wherever feasible
- Machine guarding and interlocks
- Safety training and SOPs
- Proper housekeeping

Exposure Monitoring and PEL Compliance

- Baseline and periodic workplace exposure monitoring (dust, fumes, noise, heat) will be carried out through NABL-accredited laboratories
- Monitoring results will be compared with prescribed PEL values
- In case any parameter exceeds the PEL:
 - ✓ Engineering controls will be strengthened
 - ✓ Administrative controls (job rotation) will be implemented
 - ✓ PPE specifications will be upgraded

Although no existing exposure data is available at present, the project proponent commits to identifying, monitoring, and controlling all occupational hazards to ensure that exposure levels remain within Permissible Exposure Limits, thereby safeguarding the health and safety of all workers.

7.6.7 Infrastructure Facilities to be Provided to Labor Force & Casual Workers

Adequate infrastructure facilities will be provided to the labor force during the construction phase as well as to casual workers and truck drivers during the operational phase, in compliance with the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, Factories Act, 1948, and relevant rules thereunder.

1. Construction Phase

During the construction period, the workforce will primarily consist of skilled and unskilled labourers engaged on a temporary basis. The following facilities will be provided at the construction site:

Sanitation Facilities

- Separate toilets for men and women, provided in adequate numbers as per statutory norms
- Toilets will be connected to septic tanks/temporary soak pits or mobile sanitation units
- Regular cleaning and maintenance will be ensured to maintain hygiene

Drinking Water

- Safe potable drinking water will be provided through RO-treated water or approved water supply
- Drinking water points will be located at convenient and accessible locations

Rest Areas

- Covered rest shelters with seating arrangements for labourers
- Protection from heat, rain, and dust during rest periods

Fuel and Cooking Arrangements

- No cooking using solid fuels such as firewood or coal will be permitted at the site
- If required, workers will use LPG/LNG/PNG -based cooking facilities at designated locations
- Open burning will be strictly prohibited

First Aid and Health Facilities

- First-aid boxes with essential medicines and trained first-aid personnel
- Tie-up with nearby hospitals/clinics for emergency medical care

Waste Management

- Separate bins for biodegradable and non-biodegradable waste
- Regular collection and disposal through authorized agencies

2. Operation Phase (Including Casual Workers and Truck Drivers)

During the operational phase, the project will employ permanent staff along with contract workers, casual labourers, and visiting truck drivers for transportation of raw materials and finished products.

Sanitation and Toilets

- Adequate, well-maintained toilet facilities within the plant premises
- Separate toilets for employees and visitors/truck drivers
- Toilets connected to STP/septic system as per design

Drinking Water

- Treated potable water supplied through RO systems at multiple locations
- Dedicated drinking water points near loading/unloading areas for truck drivers

Restrooms and Waiting Areas

- Designated restrooms/waiting sheds for truck drivers with seating and shade
- Ventilated rest areas for casual and contract workers

Fuel and Canteen Facilities

- No solid fuel usage within the premises
- Canteen or pantry facilities using LPG/LNG/PNG & electricity for employees, as per statutory requirement
- Outside food vendors will be regulated and monitored

Health and Safety Facilities

- Occupational Health Centre/First Aid Room within the plant
- Emergency medical support and ambulance facility on call
- PPE and hygiene facilities such as hand-wash stations provided near work areas

Lighting and Ventilation

- Adequate lighting in restrooms, loading areas, and pathways
- Proper ventilation to ensure worker comfort and safety

3. Compliance and Monitoring

- All facilities will be provided and maintained as per statutory norms
- Periodic inspections will be carried out by the Environment Management Cell (EMC) and safety officers
- Feedback from workers will be considered for continual improvement of welfare facilities

The project proponent is committed to providing **safe, hygienic, and adequate infrastructure facilities** to all categories of workers, including construction labourers, casual workers, and truck drivers, thereby ensuring occupational welfare, safety, and regulatory compliance throughout the project lifecycle.

7.7 Social Impact Assessment (SIA)

The project site is located within a government-notified industrial estate, which is already earmarked for industrial development. The surrounding region comprises semi-urban and rural settlements such as Manapparai, Amayapuram, Periapatty, Kalarampatty, Samudram, Porundalur, and Rajalipatty.

The local population is predominantly engaged in:

- Agriculture and allied activities
- Small-scale trade and services
- Industrial and construction-related employment
- Transport and logistics services

Basic infrastructure facilities such as roads, electricity, drinking water supply, educational institutions, healthcare facilities, and public transport are available in the region, particularly in Manapparai town.

7.7.1 Land Use and Resettlement Impact

The proposed project is located entirely within SIPCOT Industrial Park on land allotted for industrial use. No private land acquisition is involved, and no residential structures, agricultural land, or community assets are affected.

- No displacement of population is involved
- No resettlement or rehabilitation issues arise
- No impact on common property resources such as temples, burial grounds, grazing lands, or water bodies

Hence, the project does not trigger the provisions of land acquisition or resettlement frameworks.

7.7.2 Employment and Livelihood Enhancement

During the operational phase, the project will provide direct employment to approximately **80 persons** and indirect employment to several others through ancillary services such as transport, maintenance, housekeeping, and raw material supply. This will contribute to improvement in household incomes and local economic development.

7.7.3 Impact on Vulnerable Groups

No indigenous or vulnerable communities are affected by the project. The project does not interfere with traditional livelihoods, cultural practices, or social structures. Women will be provided equal employment opportunities in suitable roles, and a safe working environment will be ensured.

The proposed project will have overall positive socio-economic impacts on the surrounding region through employment generation, infrastructure support, and industrial growth. No significant adverse social impacts are anticipated, as the project is located within a notified industrial estate and does not involve land acquisition or displacement. With effective implementation of mitigation measures and CSR initiatives, the project will contribute to sustainable and inclusive development of the region.

7.8 R&R Action Plan

The proposed project is located entirely within SIPCOT Industrial Park, Manapparai, a government-notified industrial estate earmarked exclusively for industrial development. Since the proposed project does not involve any rehabilitation or resettlement of people, **R&R Action Plan is not applicable.**

The project is expected to generate positive socio-economic benefits through employment generation without causing any social displacement.

CHAPTER VIII

PROJECT BENEFITS

8.0 General

The proposed project involves the establishment of an industrial unit within SIPCOT Industrial Park, Manapparai, Tiruchirappalli District, Tamil Nadu. The project is planned in a government-notified industrial estate with adequate infrastructure and statutory approvals for industrial development. It is designed to operate in compliance with applicable environmental regulations, incorporating appropriate pollution control systems, resource-efficient processes, and safety measures. The project aims to contribute to regional industrial growth, employment generation, and sustainable development while ensuring minimal environmental and social impacts.

8.1 Improvements in Physical Infrastructure

The proposed project is located within SIPCOT Industrial Park, Manapparai, which is a planned industrial estate with existing infrastructure such as internal roads, power supply, water supply, storm water drainage, and common utilities. Implementation of the project will further strengthen the physical infrastructure in the region through improved internal road networks, utility corridors, and better maintenance of common facilities within the industrial park. Increased industrial activity will also contribute to enhanced connectivity, better logistics support, and improved availability of ancillary services such as transportation, warehousing, and maintenance facilities in the surrounding areas.

Additionally, the project will support optimal utilization of existing infrastructure developed by SIPCOT, ensuring efficient use of public investments made in the industrial estate and encouraging further infrastructure development in nearby areas.

8.2 Improvements in Social Infrastructure

The project will have indirect positive impacts on social infrastructure in the region. Increased industrial activity and employment opportunities will lead to greater demand for housing, healthcare services, educational institutions, and commercial establishments in nearby towns and villages such as Manapparai and surrounding

settlements. This, in turn, will encourage both public and private sector investments in social amenities, including improved medical facilities, schools, skill development centers, and community services.

The presence of an organized industrial unit will also promote better compliance with environmental, health, and safety standards, contributing to overall improvement in the quality of life of the local population.

8.3 Employment Potential

The proposed project will generate direct and indirect employment opportunities during both construction and operational phases. During the construction phase, employment will be generated for skilled, semi-skilled, and unskilled workers, including civil works, mechanical installation, electrical works, and ancillary services.

During the operational phase, the project will provide permanent employment opportunities for technical, supervisory, and administrative personnel. Indirect employment will be generated through supporting activities such as transportation, raw material supply, maintenance services, waste handling, and local service providers. Preference will be given to local manpower, thereby contributing to income generation and economic upliftment of the surrounding communities.

8.4 Other Tangible Benefits

The project will contribute to the regional and state economy through increased industrial output, revenue generation, and taxes. Adoption of modern pollution control measures, energy-efficient systems, and water conservation practices such as rainwater harvesting and recycling will promote sustainable industrial development.

The project will also encourage the growth of ancillary and downstream industries, enhance local entrepreneurship, and improve overall industrial competitiveness of the Manapparai region. By operating within a regulated industrial estate and complying with environmental norms, the project will demonstrate responsible industrial development while delivering long-term economic and social benefits.

CHAPTER IX

ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 General

As per EIA Notification dated 14th September, 2006 as amended from time to time; the chapter on “Environmental Cost Benefit Analysis” is applicable only, if the same is recommended at the Scoping Stage.

As per the ToR issued by SEIAA for the project, vide letter no. TO25B2412TN5665268N dated 17th October, 2025 the Environmental Cost Benefit Analysis is not required.

CHAPTER X

ENVIRONMENTAL MANAGEMENT PLAN

10.1 General

The Environmental Management Plan (EMP) has been formulated to ensure that the proposed project is implemented and operated in an environmentally responsible manner, in compliance with statutory requirements and best environmental practices. The EMP provides a structured framework for identification, mitigation, monitoring, and management of potential environmental impacts arising during construction and operation phases of the project. It emphasizes pollution prevention at source, efficient resource utilization, waste minimization, occupational health and safety, and continual improvement of environmental performance. The EMP is an integral part of the project design and shall be implemented throughout the life cycle of the project.

10.2 Environment Management Cell

An Environment Management Cell (EMC) will be established by the project proponent to oversee implementation of the EMP and ensure compliance with environmental regulations and consent conditions. The EMC will be headed by a senior executive with adequate authority to enforce environmental safeguards. Qualified environmental and safety personnel will support the EMC.

The key responsibilities of the EMC will include:

- Ensuring compliance with conditions stipulated in Environmental Clearance, Consent to Establish/Operate, and other statutory approvals.
- Implementation and periodic review of EMP measures.
- Coordination with regulatory authorities such as TNPCB and local administration.
- Monitoring environmental parameters and maintaining records.
- Conducting environmental awareness and training programs for employees.
- Reviewing emergency preparedness and response mechanisms.

10.3 Waste Minimization

Waste minimization is a key component of the project's environmental strategy. The project will adopt the principles of reduce, reuse, and recycle to minimize waste generation at source. Process optimization, proper material handling, preventive maintenance, and segregation of wastes will be ensured. Recyclable wastes will be reused within the plant or sent to authorized recyclers, while hazardous wastes will be handled and disposed of strictly as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules. Continuous review of operational practices will be undertaken to identify further opportunities for waste reduction.

10.4 Management Commitment

The management of the project proponent is fully committed to environmental protection and sustainable development. Adequate financial, technical, and human resources will be allocated for effective implementation of the EMP. Environmental considerations will be integrated into decision-making at all levels, and compliance with legal and corporate environmental policies will be treated as a priority. Periodic internal audits and management reviews will be conducted to assess environmental performance and initiate corrective actions wherever required.

10.5 Environmental Management Plan

10.5.1 Air Environment

Air pollution control measures will be implemented to mitigate emissions from process operations, boilers, kiln, thermal fluid heaters, material handling, and vehicular movement. Clean fuel such as LPG/LNG/PNG will be used to minimize emissions. Adequately designed stacks with appropriate height will be provided to ensure effective dispersion of pollutants. Air Pollution Control (APC) systems such as bag filters, wet scrubbers, and dust collectors will be installed where required. Fugitive emissions will be controlled through enclosure of dust-generating areas, paved internal roads, water sprinkling, and green belt development. Regular monitoring of stack emissions and ambient air quality will be carried out to ensure compliance with prescribed standards.

10.5.2 Noise Environment

Noise generated from machinery, utilities, and vehicular movement will be controlled through engineering and administrative measures. Low-noise equipment will be selected wherever feasible, and acoustic enclosures or silencers will be provided for noise-generating sources such as DG sets and compressors. Preventive maintenance of equipment will be ensured to avoid excessive noise. Workers exposed to higher noise levels will be provided with appropriate personal protective equipment (PPE). A green belt around the plant boundary will act as a noise attenuating barrier. Periodic noise level monitoring will be undertaken to ensure compliance with ambient noise standards.

10.5.3 Water Environment

The project will adopt water conservation and pollution prevention measures. Water requirement will be optimized through reuse and recycling, and wastewater generated from process, utilities, and domestic activities will be treated in an appropriate treatment system. Treated wastewater will be reused for cooling, gardening, and other non-potable purposes, aiming towards minimal discharge. Storm water will be managed through a dedicated drainage system to prevent contamination. Rainwater harvesting structures, including a proposed 100 KL rainwater harvesting pond, will be developed to augment groundwater recharge and reduce dependence on fresh water sources. Regular monitoring of wastewater quality and groundwater quality will be carried out.

10.5.4 Solid Waste Disposal

Solid and hazardous wastes generated from the project will be segregated at source and stored in designated areas with proper labeling. Non-hazardous wastes will be reused or disposed of through authorized recyclers or local bodies. Hazardous wastes such as process residues, ETP sludge, and used oil will be handled and disposed of through authorized TSDF or recyclers as per statutory requirements. Proper record keeping, manifests, and reporting will be maintained in accordance with regulatory norms.

10.5.5 Land Environment

Land environment protection measures will focus on preventing soil contamination and maintaining site aesthetics. Impervious flooring will be provided in chemical handling and waste storage areas to prevent seepage. Spill prevention and control measures will be implemented, including proper storage of raw materials and prompt cleanup of any accidental spills. A minimum of 33% of the total plot area will be developed as green belt with native and drought-resistant species to improve microclimate and enhance ecological value. Periodic inspection of land and soil quality will be undertaken.

Greenbelt will be developed inside the factory premises covering a total area of about 4.37 Hectares (33.01% of total area). The inter-spaces are laid with shrubs. The inter-space between trees planted is about 5 m.

Table 74 - Details of Greenbelt Development

S. No.	Categories	To be Provided (Nos.)
1	Punga Maram	950
2	Veppa Maram	920
3	Arasa Maram	920
4	Vengai Maram	930
5	Poovarasu Maram	950
6	Vilva Maram	950
7	Vaagai Maram	880
TOTAL		6500

10.5.6 Socio-Economic Environment

The project will have a positive socio-economic impact on the surrounding region through employment generation, improvement in local infrastructure, and support to ancillary industries. Preference will be given to local population for employment, subject to skill availability. The project proponent will also undertake community development activities in nearby villages, focusing on areas such as education, health, sanitation, and skill development. Occupational health and safety measures will be implemented to ensure a safe working environment for employees.

10.6 Details of Stack Emissions and Action Plan for Control of Emissions

The proposed manufacturing facility for inorganic and complex inorganic-colored pigments involves several combustion- and process-related operations such as kilns, boilers, thermic fluid heaters, drying units, and emergency DG sets. These operations have the potential to generate gaseous emissions and particulate matter, which, if not adequately controlled, may impact ambient air quality.

In order to ensure compliance with the applicable standards prescribed by the Central Pollution Control Board (CPCB) and Tamil Nadu Pollution Control Board (TNPCB), a comprehensive air pollution control strategy has been integrated into the project design. This includes the provision of appropriate stack heights, efficient air pollution control (APC) systems, use of cleaner fuels, and systematic monitoring mechanisms.

Table 75 - Stack-wise Emission Details

S. No.	Source / Process	Capacity	Stack Height	Pollutants Likely to be Emitted	Emission Control System
1	Kiln (Pigment Plant)	As per process requirement	55 m	Particulate Matter (PM), SO ₂ , NO _x , traces of acid gases	Wet Scrubber
2	Boiler	6 TPH	30 m	PM, SO ₂ , NO _x	Adequate stack height, low sulphur fuel
3	DG Set	1100 kVA	30 m	PM, NO _x , CO	Acoustic enclosure, CPCB-compliant stack
4	Thermic Fluid Heater (TFH)	As per process	12 m	PM, SO ₂ , NO _x	Proper combustion control
5	Drying Process	—	15 m	PM	Dust Collector with Wet Scrubber
6	Dust Collectors (4 Nos.)	—	15 m each	PM	Bag Filters

Table 76 - Anticipated Emission Characteristics

Pollutant	Source	Nature of Emission
Particulate Matter (PM)	Kilns, dryers, material handling	Process-related
Sulphur Dioxide (SO ₂)	Fuel combustion, sulphur usage	Combustion-related
Nitrogen Oxides (NO _x)	Kiln, boiler, DG set	High-temperature combustion
Carbon Monoxide (CO)	DG set	Incomplete combustion
Acidic Vapours	Pigment washing and chemical handling	Process-related

Table 77 - Action Plan for Control of Stack Emissions

Control Aspect	Action Plan
Particulate Control	Installation of bag filters, wet scrubbers, and dust collectors with adequate efficiency
Acid Gas Control	Wet scrubbers with neutralization capability
Combustion Optimization	Use of properly designed burners, controlled air–fuel ratio
Stack Design	Adequate stack heights to ensure proper dispersion
Fuel Quality	Use of cleaner fuels such as LPG/LNG/PNG and low sulphur fuels
Material Handling	Enclosed conveyors, covered storage, controlled transfer points
DG Set Emissions	Operation only during power failure, regular maintenance

Table 78 - Monitoring and Compliance Plan

Parameter	Monitoring Frequency	Responsibility
Stack Emissions (PM, SO ₂ , NO _x)	As per TNPCB consent conditions	Environment Management Cell (EMC)
Ambient Air Quality	Quarterly	NABL-accredited laboratory
Scrubber Performance	Continuous / Daily checks	Plant Operations
APC Equipment Maintenance	Preventive maintenance schedule	Maintenance Department

Emergency and Preventive Measures

- Standby APC systems and bypass prevention
- Immediate shutdown of process during APC failure
- Preventive maintenance of fans, ducting, and scrubber internals
- Training of operators on emission control systems

All major emission sources in the proposed project are provided with adequately designed air pollution control systems such as wet scrubbers, bag filters, and dust collectors, along with proper stack heights for dispersion. With the implementation of the above action plan and regular monitoring, emissions from the proposed facility will consistently comply with CPCB and TNPCB standards, ensuring minimal impact on the surrounding environment.

10.7 Measures for Fugitive Emission Control

Fugitive emissions are unorganized releases of pollutants arising from material handling, storage, transfer operations, equipment leakages, and vehicular movement within the plant premises. In the proposed inorganic and complex inorganic pigment manufacturing project, fugitive emissions are primarily expected in the form of

particulate matter and trace gaseous emissions during handling of powdered raw materials, processing, drying, and packing operations. To ensure protection of occupational health, ambient air quality, and compliance with statutory requirements, a systematic fugitive emission control strategy comprising engineering, operational, and managerial measures will be implemented.

Table 79 - Fugitive Emission Control Measures

S. No.	Source / Activity	Nature of Fugitive Emission	Control / Mitigation Measures
1	Raw material unloading and handling	Dust (PM ₁₀ , PM _{2.5})	Enclosed unloading points; covered conveyors; use of sealed bags/big bags; local exhaust ventilation (LEV) with bag filters
2	Raw material storage areas	Wind-blown dust	Storage in covered sheds/silos; proper stacking; covered pallets; periodic inspection
3	Conveying, mixing, grinding operations	Fine particulate matter	Enclosed process equipment; transfer points connected to dust collectors with bag filters
4	Kiln, dryer, and reactor leakages	Particulate matter and trace gases	Equipment operated under slight negative pressure; regular inspection of seals, flanges, and joints
5	Packing and bagging operations	Dust during filling and sealing	Enclosed packing machines; LEV systems; dust extraction hoods connected to bag filters
6	Handling of acids and gaseous chemicals (e.g., HCl)	Acidic fumes	Closed pipeline systems; corrosion-resistant materials; scrubbers and emergency neutralization systems
7	Material transfer points and spillage	Dust resuspension	Immediate spill collection; wet cleaning or vacuum cleaning; prohibition of dry sweeping
8	Internal road movement and traffic	Re-suspended dust	Paved internal roads; regular water sprinkling; speed control for vehicles
9	Entry and exit of vehicles	Dust carryover	Wheel-washing facilities at gates; covered trucks for raw materials and finished products
10	Maintenance activities	Accidental release of dust or fumes	Planned shutdown maintenance; isolation of equipment; use of PPE
11	Open areas within plant	Diffuse dust dispersion	Development of greenbelt over minimum 33% of plot area as dust and noise barrier
12	Workplace environment	Occupational exposure	Periodic workplace air monitoring; use of appropriate PPE; worker training and SOPs

10.8 Action Plan for Odour Control

Although the proposed processes are not inherently odour-intensive, an Odour Control Action Plan has been formulated to prevent nuisance conditions, protect worker comfort, and ensure compliance with CPCB and TNPCB guidelines. The strategy focuses on source control, containment, treatment, and continuous monitoring.

Table 80 - Action Plan for Odour Control

S. No.	Potential Odour Source	Nature of Odour	Control / Mitigation Measures Proposed	Monitoring & Management
1	Raw material storage (chemicals, acids)	Mild acidic / chemical odour	Storage in sealed containers, covered sheds, spill-proof flooring	Routine inspection by plant safety team
2	Acid handling and dosing areas	Acid fumes (HCl)	Closed transfer systems, local exhaust ventilation, scrubbers	Periodic workplace air quality monitoring
3	Kiln process and pigment calcination	Process-related fumes	Adequate stack height, wet scrubbers, optimized combustion	Stack emission monitoring as per CPCB
4	Boiler and thermic fluid heater	Combustion-related odour	Use of clean fuel (LPG/LNG/PNG), proper burner tuning	Fuel quality checks and emission monitoring
5	Drying and milling operations	Dust-related odour	Bag filters, dust collectors, enclosed material transfer	Housekeeping audits
6	Effluent Treatment Plant (ETP)	Minor organic / chemical odour	Covered tanks, proper aeration, quick sludge handling	Daily ETP operation log
7	ATFD operation	Salt and process vapour odour	Closed-loop operation, vapour condensation system	Continuous process control
8	Solid waste storage areas	Waste-related odour	Segregated, covered storage and timely disposal	Weekly waste management review
9	Sewage Treatment Plant (STP)	Sewage odour	Proper aeration, sludge removal, greenbelt buffer	STP performance monitoring

Additional Preventive Measures

- Development of 33% greenbelt acting as a natural odour and dust barrier.
- Adoption of good housekeeping practices across the plant.
- Implementation of a grievance redressal mechanism for addressing odour-related complaints, if any.
- Training of operating personnel on odour prevention and chemical handling.

Table 81 - Budget for Environmental Management Plan (EMP)

S. No.	Particulars	Capital Cost in Crores	Annual Recurring Cost in Crores
1	Air Pollution Management	2.00	0.50
2	Continuous Emission Monitoring	0.75	0.05
3	Noise Reduction System	0.25	0.02
4	Water and Wastewater Management	6.50	1.50
5	Solid Waste Management	1.15	0.02
6	Green Belt Development	0.15	0.01
7	Rainwater Harvesting Systems	0.60	0.01
8	Environment Monitoring & Training	0.10	0.05
9	Occupational Health & Safety	0.50	0.15
TOTAL		12.00	2.31

Table 82 - Budget for Corporate Environment Responsibility (CER)

S. No.	Description	Rs. In Crores
1	Development Facilities for Government Higher Secondary in Udayapatti. ➤ Tree Plantation ➤ Renovation & Maintenance of Toilets ➤ Establishment of Library	0.55
2	Development Facilities for Government Higher Secondary School in Sathirapatti. ➤ Tree Plantation ➤ Renovation & Maintenance of Toilets ➤ Establishment of Library	0.55
3	Development Facilities for Government Higher Secondary School in Muthapudyanpatti. ➤ Tree Plantation ➤ Renovation & Maintenance of Toilets ➤ Establishment of Library	0.55
TOTAL		1.65

CHAPTER XI

SUMMARY & CONCLUSION

11.1 General

This chapter presents a consolidated overview of the proposed project and the findings of the Environmental Impact Assessment (EIA) study. It summarizes the salient features of the project, baseline environmental conditions, anticipated impacts, and the mitigation measures proposed through the Environmental Management Plan (EMP). The chapter also draws overall conclusions on the environmental acceptability and sustainability of the project, considering regulatory compliance, resource efficiency, and socio-economic benefits.

11.2 Summary of the Project

Promoter	M/s. ULTRAMARINE & PIGMENTS LIMITED
Name of the Project	Proposed Manufacturing of Inorganic & Complex Inorganic Colored Pigments by M/s. ULTRAMARINE & PIGMENTS LIMITED located at Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.
Location	Village: Kannudaiyanpatti, SIPCOT Industrial Park Taluk: Manapparai District: Tiruchirappalli State: Tamil Nadu
Land Area	32.72 Acres (13.24 Hectares)
Greenbelt Area	10.80 Acres (4.37 Hectares – 33.01%)
Geographical Location	Latitude: 10°39'29.11"N Longitude: 78°26'44.49"E
Mean Sea Level (MSL)	166 m
Land Use Classification	Industrial Area (SIPCOT Industrial Park, Manapparai)
Proposed Capacity	Inorganic Pigments – 5500 TPA Complex Inorganic Colored Pigments – 1350 TPA
Raw Materials	China Clay, Sulphur, Sodium Carbonate, Silica, Tar Pitch
Water Consumption	Freshwater – 101 KLD Recycled Water – 254 KLD Total Water Requirement – 355 KLD
Source of Water	Water supply from SIPCOT Industrial Park, Manapparai.
Wastewater Generation	Sewage – 23 KLD Effluent – 248 KLD
Mode of Disposal for Wastewater	Sewage – Will be treated by proposed STP of capacity 25 KLD. Treated sewage will be used for greenbelt. Effluent – Will be treated by proposed ETP of capacity 300 KLD. Recovery water to be used in process and ATFD salt will be used as a Raw material or Disposal through authorized user as a raw material.

Solid Waste Generation	Broken Refractory Waste – 70 TPM Used empty HDPE Bags – 0.60 TPM ATFD salt – 100 TPM STP Sludge – 0.04 TPM
Mode of Disposal for Solid Wastes	Broken Refractory Waste – Reused in the process Used empty HDPE Bags – Disposal through authorized vendor ATFD salt – Used as a raw material STP Sludge – Used as manure
Hazardous Waste Generation & Disposal	Scum from Pigment Washing – 12 TPM Wastes or Residues Containing Oil – 0.05 TPM Used or Spent Oil – 0.10 TPM ETP Sludge – 24 TPM All hazardous wastes are disposed through authorized vendor
APC Measures	Kiln Process (Pigment Plant) - Stack with wet scrubber at a height of 55m. Boiler (6 TPH) - Stack with a height of 30m. DG Set (1100 KVA) - Stack with a height of 30m Thermic Fluid Heater - Stack with a height of 12m Drying Process - Dust Collector with wet scrubber connected with stack at a height of 15m. Dust Collectors (4 Nos.) - Bag filter connected to stack with a height of 15m
Power Consumption with source	1000 KWH (Source - TNEB)
Manpower Requirement	80 Employees (330 days)
Nearest City	Manapparai – 6.00 km
Populated Areas	Sathirapatti – 0.97 km (SE) Udayapatti – 1.38 km (SW) Muthapudyanpatti – 1.51 km (S)
Reserve Forests	No notified reserve forests within 10 km radius. However, following unnotified reserve forests are present within 10 km radius, Veeramalai Reserve Forest – 5.62 km (NW) Amayapuram Reserve Forest – 5.73 km (W) Poigai Malai Reserve Forest – 8.02 km (SW)
Eco-Sensitive Areas	No eco-sensitive zones within 10 km radius
Water Bodies within 10km radius	Pond near Samudram – 4.67 km (SE) Vengaikurichi Kulam – 9.0 km (SW)
Project Cost	Rs. 110.19 Crores

11.3 Conclusion

Based on the detailed Environmental Impact Assessment and the proposed mitigation measures, it is concluded that the proposed project is environmentally viable and sustainable. All identified impacts are either minor in nature or can be effectively mitigated through the implementation of the Environmental Management Plan.

CHAPTER XII

DISCLOSURE OF CONSULTANT ENGAGED

12.1 Profile of the Consultant

Enviro Care India Private Limited is the consultant involved in the EIA/EMP study and report preparation based on the TOR issued by SEAC, Tamil Nadu. Enviro Care India Private Limited (ISO 9001:2008 certified company) is a fast-track project engineering organization started in the year 2004, dedicated to the field of Environmental Engineering with professionally qualified and experienced team of Environmental Engineers, Chemists, etc. with a client base of more than 1000+ industries in South India. By having more than 10 years of experience in providing environmental services and solutions we have completed hundreds of projects in different domains. The laboratory is accredited by NABL (National Accreditation Board for Testing and Calibration Laboratories).

12.2 Consultancy Services

Enviro Care India Private Ltd undertakes,

- EIA/EMP Studies
- Risk analysis and assessment
- Life Cycle Assessment Study
- Design details of air pollution control equipment's
- Feasibility Study for Hazardous waste management
- Preparation of detailed project report for municipal solid waste management, water & waste water treatment plant
- Water and waste water audit for industries
- Environmental awareness training for industries

Enviro Care India Private Limited is accredited by NABET as EIA Consultant for the following sectors.

12.3 Laboratory

Our laboratory Services Division is a state-of-the-art analytical laboratory accredited by Department of Science and Technology, Government of India under National Accreditation Board for Testing and Calibration Laboratories as per ISO/IEC 17025:2005 in the field of chemical and environmental testing.

Water Analysis

- Packaged drinking water analysis as per IS 14543:2004
- Suitability of water for portability as per IS 10500:2001
- Suitability of water for Construction as per IS 456:2000
- Toxic trace metals analysis
- Surface, Ground, Sea water analysis
- Effluent/Sewage/Waste water analysis as per TNPCB norms
- Microbiological testing of water

Ambient/Workplace Air Quality Survey

- Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Particulate Matter (PM_{2.5}), Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x), Carbon monoxide (CO), Lead (Pb), Hydrocarbons (HC), Volatile Organic Compounds (VOCs), Ammonia (NH₃), Acid Mists, Oil Mist, etc).

Stack Monitoring

- Velocity & Volume of Flue Gas discharge, Dust/Particulate Emissions (PM), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Volatile Organic Compounds (VOCs), Orsat Analysis (CO, CO₂ and O₂) and Toxic trace metals.

Weather Monitoring

- Wind Speed, Wind Direction, Minimum Temperature, Maximum Temperature, Relative Humidity, Dew Point, Atmospheric Pressure, Solar Radiation, Rainfall, etc.

Noise Monitoring

- Test the noise levels at various industrial operations.

Soil Testing

- Texture, Lime Status, Moisture, Organic Carbon, pH, EC, Sodium as Na, Nitrogen as N, Phosphorous as P, Potassium as K, Iron as Fe, Zinc as Zn, Copper as Cu, Manganese as Mn and Toxic heavy metals.

12.4 Turnkey Projects

Effluent Treatment Plant with Recycling System

- Zero Liquid Discharge System
- Chemical Treatment
- Electro Coagulation
- Packaged Treatment System
- Biological Treatment System

WTP and Drinking Water Plant

- Sand and Carbon Filtration
- Reverse Osmosis Plants
- Drinking water plant as per IS 14543 on BOOSC basis
- Industrial
- Softening Plants
- De-mineralized Plants
- Iron removal filters

Air Pollution Control Equipment's

- Wet/Dry Scrubbers
- Caustic Scrubbers
- Dust Collectors
- Electro Static Precipitator (ESP)

Evaporator

- Single Stage
- Multi Stage

Secured Land Filling

- Completing the secured landfill facility as per CPCB norms
- Landfill facility for Hazardous sludge, Biomedical waste, etc.

Sewage Treatment Plant with Recycling System

- Moving Bed Biological Reactor (MBBR)
- Fluidized Aerobic Bio Reactor (FAB)
- Activated Sludge Process
- Extended Aeration Process
- Sewage Recycle Process (SRP)
- Sand and Carbon Filtration
- Chlorination, UV and Ozonator
- Packaged Treatment System

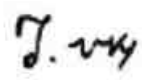
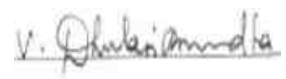
12.5 Operation & Maintenance Treatment Plant

- Sewage Treatment Plants
- Effluent Treatment Plants
- Reverse Osmosis Plants
- Softening Plants
- Sugar Process Laboratory

DECLARATION OF EXPERTS

Declaration by Experts contributing to the Environmental Impact Assessment report for the Proposed Chemical Manufacturing unit of Inorganic Pigments (5500 TPA) and Complex Inorganic Coloured Pigments (1350 TPA) to be located at Plot No. 38,39,40,41,42,43,44,46,47,50,51,52&53 in Kannudaiyanpatti Village, SIPCOT Industrial Park, Manapparai Taluk, Tiruchirappalli District, Tamil Nadu.

We, hereby, certify that we were part of the EIA team in the following capacity that developed the above EIA report,

Functional Areas	Name of Expert	Involvement (Period & Task)	Signature
HG (A), LU (A), WP (A), NV (B)	Dr. S. Rajamohan	March to May 2025 (Hydrology, Land-Use, Water Pollution, Noise)	
AP (B), AQ (B), RH (A), SC (B)	Mr. A. Nedunchezian	March to May 2025 (Air Pollution, Air Quality Modeling, Risk and Hazards, Soil Conservation)	
AP (B), AQ (B), SHW (B)	Mr. J. Vivek	March to May 2025 (Air Pollution, Air Quality Modeling, Solid and Waste Generation)	
WP (B), EB (A)	Dr. G. Thirumaran	March to May 2025 (Water Pollution, Ecology & Biodiversity)	
AQ (B), WP (B)	Ms. R. Suby	March to May 2025 (Air Quality Modeling, Water Pollution)	
SE (A)	Dr. V. Dhulasi Birundha	March to May 2025 (Socio-Economic Environment)	
GEO (A)	Mr. V. Venkateshwarlu	March to May 2025 (Geology)	

National Accreditation Board for Education and Training

Certificate of Accreditation

Enviro Care India Private Limited, Madurai

Plot No. 43, 2nd Street Harvey Nagar, Arasaradi, Madurai - 625016

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 - opencast mining only	1	1 (a) (i)	A
2.	Thermal power plants	4	1 (d)	B
3.	Metallurgical industries (ferrous only)	8	3 (a)	B
4.	Pesticides industry and pesticide specific intermediates	17	5 (b)	A
5.	Synthetic organic chemicals industry	21	5 (f)	A
6.	Distilleries	22	5 (g)	A
7.	Pulp & paper industry excluding manufacturing of paper from wastepaper and manufacture of paper from ready pulp without bleaching	24	5 (i)	A
8.	Ports, harbours, break waters and dredging	33	7 (e)	B
9.	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
10.	Building and construction projects	38	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated June 03, 2025 posted on QCI-NABET website.

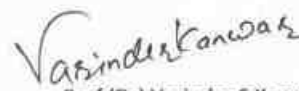
The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACC/25/3654 dated June 10, 2025. The accreditation needs to be renewed before the expiry date by Enviro Care India Private Limited, Madurai following due process of assessment.

Valid up to
Dec 15, 2027

Issue Date
June 10, 2025



Certificate No.
NABET/EIA/24-27/RA 0406


 Prof (Dr) Varinder S Kanwar
 (CEO - NABET)

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

ANNEXURE I

Soil Test Report

	VRR ENGINEERING CONSULTANCY Geotechnical & Structural Consultant # 2/81, 1 st Street, Sairam Avenue, Balaiah Garden, Madipakkam, Chennai - 600 081 Phone: 044 42044361 / +91 9840020827 / +91 9367758590, E-Mail: vrrc@yashoo.in
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சுவரிக்ஷேபகரணம் அறிக்கை விவரம்: 2025/25/2025 25/08/2025	
GEOTECHNICAL INVESTIGATION REPORT	
NAME OF WORK :	GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF NEW MANUFACTURING INDUSTRY AT SIPCOT INDUSTRIAL PARK IN MANAPPARAI, TRICHY.
CLIENT :	M/s. Ultramarine and Pigments Ltd.
REPORT NO :	215 / GT / VRR / 2025
DATE :	25 th August 2025

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தமிழ்நாடு

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF NEW MANUFACTURING INDUSTRY AT SIPCOT INDUSTRIAL PARK IN MANAPPARAI, TRICHY.

1. INTRODUCTION

M/s. Ultramarine and Pigments Ltd, has proposed to construct New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy. The detailed Geotechnical Investigation was suggested by the client for obtaining the geotechnical / geological profile. Accordingly, the work was awarded to M/s VRR Engineering Consultancy, Chennai - 91. The Geotechnical Investigation was carried during 19th June to 30th July 2025. This report comprises of the details of Geotechnical Investigation, analysis of field and lab test results, recommendation of geotechnical design parameters such as bearing capacity and settlement of foundation etc.,

2. SITE CONDITION AND INVESTIGATION PROGRAMME

The proposed site is located at Manapparai, Trichy. The number of boreholes has been decided as fourteen. The field tests includes standard penetration test and obtaining soil samples through split spoon sampler, undisturbed sampling in soft to medium stiff cohesive soil (if occurred), identification of different soil layers, location of ground water table and complete logging of the borehole etc, Laboratory investigation consists of classification tests such as grain size distribution, Atterberg limits, specific gravity, free swell index, natural moisture content, density and engineering property tests such as UCC test / Direct Shear test / Triaxial shear test and consolidation test on soil samples and point load strength index, UCS test, water absorption, specific gravity tests on rock core samples, chemical analysis of soil and water samples. The applicability of field and laboratory tests are based on the quantity and type of soil samples (cohesion less and cohesive soil) and CR and RQD of the rock core samples.

3. GEOTECHNICAL INVESTIGATION PROCEDURE

3.1 In-situ Investigation in Soil:

The Rotary Rig with Auto-trip SPT Hammer was set up at specified borehole location.. Boreholes were drilled at that location to obtain information about the sub-soil stratification and to collect soil samples for strata identification and conducting various related laboratory tests.

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The maximum diameter of the bore hole was 150 mm and drilling was carried out in accordance with the provision of IS : 1892-2021. The drilling was proceeded by the cutting action of a rotating soil cutter which should be kept in firm contact with the bottom of the hole. The soil cutter has been carried at the end of hollow coupled drilled rods which was rotated by a suitable chuck. Drilling mud (bentonite) will be used below ground water table. Mud fluid has been pumped continuously down the hollow drill rods and the return fluid come to the surface in the annular space between the rods and the sides of the hole and so the protective casing may not be generally necessary.

In-situ SPT tests was carried out in all kinds of soil and completely weathered dis-integrated rock (penetrated by Soil cutter / TC Bit) at 1.5 m intervals / change of strata till termination depth and collection of disturbed samples through split spoon sampler through SPT. The boreholes was cleaned using drilling fluid pump up to the depth of testing or sampling to ensure minimum disturbance of soil at the bottom of the borehole. Disturbed soil samples was preserved for conducting various tests in the laboratory.

3.2 Standard Penetration Test (SPT) for Soil

This test was conducted in all types of soil deposits met within the borehole to find the resistance of soil by correlating with the number of blows required for 30 cm penetration. This test was conducted at 1.5 m intervals / change of strata till termination depth. Procedure for conducting the test, presentation of test results and collection of disturbed soil samples etc. shall confirm to IS: 2131:2021 & 1892:2021. This test was carried out by driving a standard split spoon sampler in the borehole by means of a 63.5 kg hammer having a free fall of 75 cm. The sampler was driven using the number of blows for every 150 mm penetration was recorded. The number of blows for the last 300 mm drive was reported as "N" value. The test was discontinued when the blow count is equal to 50 for 150 mm penetration depth and the penetration length was recorded. Refusal was considered to be met with when the blow count is equal to 100 for 300 mm i.e. 50 for 150 mm at the location when the test was discontinued the penetration and the corresponding number of blows was reported. Sufficient quantity of

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disturbed soil samples was collected from the split spoon sampler and below the test level for identification and laboratory tests. The samples was visually classified and recorded at the site and was properly preserved and labled for future identification and testing. These SPT tests were carried out using Auto-Trip Free Fall Hammer system for which the expected energy level is approximately 60% to 70%. The SPT 'N' value resulting from this procedure may be considered as 'N₆₀'.

3.3 Core Drilling in Rock / Hard Stratum

Drilling in rock was carried out by rotary motion using diamond bit. The rotary core drilling equipment and procedure for drilling was confirmed to IS : 6926:2020. Drilling was carried out with NX size bits. Suitable Reamer shell and core catchers was used to ensure continuous and good core recovery.

The drilling fluid was water. Circulation of drilling fluid was started before the core barrel reaches the bottom of the hole to prevent cutting of sludge from entering the core barrel at the start of coring. Drilling fluid was circulated continuously down the hollow rods to remove the rock cuttings to the surface. The core was collected with least disturbance after drilling the desired depth. If the core recovery was less than 5% then SPT was also performed before commencing the next drill run. If at any time blocking of the bit or grinding of the core is observed the core barrel was immediately withdrawn from the borehole regardless of the length of drill completed.

The depths through which a uniform rate of penetration is maintained, the depth at which a marked change in rate of penetration or sudden fall or drill rod occurs, the depth at which any blockage of drill bit causing core loss if any etc. had been recorded. Any heavy vibration or torque noticed during drilling was also recorded together with the depth of occurrence. During drilling operation, observation was noted in one specified proforma. Core samples was extracted from the core barrel without vibration. Core was taken to maintain the direction of extrusion of sample. Immediately after withdraw from the core barrel, the cores was placed in a tray and transferred into boxes specially prepared for the purpose. The boxes were

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தொலைபேசி

made as per IS: 4078:2019. The total core recovery (TCR) and rock quality designation (RQD) was computed as per IS 11315:2023 guidelines. The cores was numbered serially and arrange in the boxes in sequential order. The description of the core samples was recorded as per IS: 4464:2020. Ground water table depth was measured in the bore-hole location. On completion of the borehole the portion drilled in soil was plugged by admixing cement with the available cuttings taken from the bore-holes and grouted from bottom to top of the bore-hole. All the field test results recorded in the bore logs are illustrated in Annexure -1.

4. METHODOLOGY ADOPTED IN LABORATORY INVESTIGATION

4.1 Index Tests

Natural moisture content of soil samples is measured as per IS: 2720 (Part 2) – 1973. Specific gravity test on soil samples are conducted using specific gravity bottle as per IS: 2720 (Part 3 / sec-1) – 1980. Grain size distribution analysis is performed as per IS: 2720 (part 4) – 1985 for all disturbed and un-disturbed soil samples. As per IS: 2720 (Part 5) – 1985, the soil samples have been sieved through 425 micron IS sieve and used for determining Atterberg Limits of soils. Liquid limit test of soils is determined by using Casagrande apparatus as per IS: 2720 (Part 5) – 1985. Plastic limit test of soils is conducted by standard method (IS: 2720 (Part 5) – 1985). The shrinkage limit of the soil is determined as per the bureau of Indian standard procedure IS: 2720 (Part 6) – 1972. The free swell index test is determined as per IS: 2720 (Part 40) – 1972 expressed in percentage.

4.2 Engineering Properties Test

The Shear Strength Parameters (Cohesion, 'c' and Angle of Internal Friction ' ϕ ') of undisturbed soil samples are obtained by conducting Direct Shear Test as per IS: 2720 (Part 13) – 1986. The undrained cohesion ' c_u ' of the clay layer is obtained by conducting Unconfined Compressive Strength Test as per IS 2720 (Part 10) – 1973. The Settlement parameters (Co-efficient of consolidation ' C_v ' and Compressibility Co-efficient ' C_c ') are determined by conducting consolidation test as per IS 2720 Part 15 – 1986 on the undisturbed soil samples obtained through Thin-Walled Shelby Tube sampler.

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4.3 Laboratory Test on Rock Cores:

Density & Specific Gravity: Density & Specific Gravity of rock core samples are tested in the Laboratory as per IS: 2386 (Part-III).

Water Absorption: Water Absorption percentage of Rock core samples are tested in the Laboratory as per IS: 2386 (Part-III). **Porosity:** Porosity of Rock core samples is determined as per IS: 13030.

Point Load Strength Index of Rock: Rock core samples collected in various depths from different borehole has been shaped and tested in the laboratory as per IS: 8764 specifications. The reported value of the point strength index is $I_{s(50)}$ in kN/m^2 .

Unconfined Compressive Strength of Rock Materials: Length of Rock core samples collected in various depths from different borehole are measured and when length of cores found more than two times of diameter of core then those cores are taken part in preparation of UCC test. The length of diameter ratio of cylindrical specimens has been kept minimum two times; cutting and polishing has been made in the lathe for conducting UCC test for soaked condition as per guidelines of clause no 3.3 of IS:9143. Test procedures, calculation and reporting UCC of rock cores are carried out as per guidelines of clause no. 4,5 & 6 of IS: 9143.

The applicability of field and laboratory tests are based on the quantity and type of soil samples (cohesion less and cohesive soil) and CR and RQD of the rock core samples.

5.0 TRIAL PIT

Trial Pit was excavated as per IS 1892 (2021). The Photographs of Trial Pit soil profile is shown in Annexure 2. Soil samples were collected at every 0.5 m, 1.0 m and 2.0 m depths. Beyond 2.0 m depth weathered rock layer was encountered during excavation of trial pit. All laboratory tests are conducted as per the Indian Standard Testing Procedure (SP 36 Part I: 1987 & Part II: 1988). All Laboratory test results of soil samples collected are summarized in Annexure 2 of this report.

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Table 1: Trial Pit test Results

S. No.	Test Location	Depth from EGL (m)	Type of Soil	Optimum Moisture Content (%)	Maximum Dry Density (kN/m ³)	Soaked CBR Value (%)
1	TP-01	0.5	Brownish Sandy Clay (CI)	16.5	15.9	3.56
2	TP-01	1.0	Greyish Brown Clayey Sand (SC)	11.3	18.8	11.14
3	TP-01	2.0	Brownish Silty Sand (SM)	8.9	19.6	17.36
4	TP-02	0.5	Brownish Sandy Clay (CI)	15.7	16.3	6.42
5	TP-02	1.0	Greyish Silty Sand (SM)	8.7	19.7	12.56
6	TP-02	2.0	Greyish Silty Sand (SM)	8.4	2.0	19.54

6.0 FALLING HEAD PERMEABILITY TEST

The Falling Head Permeability Test has been conducted as per IS 5529 – Part (1) method. The hole is drilled upto the level at which test is to be performed. If the hole cannot stand, the casing pipe with perforated section can be used in the strata. After cleaning the hole, the water pipe is filled with water upto its top and rate of fall of the water inside pipe is recorded. The permeability value has been arrived as per procedure outlined in section 9.0 of IS 5529 – Part (1):2015 is presented in Table 2. The Falling Head Permeability Test results are illustrated in Annexure - 3.

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Table 2: Falling Head Permeability Results of Different Bore-hole Locations

S. No.	BH No.	Depth from EGL (m)	Lithology	In-situ Permeability, $k \times 10^{-5}$ cm/sec
1	BH 3	0.5 – 2.0	Brownish Silty Sand (SM)	2.12
2	BH 4	0.5 – 2.0	Brownish Silty Sand (SM)	2.91
3	BH 8	0.5 – 2.0	Brownish Silty Sand (SM)	2.49
4	BH 12	0.5 – 2.0	Brownish Silty Sand (SM)	2.58

7.0 PACKER PERMEABILITY TEST

The Packer Permeability Test has been conducted as per IS 5529 – Part (2):2015 method. The inflatable packer has been lowered at desired depth and inflated through Water pressure pumping system. The inflow pressure has been varied between 0.5 kg/cm² to 1.5 kg/cm² depending on geological texture of Subsurface Strata. The water pressure has been controlled through pressure control valve fixed in the High-Pressure Triplex Pump. The water inflow was recorded in the flowmeter for 15 minutes for all pressure increments. The lugeon value and permeability has been arrived as per procedure outlined in section 9.0 of IS 5529 – Part (2):2015 is presented in Table 3. The Packer Permeability Test results are shown in Annexure 4.

Table 3: Packer Permeability Results of Different Bore-hole Locations

S. No.	BH No.	Depth from EGL (m)	Lithology	Lugeon Value (lit/min/m)	In-situ Permeability, $k \times 10^{-5}$ cm/sec
1	BH 3	4.5 - 6.0	Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	8.127	8.354
2		7.5 - 9.0	Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	1.167	1.199

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S. No.	BH No.	Depth from EGL (m)	Lithology	Lugeon Value (lit/min/m)	In-situ Permeability, $k \times 10^{-5}$ cm/sec
3		9.0 – 10.5	Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)	0.625	0.642
4		10.5 – 12.0	Chamockite, Greyish Black, Medium Grained, Moderately Weathered Rock (Grade III)	0.375	0.385
5	BH 4	8.0 – 9.5	Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	5.273	5.420
6		10.0 – 11.5	Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)	0.583	0.600
7		11.5 – 13.0	Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)	0.250	0.257
8	BH 8	5.5 – 7.0	Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade V)	7.810	8.028
9		7.0 – 8.5	Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	4.788	4.922
10		8.5 – 10.0	Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	3.576	3.676
11		10.5 – 12.0	Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)	0.375	0.385
12	BH 12	6.5 – 8.0	Chamockite, Brownish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	8.825	9.072
13		8.5 – 10.0	Chamockite, Brownish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	5.333	5.482
14		10.5 – 12.0	Chamockite, Brownish Grey, Medium Grained, Fresh and No Sign of Weathering (Grade I)	0.667	0.685
15		12.0 – 13.5	Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)	0.208	0.214

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8.0 FIELD CALIFORNIA BEARING RATIO TEST

The Field California Bearing ratio test has been conducted as per IS 2720 (Part 31):2006 method. This test was conducted to obtain the properties of soils required for construction of roads / pavements. Load was applied on the penetration piston so that the penetration is approximately 1.25 mm/min. The load readings were recorded at penetration of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 7.5, 10.0 and 12.5 mm. The soil samples were collected and the laboratory tests were carried out. The results are summarized in Table 4. The Field California Bearing ratio test results are shown in Annexure 5.

Table 4: Field California Bearing ratio test Results

S. No.	Test Location	Test Depth from EGL (m)	Field Density (g/cc)	Moisture Content (%)	Field CBR Value (%)
1	CBR-01	1.0	1.78	7	15.19
2	CBR-02	1.0	1.86	5	21.37
3	CBR-03	1.0	1.87	4	22.41
4	CBR-04	1.0	1.89	4	24.50

9.0 CYCLIC PLATE LOAD TEST

The Cyclic Plate Load test has been conducted as per IS 5249 : 1992 – RA 2020 method. Cyclic Plate load test is conducted to determine the Coefficient of Elastic Uniform Compression (C_u) for a given area under dynamic loading conditions. From the data obtained during cyclic plate load test, the elastic rebound of the plate corresponding to each intensity of loading was obtained. The results are summarized in Table 5. The Cyclic Plate Load Test results are shown in Annexure 8.

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Table 5: Cyclic Plate Load Test Results

S. No.	Test Location	Test Depth from EGL (m)	Coefficient of Elastic Uniform Compression (c_u) (kg/cm ²)
1	CPLT-01	2.5	133.19
2	CPLT-02	2.5	150.14

10.0 GEOTECHNICAL DESIGN PARAMETERS

The Geotechnical design parameters such as Shear Strength (" c_u " and " ϕ "), Elastic Modulus (E_s) (Bowles 1997), Design SPT 'N' values and Bulk density values are arrived from Laboratory Tests and Empirical Correlations are summarized in Appendix – A of this report along with variation of SPT 'N' value with respect to depth in different borehole locations.

11.0 COMPUTATION OF BEARING CAPACITY AND SETTLEMENT

Based on the observation made in the borehole location of the proposed site, an attempt is made to arrive the safe bearing capacity, safe bearing pressure and allowable settlement of the foundation soil. In order to compute safe bearing capacity, the depth of foundation is taken as 1.5 m, 2.0 m, 2.5 m and 3.0 m and size of foundations as 1.5 m x 1.5 m, 2.0 m x 2.0 m, 2.5 m x 2.5 m, 2.0 m x 3.0 m and 1.25 m wide strip footing. The SPT 'N' value, Correlated Elastic Modulus ' E_s ' value (Bowles 1997) and shear strength parameters and engineering properties of soil layers, which are required to determine bearing capacity and settlement, were taken from Appendix – A. The Safe Bearing Capacity is computed using Bureau of Indian Standard IS 6403-1981 equation. The elastic settlement of foundation is arrived based on IS 8009 (Part I) 1976 Method using the Elastic Modulus values of soil layers for the proposed site. The ground water table depth is considered as Ground Surface to compute safe bearing capacity and settlement of foundation.

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11.1 Safe Bearing Capacity

For the determination of Safe Bearing Capacity using IS 6403-1981 equation, the shear strength parameters below foundation level up to the influence depth of 1B is considered. The safe bearing capacity thus computed are shown in Appendix – B.

11.2 Settlement Calculations for Foundation Soils

One of the important functions of any foundation systems is to satisfy the settlement criteria apart from bearing capacity criteria. The total settlement of foundation is becoming very critical, especially if the foundation is located on clays, because the clay layer is expected to undergo excessive consolidation settlement over a period of time under sustained loadings which of course depends on the state of clay (initial water content / void ratio), whereas in the case of loose sand layer, elastic or immediate settlement plays a crucial role. The Soil layers existing below foundation depth is medium dense clayey sand with significant amount of sand fraction and silty clay in stiff consistency. By considering the stiffness of clay layer and sand fraction of clayey sand layer, immediate / elastic settlement are alone computed and considered for recommendation of foundation system. The immediate / elastic settlement of foundation is computed based on IS 8009 (Part I) 1976 Method for different depths and size of foundations which is shown in Appendix -B. The settlement has been computed up to the influence depth of "2B" below the foundation. The settlement computations are made for 200 kN/m², 250 kN/m², 300 kN/m² and 350 kN/m² at Foundation Base is presented in Table 6. *The allowable settlement as per IS 1904 Table I 1986 is limited to 50 mm for Individual Footing and 100 mm for Raft foundation in High Plastic Clay.*

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பொது

TABLE 6 Computed Settlement Values of the Open Foundation

Type of Foundation (m)	Size of Foundation (m)	Depth of Foundation (m)	Pressure at Foundation Base Level (kN/m ²)	Immediate Settlement as per IS 8009 (Part I) 1976 Method (mm)
Square Footing	1.5 x 1.5	1.5	200	4.21
		2.0	250	4.90
		2.5	300	6.31
		3.0	350	5.22
Square Footing	2.0 x 2.0	1.5	200	5.99
		2.0	250	5.67
		2.5	300	5.72
		3.0	350	5.36
Square Footing	2.5 x 2.5	1.5	200	5.33
		2.0	250	5.58
		2.5	300	5.42
		3.0	350	5.57
Rectangular Footing	2.0 x 3.0	1.5	200	6.74
		2.0	250	6.57
		2.5	300	6.78
		3.0	350	5.62
Strip Footing	1.25 m Wide	1.5	200	3.33
		2.0	250	4.16
		2.5	300	4.99
		3.0	350	5.82

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12. SUMMARY

The following recommendations are suggested for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.

- ✓ It is recommended to provide Shallow Open Foundation for different type of structures.
- ✓ The recommended depth of Shallow Open Foundation system are 1.5 m, 2.0 m, 2.5 m and 3.0 m from the existing ground level for different type of structures with varying super structure loads.
- ✓ The recommended safe bearing capacity of Shallow Open Foundation at 1.5 m, 2.0 m, 2.5 m and 3.0 m depth is 200 kN/m², 250 kN/m², 300 kN/m² and 350 kN/m² respectively. The permissible settlement of Footings is 50 mm.
- ✓ The top 0.6 m soil has significant amount of clay fraction and it shall not be used for backfilling purpose. The excavated soil beyond 0.75 m depth may be used for backfilling purpose due to the presence of coarser fraction (sand content).
- ✓ It is recommended to adopt suitable supporting system with dewatering method to excavate subsurface strata up to the desired depth of foundation for different type of structures.

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		IN-SITU GEOTECHNICAL BORE LOG						BORE-HOLE No.		BH 01	
								SHEET No.		(1/2)	
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.									
Co-ordinates:		N - 1179320.771 ; E - 220548.491				Started:		28-07-2025			
Location:		Manapparai				Completed:		30-07-2025			
Elevation (RL):		-				Ground Water Level:		7.50			
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:		-				Water Loss Depths:		13.00 m			
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		20.00 m - (Soil - 2.0 m, Rock - 18.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock	
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)		
0 30 60 90 120 150											
0.25			Greyish Silty Sand (SM)	3	8	7	13				Medium Dense
1.0			Greyish Clayey Sand (SC)	6	23	50 (7 cm) Rb	>100				Very Dense
2.0			Greyish Clayey Sand (SC)	37	55 (7 cm) Rebound		>100				Very Dense
3.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100				Hard / Very Weak
4.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100				Hard / Very Weak
6.0			Chamockite, Whitish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)	55 (8 cm) Rebound			>100	5.00	0		Hard / Weak
7.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100	0	0		Hard / Very Weak
9.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100	0	0		Hard / Very Weak
10.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100	0	0		Hard / Very Weak
12.0			Chamockite, Greyish Brown, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					13.33	0		Hard / Weak
13.5			Chamockite, Brownish White, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					20.00	0		Hard / Weak
15.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					26.60	0		Hard / Weak
16.5			Chamockite, Brownish Grey, Medium Grained, Slightly Weathered Rock (Grade II)					97.00	54.00		Strong

			IN-SITU GEOTECHNICAL BORE LOG						BORE-HOLE No.		BH 01		
									SHEET No.		(2/2)		
Project:			Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.										
Co-ordinates:			N - 1179320.771 ; E - 220548.491				Started:		28-07-2025				
Location:			Manapparai				Completed:		30-07-2025				
Elevation (RL):			-				Ground Water Level:		7.50				
Dia of Boring:			Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel				
Casing Depth:			-				Water Loss Depths:		13.00 m				
Type of Boring:			Rotary Rig - Auto Trip SPT				Total Drill Depth:		20.00 m - (Soil - 2.0 m, Rock - 18.0 m)				
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations				Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
							0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
													0 30 60 90 120 150
17.0			Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)										Moderately Strong
18.0												90.00	
19.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)								100.00	100.00	Strong
20.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)								100.00	100.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 02			
						SHEET No.		(1/1)			
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.									
Co-ordinates:		N - 1179335.795; E - 220697.935				Started:		25-07-2025			
Location:		Manapparai				Completed:		26-07-2025			
Elevation (RL):		-				Ground Water Level:		7.50 m			
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:		-				Water Loss Depths:		-			
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		14.00 m - (Soil - 3.0 m, Rock - 11.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock	
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)		
0 30 60 90 120 150											
0.25			Brownish Sandy Clay (Cl)	4	9	13	22			Very Soft	
1.0			Whitish Brown Clayey Sand with Calcium Matrix (SC)	13	28	50 (3 m) Rb	>100			Medium Dense	
2.0			Whitish Brown Clayey Sand with Calcium Matrix (SC)	15	32	55 (3 m) Rb	>100			Medium Dense	
3.0			Brownish Clayey Sand with Calcium Matrix (SC)	33	55 (2.5 m) Rb		>100			Medium Dense	
4.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials		55 (2.5 m) Rb		>100			Hard / Very Weak	
5.5			Chamockite, Whitish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					34.60	7.33	Hard / Weak	
7.0			Chamockite, Whitish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					20.00	0	Hard / Weak	
8.5			Chamockite, Whitish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					21.30	0	Hard / Weak	
10.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					94.00	93.00	Strong	
11.5			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					88.00	84.00	Strong	
13.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					98.00	98.00	Strong	
14.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					98.00	98.00	Strong	

		IN-SITU GEOTECHNICAL BORE LOG						BORE-HOLE No.		BH 03	
								SHEET No.		(1/2)	
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.									
Co-ordinates:		N - 1179243.267; E - 220672.479				Started:		22-07-2025			
Location:		Manapparai				Completed:		24-07-2025			
Elevation (RL):		-				Ground Water Level:		7.80 m			
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:		2.0 m				Water Loss Depths:		-			
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		20.00 m - (Soil - 2.0 m, Rock - 18.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock	
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)		
0 30 60 90 120 150											
0.25			Brownish Silty Clay (CI)	2	3	5	8				Medium Soft
1.0			Brownish Silty Sand (SM)	27	55 (3 cm) Rb		>100				Very Dense
2.0			Brownish Silty Sand (SM) - Residual Soil	55 (7 cm) Rebound			>100				Very Dense
3.0			Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound			>100				Hard / Very Weak
4.5			Chamockite, Whitish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					10.60	0		Hard / Weak
6.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					13.30	0		Hard / Weak
7.5			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					16.00	0		Hard / Weak
9.0			Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					36.60	33.30		Moderately Strong
10.5			Chamockite, Greyish Black, Medium Grained, Moderately Weathered Rock (Grade III)					50.00	34.00		Moderately Strong
12.0			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					72.00	33.00		Moderately Strong
13.5			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					67.00	32.00		Moderately Strong
15.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					52.00	6.66		Hard / Weak
16.5			Chamockite, Whitish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					52.00	28.00		Moderately Strong

			IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 03				
							SHEET No.		(2/2)				
Project:			Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.										
Co-ordinates:			N - 1179243.267; E - 220672.479				Started:			22-07-2025			
Location:			Manapparai				Completed:			24-07-2025			
Elevation (RL):			-				Ground Water Level:			7.80 m			
Dia of Boring:			Px Size in Soil, Nx Size in Rock				Type of Core Barrel:			Nx Size Core Barrel			
Casing Depth:			2.0 m				Water Loss Depths:			-			
Type of Boring:			Rotary Rig - Auto Trip SPT				Total Drill Depth:			20.00 m - (Soil - 2.0 m, Rock - 18.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations				Standard Penetration Test (SPT) / UDS / Core Drilling				Relative Density / Consistency of Soil / Strength of Rock		
							0-15 cm	15-30 cm	30-45 cm	SPT-N		TCR (%)	RQD (%)
0 30 60 90 120 150													
17.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)										
18.0											100.00	100.00	Strong
19.0											100.00	100.00	Strong
20.0											100.00	100.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 04		
						SHEET No.		(1/1)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179132.604; E - 220642.136			Started:		22-07-2025			
Location:		Manapparai			Completed:		23-07-2025			
Elevation (RL):		-			Ground Water Level:		6.30 m			
Dia of Boring:		Px Size in Soil, Nx Size in Rock			Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:		3.0 m			Water Loss Depths:		-			
Type of Boring:		Rotary Rig - Auto Trip SPT			Total Drill Depth:		14.00 m - (Soil - 3.0 m, Rock - 11.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
				0 30 60 90 120 150						
0.25			Greyish Sandy Clay (CI)	4	5	7	12			Stiff
1.0			Brownish Silty Sand (SM)	34	55 (2 cm) Rb		>100			Very Dense
2.0			Brownish Grey Silty Sand (SM) - Residual Soil	55 (4 cm) Rebound			>100			Very Dense
3.0			Greyish Silty Sand (SM) - Residual Soil	55 (7 cm) Rebound			>100			Very Dense
4.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100	0	0	Hard / Very Weak
6.0			Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100	0	0	Hard / Very Weak
7.5			Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (8 cm) Rebound			>100	0	0	Hard / Very Weak
9.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					22.00	0	Hard / Weak
10.5			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					60.00	28.00	Moderately Strong
12.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					94.00	93.00	Strong
13.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	96.00	Strong
14.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	98.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 05		
						SHEET No.		(1/1)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179178.565; E - 220776.011				Started:		28-06-2025		
Location:		Manapparai				Completed:		01-07-2025		
Elevation (RL):		-				Ground Water Level:		4.40 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		15.00 m - (Soil - 2.0 m, Rock - 13.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
0 30 60 90 120 150										
0.25			Brownish Silty Sand (SM)	7	20	35	55			Very Dense
1.0			Brownish Silty Sand (SM)	36	55 (6 cm) Rb		>100			Very Dense
2.0			Brownish Silty Sand (SM) - Residual Soil	55 (6 cm)	Rebound		>100			Very Dense
3.0			Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm)	Rebound		>100			Hard / Very Weak
4.0			Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (6 cm)	Rebound		>100			Hard / Very Weak
5.5			Chamockite, Greyish Brown, Coarse to Medium Grained, Completely Weathered Rock (Grade V)					6.66	0	Hard / Very Weak
7.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					24.00	0	Hard / Weak
8.5			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					40.00	0	Hard / Weak
10.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					76.00	14.00	Hard / Weak
11.5			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					80.00	46.00	Moderately Strong
13.0			Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					83.00	40.00	Moderately Strong
14.0			Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					85.00	58.00	Strong
15.0			Chamockite, Greyish White, Medium Grained, Moderately Weathered Rock (Grade III)					92.00	42.00	Moderately Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 08		
						SHEET No.		(1/2)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179219.588 ; E - 220895.516				Started:		25-06-2025		
Location:		Manapparai				Completed:		27-06-2025		
Elevation (RL):		-				Ground Water Level:		3.30 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		RotaryRig - Auto Trp SPT				Total Drill Depth:		20.0 m - (Soil - 2.0 m, Rock - 18.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
0 30 60 90 120 150										
0.25			Brownish Clayey Sand (SC)	3	7	10	17			Moderately Dense
1.0			Brownish Silty Sand (SM)	39	55 (7 cm) Rb		>100			Very Dense
2.0			Brownish Silty Sand (SM) - Residual Soil	30	55 (3 cm) Rb		>100			Very Dense
3.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound			>100			Hard / Very Weak
4.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound			>100			Hard / Very Weak
5.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (0 cm) Rebound			>100	0	0	Hard / Very Weak
6.0			Chamockite, Brownish White, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					15.00	0	Hard / Weak
7.0			Chamockite, Brownish White, Coarse to Medium Grained, Completely Weathered Rock (Grade V)					8.00	0	Hard / Very Weak
8.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (6 cm) Rebound			>100	0	0	Hard / Very Weak
10.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (6 cm) Rebound			>100	0	0	Hard / Very Weak
11.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (6 cm) Rebound			>100	0	0	Hard / Very Weak
13.0			Chamockite, Greyish White, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					18.00	0	Hard / Weak
14.5			Chamockite, Greyish White, Medium Grained, Moderately Weathered Rock (Grade III)					38.60	22.60	Moderately Strong
16.0			Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					92.00	70.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 08		
						SHEET No.		(2/2)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179219.588 ; E - 226895.516				Started:		25-06-2025		
Location:		Manapparai				Completed:		27-06-2025		
Elevation (RL):		-				Ground Water Level:		3.30 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths :		-		
Type of Boring:		RotaryRig - Auto Trip SPT				Total Drill Depth:		20.0 m - (Soil - 2.0 m, Rock - 18.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
				0 30 60 90 120 150						
17.5	7.0	+	Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					88.00	38.00	Moderately Strong
19.0	8.0	+	Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					82.00	28.00	Moderately Strong
20.0	9.0	+	Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					100.00	30.00	Moderately Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 07		
						SHEET No.		(1/2)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179260.279 ; E - 221013.776				Started:		26-06-2025		
Location:		Manapparai				Completed:		27-06-2025		
Elevation (RL):		-				Ground Water Level:		4.10 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		17.00 m - (Soil - 2.0 m, Rock - 15.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
				0 30 60 90 120 150						
0.25			Brownish Silty Clay (CI)	2	2	2	4			Soft
1.0	1.0		Brownish Clayey Sand (SC)	13	38	50 (1.0m) Rh	>100			Very Dense
2.0	2.0		Brownish Silty Sand (SM)	55 (1.0m) Rebound			>100			Very Dense
3.0	3.0		Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (1.0m) Rebound			>100			Hard / Very Weak
4.5	4.0		Chamockite, Greyish White, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					14.00	0	Hard / Weak
6.0	5.0		Chamockite, Brownish Black, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					20.00	0	Hard / Weak
7.5	6.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					32.00	0	Hard / Weak
9.0	7.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					30.00	10.00	Hard / Weak
10.5	8.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					36.00	11.33	Hard / Weak
12.0	9.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					40.00	20.00	Hard / Weak
13.5	10.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)							
15.0	11.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)							
16.0	12.0		Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					40.00	20.00	Hard / Weak
	13.0		Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					66.00	73.00	Strong
	14.0		Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					72.00	46.00	Moderately Strong
	15.0		Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					87.00	72.00	Strong

			IN-SITU GEOTECHNICAL BORE LOG					BORE-HOLE No.		BH 07		
								SHEET No.		(2/2)		
Project:			Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.									
Co-ordinates:			N - 1179260.279 ; E - 221013.776				Started:		26-06-2025			
Location:			Manapparai				Completed:		27-06-2025			
Elevation (RL):			-				Ground Water Level:		4.10 m			
Dia of Boring:			Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:			-				Water Loss Depths:		-			
Type of Boring:			Rotary Rig - Auto Trip SPT				Total Drill Depth:		17.00 m - (Soil - 2.0 m, Rock - 15.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations				Standard Penetration Test (SPT) / UDS / Core Drilling				Relative Density / Consistency of Soil / Strength of Rock	
							0-15 cm	15-30 cm	30-45 cm	SPT-N		TCR (%)
0 30 60 90 120 150												
17.0	17.0		Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)							80.00	63.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 08		
						SHEET No.		(1/1)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179080.850 ; E - 220753.255			Started:		18-07-2025			
Location:		Manapparai			Completed:		19-07-2025			
Elevation (RL):		-			Ground Water Level:		7.00 m			
Dia of Boring:		Px Size in Soil, Nx Size in Rock			Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:		2.0 m			Water Loss Depths :		-			
Type of Boring:		Rotary Rig - Auto Trip SPT			Total Drill Depth:		14.00 m - (Soil - 2.0 m, Rock - 12.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations			Standard Penetration Test (SPT) / UDS / Core Drilling				Relative Density / Consistency of Soil / Strength of Rock
						0-15 cm	15-30 cm	30-45 cm	SPT-N	
0 30 60 90 120 150										
0.25			Brownish Clayey Sand (SC)	3	3	5	8			Loose
1.0			Brownish Silty Sand (SM)	32	41	55 (a cm) Rb	>100			Very Dense
2.0			Brownish Silty Sand (SM)	24	30	55 (c cm) Rb	>100			Very Dense
3.0			Brownish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound			>100			Hard / Very Weak
4.5			Chamockite, Brownish, Coarse to Medium Grained, Completely Weathered Rock (Grade V)	55 (2 cm) Rebound			>100	6.66	0	Hard / Very Weak
6.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade V)	55 (2 cm) Rebound			>100	10.66	0	Hard / Very Weak
7.5			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					29.30	16.00	Hard / Weak
9.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					33.30	11.33	Hard / Weak
10.5			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					60.00	37.33	Moderately Strong
12.0			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					60.00	31.33	Moderately Strong
13.0			Chamockite, Brownish Grey, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	100.00	Strong
14.0			Chamockite, Brownish Grey, Medium Grained, Slightly Weathered Rock (Grade II)					90.00	72.00	Strong

			IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 09	
							SHEET No.		(1/1)	
Project:			Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.							
Co-ordinates:			N - 1179120.662 ; E - 220868.841			Started:			02-07-2025	
Location:			Manapparai			Completed:			03-07-2025	
Elevation (RL):			-			Ground Water Level:			3.60 m	
Dia of Boring:			Px Size in Soil, Nx Size in Rock			Type of Core Barrel:			Nx Size Core Barrel	
Casing Depth:			-			Water Loss Depths:			-	
Type of Boring:			Rotary Rig - Auto Trip SPT			Total Drill Depth:			9.00 m - (Soil - 1.0 m, Rock - 8.0 m)	
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
0 30 60 90 120 150										
0.25			Brownish Clayey Sand with Calcium Matrix (SC)	11	27	155	193			Very Loose
1.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (Rebound)			>100			Hard / Very Weak
2.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (Rebound)			>100			Hard / Very Weak
3.0			Whitish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (Rebound)			>100			Hard / Very Weak
4.0			Brownish White, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (Rebound)			>100			Hard / Very Weak
5.5			Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					66.00	60.00	Strong
7.0			Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					91.00	70.00	Strong
8.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	100.00	Strong
9.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	100.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG						BORE-HOLE No.		BH 10	
								SHEET No.		(1/1)	
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.									
Co-ordinates:		N - 1179161.626 ; E - 220988.444					Started:		24-06-2025		
Location:		Manapparai					Completed:		25-06-2025		
Elevation (RL):		-					Ground Water Level:		3.50 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock					Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-					Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT					Total Drill Depth:		16.00 m - (Soil - 2.0 m, Rock - 14.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock	
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)		
0 30 60 90 120 150											
0.25			Brownish Silty Sand (SM)	7	9	11	20			Medium Dense	
1.0			Brownish Silty Sand (SM)	20	36	56 (2m) Rb	>100			Very Dense	
2.0			Brownish Silty Sand (SM)	55 (1.7m) Rebound			>100			Very Dense	
3.0			Blackish White, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2m) Rebound			>100			Hard / Very Weak	
4.0			Blackish White, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (1.7m) Rebound			>100			Hard / Very Weak	
5.5			Blackish White, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (1.7m) Rebound			>100	0	0	Hard / Very Weak	
7.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Completely Weathered Rock (Grade V)					10.00	0	Hard / Very Weak	
8.5			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					17.00	0	Hard / Weak	
10.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					40.00	20.00	Hard / Weak	
11.5			Chamockite, Greyish, Medium Grained, Moderately Weathered Rock (Grade III)					61.00	40.00	Moderately Strong	
13.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					98.00	92.00	Strong	
14.5			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					94.00	90.00	Strong	
16.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	100.00	Strong	

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 11		
						SHEET No.		(1/2)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1178979.023 ; E - 220718.310				Started:		28-06-2025		
Location:		Manapparai				Completed:		01-07-2025		
Elevation (RL):		-				Ground Water Level:		5.50 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		17.00 m - (Soil - 2.0 m, Rock - 15.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
0 30 60 90 120 150										
0.25			Brownish Sandy Clay (CI)	2	4	8	10			Soft
1.0			Brownish Silty Sand (SM)	9	27	55 (3 cm) Rb	>100			Very Dense
2.0			Brownish Silty Sand (SM) - Residual Soil	33	55 (3 cm) Rb	>100				Very Dense
3.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound	>100					Hard/Very Weak
4.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound	100					Hard/Very Weak
5.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound	>100			0	0	Hard/Very Weak
7.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound	>100			0	0	Hard/Very Weak
8.5			Chamockite, Brownish White, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					13.00	0	Hard/Weak
10.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					46.00	9.33	Hard/Weak
11.5			Chamockite, Greyish Black, Medium Grained, Moderately Weathered Rock (Grade III)					54.00	20.00	Moderately Strong
13.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					95.00	90.00	Strong
14.5			Chamockite, Greyish Black, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	86.00	Strong
16.0			Chamockite, Brownish Grey, Medium Grained, Fresh and No Sign of Weathering (Grade I)					90.00	43.00	Strong

			IN-SITU GEOTECHNICAL BORE LOG					BORE-HOLE No.		BH 11		
								SHEET No.		(2/2)		
Project:			Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.									
Co-ordinates:			N - 1178979.023 ; E - 220718.310				Started:		28-06-2025			
Location:			Manapparai				Completed:		01-07-2025			
Elevation (RL):			-				Ground Water Level:		5.50 m			
Dia of Boring:			Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel			
Casing Depth:			-				Water Loss Depths:		-			
Type of Boring:			Rotary Rig - Auto Trip SPT				Total Drill Depth:		17.00 m - (Soil - 2.0 m, Rock - 15.0 m)			
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations				Standard Penetration Test (SPT) / UDS / Core Drilling				Relative Density / Consistency of Soil / Strength of Rock	
							0-15 cm	15-30 cm	30-45 cm	SPT-N		TCR (%)
0 30 60 90 120 150												
17.0	17.0		Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)							95.00	68.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 12		
						SHEET No.		(1/1)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179025.078 ; E - 220852.220				Started:		18-07-2025		
Location:		Manapparai				Completed:		19-07-2025		
Elevation (RL):		-				Ground Water Level:		6.50 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		2.00 m				Water Loss Depths:		-		
Type of Boring:		Calyx Rig - Auto Trip SPT				Total Drill Depth:		14.00 m - (Soil - 4.0 m, Rock - 10.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
				0 30 60 90 120 150						
0.25			Brownish Clayey Sand (SC)	5	11	15	26			Very Soft
1.0			Brownish Silty Sand (SM)	28	55 (3 cm) Rb		>100			Very Dense
2.0			Brownish Silty Sand (SM)	32	38	55 (2 cm) Rb	>100			Very Dense
3.0			Brownish Silty Sand (SM)		55 (7 cm) Rebound		>100			Very Dense
4.0			Brownish Silty Sand (SM)		55 (6 cm) Rebound		>100			Very Dense
5.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials		55 (2 cm) Rebound		>100	0	0	Hard / Very Weak
6.0			Chamockite, Brownish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					24.66	0	Hard / Weak
7.0			Chamockite, Brownish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					28.00	0	Hard / Weak
8.5			Chamockite, Brownish Grey, Medium Grained, Moderately Weathered Rock (Grade III)					51.00	25.00	Moderately Strong
10.0			Chamockite, Brownish Grey, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	80.00	Strong
11.5			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	100.00	Strong
13.0			Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					98.00	80.00	Strong
14.0										

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 13		
						SHEET No.		(1/1)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179058.967 ; E - 220950.838				Started:		19-06-2025		
Location:		Manapparai				Completed:		24-06-2025		
Elevation (RL):		-				Ground Water Level:		3.50 m		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		15.00 m - (Soil - 2.0 m, Rock - 13.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
				0 30 60 90 120 150						
0.25			Brownish Silty Sand (SM)	8	10	12	22			Medium Dense
1.0			Brownish Silty Sand (SM)	36	55 (2 cm) Rb		>100			Very Dense
2.0			Brownish Silty Sand (SM) - Residual Soil	55 (4 cm) Rebound			>100			Very Dense
3.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound			>100			Hard / Very Weak
4.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (2 cm) Rebound			>100			Hard / Very Weak
5.5			Chamockite, Brownish, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					13.00	0	Hard / Weak
7.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					32.00	0	Hard / Weak
8.5			Chamockite, Greyish, Medium Grained, Slightly Weathered Rock (Grade II)					76.00	60.00	Strong
10.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					94.00	92.00	Strong
11.5			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					100.00	93.00	Strong
13.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					98.00	98.00	Strong
14.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					98.00	88.00	Strong
15.0			Chamockite, Greyish, Medium Grained, Fresh and No Sign of Weathering (Grade I)					98.00	98.00	Strong

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 14		
						SHEET No.		(1/2)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179099.453 ; E - 221069.014				Started:		19-06-2025		
Location:		Manapparai				Completed:		23-06-2025		
Elevation (RL):		-				Ground Water Level:		3.50		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		18.00 m - (Soil - 2.0 m, Rock - 16.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
0 30 60 90 120 150										
0.25			Brownish Clayey Sand with Calcium Matrix (SC)	5	8	11	19			Medium Dense
1.0			Brownish Clayey Sand with Calcium Matrix (SC)	6	20	55 (T cm) Rb	>100			Very Dense
2.0			Brownish Clayey Sand with Calcium Matrix (SC)	33	55 (T cm) Rebound		>100			Very Dense
3.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (T cm) Rebound			>100			Hard / Very Weak
4.0			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (T cm) Rebound			>100			Hard / Very Weak
5.5			Blackish, Completely Weathered, Disintegrated and Decomposed Rock Materials	55 (T cm) Rebound			>100	0	0	Hard / Very Weak
6.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Completely Weathered Rock (Grade V)					9.00	0	Hard / Very Weak
7.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Completely Weathered Rock (Grade V)					10.00	0	Hard / Very Weak
8.5			Chamockite, Brownish Grey, Coarse to Medium Grained, Completely Weathered Rock (Grade V)					15.00	0	Hard / Weak
10.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					48.00	8.66	Hard / Weak
11.5			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					23.33	8.00	Hard / Weak
13.0			Chamockite, Brownish Grey, Coarse to Medium Grained, Highly Weathered Rock (Grade IV)					57.00	38.00	Moderately Strong
14.5			Chamockite, Greyish Black, Medium Grained, Moderately Weathered Rock (Grade III)					97.00	94.00	Strong
16.0			Chamockite, Greyish, Medium Grained, Fresh, No Sign of Weathering (Grade I)							

		IN-SITU GEOTECHNICAL BORE LOG				BORE-HOLE No.		BH 14		
						SHEET No.		(2/2)		
Project:		Geotechnical Investigation for the Proposed Construction of New Manufacturing Industry at SIPCOT Industrial Park in Manapparai, Trichy.								
Co-ordinates:		N - 1179099.453 ; E - 221069.014				Started:		19-06-2025		
Location:		Manapparai				Completed:		23-06-2025		
Elevation (RL):		-				Ground Water Level:		3.50		
Dia of Boring:		Px Size in Soil, Nx Size in Rock				Type of Core Barrel:		Nx Size Core Barrel		
Casing Depth:		-				Water Loss Depths:		-		
Type of Boring:		Rotary Rig - Auto Trip SPT				Total Drill Depth:		18.00 m - (Soil - 2.0 m, Rock - 16.0 m)		
Depth from EGL (m)	Log	Lithology	Description / Classification of Soil and Rock / Weathering Grade of Rock as per IS 4464 / Special Observations and Interpretations	Standard Penetration Test (SPT) / UDS / Core Drilling						Relative Density / Consistency of Soil / Strength of Rock
				0-15 cm	15-30 cm	30-45 cm	SPT-N	TCR (%)	RQD (%)	
				0 30 60 90 120 150						
17.0	17.0	+	Chamockite, Greyish, Medium Grained, Fresh, No Sign of Weathering (Grade I)					100.00	92.00	Strong
18.0	18.0	+	Chamockite, Greyish, Medium Grained, Fresh, No Sign of Weathering (Grade I)					100.00	85.00	Strong



தமிழ்நாடு தமிழ்நாடு TAMILNADU 721128224 R. முருகானந்தம் DW 823373
M/s. Ultramarine & Pigments Ltd. ஸ்தலத்தார் கிறிபணயார்
- Chennai. டிஸம் எண்: 5/2015/100 ப.ச.முத்தூர்
சார்புணர் அனுமதி உரைகள்
மண்பயம்து. அறிஞர்

**AGREEMENT FOR THE SUPPLY OF WATER FROM THE WATER SUPPLY
SCHEME, SIPCOT INDUSTRIAL PARK, MANAPPARAI**

This Agreement made at SIPCOT Industrial Park, Manapparal, on the 12th December 2024(12.12.2024) between STATE INDUSTRIES PROMOTION CORPORATION OF TAMILNADU LIMITED (SIPCOT) having its Registered Office at 19-A, Rukmani Lakshmipathy Road, Egmore, Chennai-600 008 and represented Thiru.J.Pradeep (Aadhar 3979 9025 2327) (Cell 9787404111) (Employee Id: 2327) son of Thiru.Jegadeesh Project Officer SIPCOT Industrial Park, Manapparai. (hereinafter called SIPCOT which expression shall unless the context otherwise requires include its successors, Administrators and assigns) of the ONE PART:

For Ultramarine & Pigments Limited
Kishore L.
Company Secretary


Project Officer,
SIPCOT Industrial Park,
Manapparai.

M/s. ULTRAMARINE & PIGMENTS LIMITED (PAN No.AACU0718Q) a Public Limited company registered under the Companies Act 1956 and having its Registered Office at Thirumalai House, Road No,29 Near Sion Hill Fort, Sion (East) Mumbai, Maharashtra -400 022.represented by its Thiru. KISHORE KUMAR SAHOO (Aadhar No. 7097 3877 2497 (Cell.-8220013867) (PAN No. BBXPK9828D) Son of Thiru. LAKSHMAN SAHOO, residing at C 802 ALTIS ASHRAYA, OPP KUNDRATHUR, MAIN ROAD, SRIRAM DIVINE CITY, MANGADU, KANCHEEPURAM - 600 122.(hereinafter called the allottee which expression unless the context otherwise requires include their successors, administrators, legal representatives and assigns) of the other Part, witnesseth as follows:

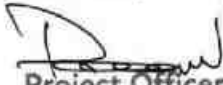
The ALLOTTEE has requested SIPCOT to supply water from the water supply system at the SIPCOT Industrial Park, Manapparai SIPCOT agrees to supply water to the allottee for the industry set up by them in plot Nos. **38, 39, 40, 41, 42, 43, 44, 46, 47, 50, 51, 52 & 53** at SIPCOT Industrial Park, Manapparai from the date of this agreement on the terms and conditions hereinafter mentioned. SIPCOT is at liberty to cancel or modify any or all of the conditions hereinafter mentioned after giving a notice of 15 days to ensure equitable distribution of water and to safeguard the general interests of the allottees in the Industrial Park.

Now this Deed witnesseth as follows:

1. The pumps and pipelines up to the termination receiving point of the allottee shall be installed by SIPCOT at its cost and they shall always remain the property of SIPCOT.
2. SIPCOT shall man and run these pumps and maintain the pumping mains connected therein including pump-houses and their sites and the same shall always remain the property of SIPCOT.
3. The cost of maintaining and repairing the said installation due to normal wear and tear shall be borne by SIPCOT.
4. The water will be delivered as available from the infiltration wells/bore wells/ open wells.
5. Water will be supplied at the receiving point of the allottee from the Over Head Tank/ Sump or Well of SIPCOT up to a limit of **2,00,000 Liters (200 KLD)** per day on a 16 (Sixteen) hours basis daily.

For Ultramarine & Pigments Limited

 Company Secretary


 Project Officer,
 SIPCOT Industrial Park,
 Manapparai.

6. The water will be delivered into the receiving point of the allottee from where pumping for the use of factory will be the responsibility of allottee. SIPCOT and its officers and servants will have free access to inspect and check the arrangements made at the delivery point.
7. The rate of pumping of water shall not normally exceed 2,00,000 Liters (200 KLD) per day and the allottee shall make arrangements to receive and design the internal system with adequate capacity, pressure, etc.
8. The allottee shall not interfere with the actual pumping or working the scheme in anyway. The allottee shall use the water only for the purpose of the project for which the land is allotted including construction work. The water supply should not be used for maintenance of lawns, gardens etc., the water supplied should not be supplied to other units or outsiders, either on charge or at free of cost.
9. Every attempt will be made by SIPCOT to supply water on a 16 (sixteen) hour basis but in case of breakdown in the supply, the allottee shall make their own arrangements for supply by having recourse to storage sumps of the allottee system itself upto a minimum period of 24 hours and SIPCOT shall not be liable to pay any compensation, damages etc. on that account and for its failure to keep up continuous supply to its industry.
10. **A.** For the purpose of recovering charges from the allottee the water consumed by it shall be measured by water meter as herein provided, and the reading of the meters made by SIPCOT or its officers shall be binding upon the allottee.

B. Water meter shall be installed by the allottee in the pipeline connecting the water supply with the allottee and the maintenance of water meter shall be carried out by the allottee. The water meter shall be checked periodically and recalibrated from time to time by the allottee to the satisfaction of SIPCOT.

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Company Secretary


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Manapparai.

C. The water meter reading cycle will be from 27th and will be completed by 30th of every month as detailed below:

1 – 50 units	- 1st cycle
51 – 100 units	- 2nd cycle
101 – 150 units	- 3rd cycle
151 – 200 and above units	- 4th cycle

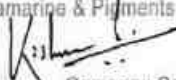
The reading taken by SIPCOT shall be final and binding on the allottee.

D.i. when the water meter goes out of order in any month, on any day, the water charges for the particular unit, will be worked out for the number of days, the water meter goes out of order proportionately on the highest monthly consumption of a particular month in the preceding 12 months when the water was functioning and the unit was working subject to minimum as fixed as per clause No. 11.a.

ii. The allottee shall inform SIPCOT immediately in case the water meter goes out of order and rectify the meter within two days, failing which a new water meter will be installed by SIPCOT and the cost will be included in the subsequent monthly water bill.

11. a. The charges for the quantity of water drawn by the allottee shall be payable at the rate as fixed from time to time by SIPCOT and subject to such minimum charge as may be fixed by SIPCOT.

b. The allottee has to remit at the rate as applicable per 2,00,000 Liters (200 KLD) of water for the allocated quantity towards the recovery of 50 % of the capital cost of the water supply system at the time of execution of water supply agreement and the balance will be recovered on annuity basis along with the recovery of operating expenses every month.

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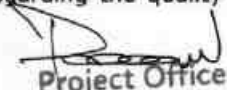
12. The payment of water charges for each month at the rate specified in clause 11 (a) shall be paid through online portal within 15 days of the receipt of the invoice. Representations on errors or omissions, if any, in the invoice can be made only after payment of the amount as per invoice. If the allottee fails to pay any invoice within the stipulated period, water supply will be disconnected on the 22nd day from the date of receipt of invoice.

For any payments made after 15 days from the date of receipt of invoice, interest at 12 % per annum or at such other rate as may be fixed by SIPCOT from time to time will be charged and collected.

13. Any tampering with the water supply system including unauthorized drawal of water or causing damage to SIPCOT installations or tampering with water meters will entail disconnection of water supply and cancellation of this agreement.
14. If the water supply is disconnected by SIPCOT for any reason, representation for reconnection of water supply will be entertained only subject to the following:
- i. The allottee has rectified all the lapses for which the water supply was disconnected.
 - ii. The representation is accompanied by proof of payment of all arrears due as per this agreement and as per the lease deed for the plot including interest upto the date of representation.
 - iii. The representation is accompanied by proof of reconnection charges of Rs. 1000/- plus GST as fixed by SIPCOT from time to time.
15. SIPCOT shall give atleast 24 hours notice for any disruption in supply of water to the allottee except due to the natural calamities or any other situation beyond the control of SIPCOT. When such prior intimation could not be given, SIPCOT will not be answerable to any loss or claim for damages on account of such stoppage of supply.
16. SIPCOT shall be at liberty to connect any other sources of water supply to the pipe line installations to the allottee and on request from the allottee shall also provide all information regarding the quality of water from new source.

For Ultramarine & Pigments Limited


Company Secretary


Project Officer,
SIPCOT Industrial Park,
Manapparai.

17. Any disputes or differences between the parties arising out of or relating to this agreement shall be referred to the Managing Director of SIPCOT whose order shall be final and binding upon the allottee.
18. The allottee will be entitled to the supply of water as per this agreement only on his fully complying with all the terms and conditions of the lease governing the allotment of the plot. On the cancellation of the lease deed governing the plot for any reason, the agreement for water supply will also stand automatically cancelled.
19. If allottees consume excess water over and above the committed quantity for two months continuously, the allottee shall pay additional capital cost on water supply (as applicable) for the excess quantity. Enhanced water charges will be levied till the payment of 50% capital cost for the additional quantity for the water consumed over and above committed quantity of water already agreed.
20. The allottee shall not draw water from their own Borewell / open well / tube well sunk in private lands adjacent to SIPCOT Industrial Park through pipeline unauthorized trespassing into SIPCOT premises. If at any time, such trespass is found by SIPCOT, water supply will be disconnected besides severing the trespassed water line.
 - a. The allottee shall not sink any well/ bore well/ tube well within the plot leased to it without permission from SIPCOT.
21. For any change in the constitution of the company prior written approval of SIPCOT should be obtained.
22. SIPCOT is at liberty to cut-off the water supply for violation of all or any of the conditions of this agreement including the terms and conditions governing the allotment of the plot.

For Ultramarine & Pigments Limited

Company Secretary

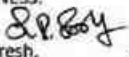

Project Officer,
SIPCOT Industrial Park
Manapparai.

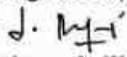
IN WITNESS WHEREOF THE parties to this Agreement have set and subscribed their respective hands on the day, month and the year first above written.


Project Officer,
SIPCOT Industrial Park,
Manapparai.
Authorized Signatory

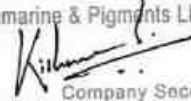
WITNESSES:

WITNESS:

1. 
P.Suresh, S/o.Paneerselvan, No.L160, R.M.Colony, East Govindapuram,
Dindigul-624001, Dindigul District (Aadhar No.7466 5680 3067)

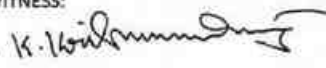
2. 
Rajeswari W/o.Tamilarasan, 2/3001. Chinnamanapatti, F-Keelaiyur Village,
Manapparai Taluk, Trichy District. (Aadhar 7943 4612 5511)

For Ultramarine & Pigments Limited


Company Secretary
Signature of Allottee

WITNESSES:

WITNESS:

1. 
K.Krishnamoorthy, S/o.Vasudevareddy, 12/34, 7th Cross Street, Thendral Nagar West,
Thirumullaivoyal, Vellanur, Tiruvallur District - 600 062 (Aadhar No.3000 0351 9749)

2. 
V.Srivathsan S/o.Venkatachari, 85A1, 3rd Street, Balaji Nagar, Alwarthirunagar,
Tiruvallur District-600087 (Aadhar 9822 3746 5745)

ANNEXURE III

Corporate Environmental Policy



UPL/IMS/01

Integrated Management System (IMS) Policy

Quality is the top priority at Ultramarine & Pigments Limited (UPL). We are committed to continuous improvement in a safe and environmentally responsible manner, ensuring we exceed customer expectations in all our operations.

Compliance & Quality Commitment

UPL ensures 100% compliance with legal and regulatory requirements by:

- Adopting a process-driven approach with risk-based thinking.
- Controlling activities that cause dust and harmful spills.
- Promoting sustainability solutions wherever applicable.
- Communicating policies effectively to employees, stakeholders, and the public.
- Encouraging sustainable practices throughout the supply chain and addressing climate change challenges.
- Providing value addition to stakeholders by manufacturing and supplying quality products thereby ensuring and moving towards continual improvement

Environmental Commitment

UPL pledges to protect the environment by:

- Utilizing renewable energy sources and conserving natural resources.
- Continuously upgrading technology to minimize environmental impact.
- Embedding a culture of environmental responsibility across all levels.
- Reducing and controlling waste through systematic and legally compliant disposal methods.
- Preventing pollution and minimizing greenhouse gas emissions through technological advancements.



**ULTRAMARINE &
PIGMENTS LTD.**

- Promoting sustainable resource management using the reduce, recycle, and reuse approach.
- Striving for a Net Positive Impact on biodiversity and sustaining ecosystems with minimal negative impact.

Health & Safety Commitment

UPL is dedicated to providing a safe and healthy workplace by:

- Addressing work-related injuries and health risks from the project stage onward.
- Training employees to identify hazards and mitigate associated risks and rewarding them based on their safety performance
- Implementing automation wherever possible to minimize human stress.
- Consulting and involving employees in safety committees and process improvements.
- Engaging all stakeholders to share concerns and enhance operational safety.

To achieve these objectives, we implement, maintain, and continuously improve our Integrated Management System in alignment with **ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, Responsible Care, HALAL, Kosher, NABL standards, and other relevant statutory and voluntary requirements.**

G.R. SENTHILKUMAR
WHOLE TIME DIRECTOR

Iss.no.:1|Rev.no.:2|Dt: 01.04.2025

ANNEXURE IV

List of Industries around Project Site

S.NO	Name of the Industry	Plot No	Extent in acres	Plot area (sq. feet)	Alotment Order Date	Lease Start Date	Water Agreed upon	Investment (IN Lakhs)	Employee count	Manufacturing Product	Remarks
1A											
Not in Start											
1	M/s. Maruthi Dairy Products Pvt. Ltd.	PB5, PB7, PB8, PB33, PB34, PB35	4.3	58	22.12.2012	10.03.20	10.03.2021	1341.56	376	Milk Powder & Long life Milk	Its implementation period is upto 01.03.2026
2	M/s. Redwan Foods India Pvt.Ltd	R02, R03, P034, P04, P02, P05	14.26	68	10.03.2014	10.03.24	25.03.2024		50	Fruit Juice, Mineral Water, Softdrinks	25.03.2027
3	M/s. Zubeed Food And Beverage Pvt.Ltd	P05	1.02	68	22.08.2013	11.03.23	11.03.2023	888.84	50	Mango Juice Processing Unit	Its implementation period is upto 30.03.2027
4	M/s. Raghav Foods Holdings Pvt. Ltd.	P06, P07, P08, P09, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20	27.06	68	13.03.2015	09.07.25		51047.18	50	Instant Noodles, Corned Beef, Bread, etc.	Its implementation period is upto 01.03.2028
Under Construction											
5	M/s. Debez Food And Beverage Pvt.Ltd.	P01	1.02	68	25.02.2024	27.01.24	11.03.2023	515.34	50	Mango Juice Processing Unit	Its implementation period is upto 18.03.2025
6	M/s. Dairy Food Items India Pvt.Ltd	P04, P05, P016, P017, P018, P019, P020	8.21	68	30.10.2015	05.01.24	05.01.2024	8000.00	200	Fruit Based Drinks, Aerated Drinks	Its implementation period is upto 04.02.2027
7	M/s. Sri Anandhi Water Works (India)	P08, P05	3.15	68	31.10.2013	12.12.23	12.12.2023	990.35	50	Mango Juice, Mineralized MB, Fruit Juice and Carbonated Soft Drinks	Its implementation period is upto 11.12.2025
Lease Deed to be Executed											
8	M/s. Sri Anandhi Water Works (India)	P08	3	68	12.11.2023					Fruit Beverages	
Phase I (Food Park)											
Sub Total - A											
General Engineering											
Not in Start											
9	M/s. Eco Leaf Industries Pvt.Ltd.	P01	1.89	77	28.01.2024	25.03.24	25.03.2024	200.00	40	Pineapple, Cabbage, Car Cabbies	Its implementation period is upto 01.03.2027
10	M/s. Resol Agritech India Pvt.Ltd.	P01	1.26	77	04.02.2024	24.01.24	24.03.2024	800.00	40	General Food Processing	Its implementation period is upto 25.03.2027
11	M/s. Ultramarine & Agritech Ltd.	P03, P04, P05, P06, P07, P08, P09, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20, P21, P22, P23, P24, P25, P26, P27, P28, P29, P30, P31, P32, P33, P34, P35, P36, P37, P38, P39, P40, P41, P42, P43, P44, P45, P46, P47, P48, P49, P50, P51, P52, P53, P54, P55, P56, P57, P58, P59, P60, P61, P62, P63, P64, P65, P66, P67, P68, P69, P70, P71, P72, P73, P74, P75, P76, P77, P78, P79, P80, P81, P82, P83, P84, P85, P86, P87, P88, P89, P90, P91, P92, P93, P94, P95, P96, P97, P98, P99, P100	22.72	77	20.09.2024	12.12.24	12.02.2024	11029.14	50	Ultramarine Blue	Its implementation period is upto 11.12.2027
12	M/s. RCI Plastech Pvt.Ltd.	P01	1.08	77	18.08.2015	18.03.25	18.03.2025		50	Plastic Bags	Its implementation period is upto 18.03.2028
13	M/s. Sreeva Steel Pvt.Ltd.	P01, P02, P03	3.07	77	05.06.2020	11.01.25	11.01.2025			Independent Structural & Structural Steel	Its implementation period is upto 10.09.2028
14	M/s. Sreeva Metals	P01	1.24	77	01.07.2020	10.09.25	10.09.2025	325.48	50	Copper Based Coated Pipes	Its implementation period is upto 15.09.2028
15	M/s. Sreeva Plastic Technologies	P01	4.44	77	05.06.2020	24.11.25	24.11.2025	1991.49	50	Industrial: Agribusiness, Submarine: Plastic, Glass Fibers, Corrosion, Storage Tanks	Its implementation period is upto 11.12.2029
Under Construction											
16	M/s. Mahalaxmi Industries	P01	0.75	77	28.02.2024	13.01.24	10.03.2024	200.00	30	Food Oil	Its implementation period is upto 13.01.2027
17	M/s. Sreeva Steel Buildings India Pvt.Ltd.	P01, P02, P03	15.88	77	02.02.2020	20.02.25	20.02.2025			Structural Steel	Its implementation period is upto 19.02.2028

17	M/s. Scientific Agriculture Laboratory Pvt., Ltd.	G10	4.63	77	10.05.2013	03.08.23	03.08.2023	778.91	300	Sabao, mma, PMS A, Sabs, Sabs B, Sabs C, Sabs D, Sabs E, Sabs F, Sabs G, Sabs H, Sabs I, Sabs J, Sabs K, Sabs L, Sabs M, Sabs N, Sabs O, Sabs P, Sabs Q, Sabs R, Sabs S, Sabs T, Sabs U, Sabs V, Sabs W, Sabs X, Sabs Y, Sabs Z, Sabs AA, Sabs AB, Sabs AC, Sabs AD, Sabs AE, Sabs AF, Sabs AG, Sabs AH, Sabs AI, Sabs AJ, Sabs AK, Sabs AL, Sabs AM, Sabs AN, Sabs AO, Sabs AP, Sabs AQ, Sabs AR, Sabs AS, Sabs AT, Sabs AU, Sabs AV, Sabs AW, Sabs AX, Sabs AY, Sabs AZ, Sabs BA, Sabs BB, Sabs BC, Sabs BD, Sabs BE, Sabs BF, Sabs BG, Sabs BH, Sabs BI, Sabs BJ, Sabs BK, Sabs BL, Sabs BM, Sabs BN, Sabs BO, Sabs BP, Sabs BQ, Sabs BR, Sabs BS, Sabs BT, Sabs BU, Sabs BV, Sabs BW, Sabs BX, Sabs BY, Sabs BZ, Sabs CA, Sabs CB, Sabs CC, Sabs CD, Sabs CE, Sabs CF, Sabs CG, Sabs CH, Sabs CI, Sabs CJ, Sabs CK, Sabs CL, Sabs CM, Sabs CN, Sabs CO, Sabs CP, Sabs CQ, Sabs CR, Sabs CS, Sabs CT, Sabs CU, Sabs CV, Sabs CW, Sabs CX, Sabs CY, Sabs CZ, Sabs DA, Sabs DB, 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Sabs LR, Sabs LS, Sabs LT, Sabs LU, Sabs LV, Sabs LW, Sabs LX, Sabs LY, Sabs LZ, Sabs MA, Sabs MB, Sabs MC, Sabs MD, Sabs ME, Sabs MF, Sabs MG, Sabs MH, Sabs MI, Sabs MJ, Sabs MK, Sabs ML, Sabs MM, Sabs MN, Sabs MO, Sabs MP, Sabs MQ, Sabs MR, Sabs MS, Sabs MT, Sabs MU, Sabs MV, Sabs MW, Sabs MX, Sabs MY, Sabs MZ, Sabs NA, Sabs NB, Sabs NC, Sabs ND, Sabs NE, Sabs NF, Sabs NG, Sabs NH, Sabs NI, Sabs NJ, Sabs NK, Sabs NL, Sabs NM, Sabs NN, Sabs NO, Sabs NP, Sabs NQ, Sabs NR, Sabs NS, Sabs NT, Sabs NU, Sabs NV, Sabs NW, Sabs NX, Sabs NY, Sabs NZ, Sabs OA, Sabs OB, Sabs OC, Sabs OD, Sabs OE, Sabs OF, Sabs OG, Sabs OH, Sabs OI, Sabs OJ, Sabs OK, Sabs OL, Sabs OM, Sabs ON, Sabs OO, Sabs OP, Sabs OQ, Sabs OR, Sabs OS, Sabs OT, Sabs OU, Sabs OV, Sabs OW, Sabs OX, Sabs OY, Sabs OZ, Sabs PA, Sabs PB, Sabs PC, Sabs PD, Sabs PE, Sabs PF, Sabs PG, Sabs PH, Sabs PI, Sabs PJ, Sabs PK, Sabs PL, Sabs PM, Sabs PN, Sabs PO, Sabs PP, Sabs PQ, Sabs PR, Sabs PS, Sabs PT, Sabs PU, Sabs PV, Sabs PW, Sabs PX, 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Sabs UF, Sabs UG, Sabs UH, Sabs UI, Sabs UJ, Sabs UK, Sabs UL, Sabs UM, Sabs UN, Sabs UO, Sabs UP, Sabs UQ, Sabs UR, Sabs US, Sabs UT, Sabs UY, Sabs UZ, Sabs VA, Sabs VB, Sabs VC, Sabs VD, Sabs VE, Sabs VF, Sabs VG, Sabs VH, Sabs VI, Sabs VJ, Sabs VK, Sabs VL, Sabs VM, Sabs VN, Sabs VO, Sabs VP, Sabs VQ, Sabs VR, Sabs VS, Sabs VT, Sabs VU, Sabs VV, Sabs VW, Sabs VX, Sabs VY, Sabs VZ, Sabs WA, Sabs WB, Sabs WC, Sabs WD, Sabs WE, Sabs WF, Sabs WG, Sabs WH, Sabs WI, Sabs WJ, Sabs WK, Sabs WL, Sabs WM, Sabs WN, Sabs WO, Sabs WP, Sabs WQ, Sabs WR, Sabs WS, Sabs WT, Sabs WU, Sabs WV, Sabs WW, Sabs WX, Sabs WY, Sabs WZ, Sabs XA, Sabs XB, Sabs XC, Sabs XD, Sabs XE, Sabs XF, Sabs XG, Sabs XH, Sabs XI, Sabs XJ, Sabs XK, Sabs XL, Sabs XM, Sabs XN, Sabs XO, Sabs XP, Sabs XQ, Sabs XR, Sabs XS, Sabs XT, Sabs XU, Sabs XV, Sabs XW, Sabs XX, Sabs XY, Sabs XZ, Sabs YA, Sabs YB, Sabs YC, Sabs YD, Sabs YE, Sabs YF, Sabs YG, Sabs YH, Sabs YI, Sabs YJ, Sabs YK, Sabs YL, Sabs YM, Sabs YN, Sabs YO, Sabs YP, Sabs YQ, Sabs YR, Sabs YS, Sabs YT, Sabs YU, Sabs YV, Sabs YW, Sabs YX, Sabs YY, Sabs YZ, Sabs ZA, Sabs ZB, Sabs ZC, Sabs ZD, Sabs ZE, Sabs ZF, Sabs ZG, Sabs ZH, Sabs ZI, Sabs ZJ, Sabs ZK, Sabs ZL, Sabs ZM, Sabs ZN, Sabs ZO, Sabs ZP, Sabs ZQ, Sabs ZR, Sabs ZS, Sabs ZT, Sabs ZU, Sabs ZV, Sabs ZW, Sabs ZX, Sabs ZY, Sabs ZZ	Its implementation period is upto 01.08.2016
1B											
18	M/s. Krishna Industries Pvt., Ltd.	G10	5.96	57	27.12.2012	10.03.23	10.03.2023	14638.72	105	Metal and Alloy powder ingot	Its implementation period is upto 09.02.2016
19	M/s. New Tech Engineering	G1	1.88	57	27.12.2012	31.03.23	11.03.2023	245.73	50	Valve Filling	Its implementation period is upto 30.03.2016
20	M/s. RAC Industries And Logistics Park Pvt., Ltd.	2 to 14	30.3	77	26.04.2013	06.10.22	10.03.2023	26333.13	150	Glass	Its implementation period is upto 07.05.2016
Functioning											
21	M/s. Sreeva Capital Information Ltd.	C16C1	0.165	154	27.08.2024	31.10.25				Active Travel	
22	M/s. Sreeva Steel Industry Pvt.Ltd.	G6	3.87	57	10.03.2023	20.03.23	20.03.2023	408.38	82	Coasting Sheet, Adjustable pipe, Adjustable Pipe, Column Base, SS Sheet and Scaffolding	
Lease Deed to be Executed											
23	M/s. Sreeva Building Systems & Structures India Pvt.Ltd.	06,07,03(A&B), A,06,07,04,08,12b,12c,130,131,132,133,134,135, Road	33.30	77	04.08.2023					Pre-Engineered Building,Steel Structures	
24	M/s. Sreeva Saravathi Textiles Pvt.Ltd.	179,140,141,142	15.87	77	05.08.2025			1243.99	50	Bedding, Qu and Prepared silk Spinning	
25	M/s.Viswes Alloy Pvt. Ltd.	G17	9.41	77	14.08.2024			5124.52	50	Valve Filling Parts and Engineering Filling Parts	
26	M/s. Puri Plastics and Composites Pvt.Ltd	77,28	1.9	77	17.08.2025			513.38	50	ABS Injection Moulded Parts	
Phase I (General Engineering)											
Phase II (General Engineering)											
27	Sreeva Industries	164-195	111.61		03.11.2023						
28	Sreeva	G3	5.96			03.07.25					
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ANNEXURE V

Comparative Study of Energy Efficiency in the Proposed Plant

1. Introduction

Energy efficiency is a critical parameter for sustainable industrial operations. The proposed plant for manufacturing Inorganic and Complex Inorganic Colored Pigments at SIPCOT Industrial Park, Manapparai, has been designed to meet best practices in energy utilization, ensuring minimal energy wastage and reduced greenhouse gas emissions. A comparative analysis has been carried out vis-à-vis global benchmarks in pigment manufacturing.

2. Energy Consumption in Proposed Plant

Equipment / Process	Installed Capacity	Fuel / Power Source	Energy Consumption	Remarks
Kiln Process	5500 TPA Inorganic Pigments	LPG/LNG/PNG	3.5–4.0 GJ/tonne of pigment	Use of wet scrubber reduces process inefficiency
Boiler	6 TPH	LPG/LNG/PNG	2.8–3.2 GJ/tonne of steam	Optimized combustion and insulation minimize losses
Thermic Fluid Heater (TFH)	6 lakh kcal/hr	LPG/LNG/PNG	3.0 GJ/tonne of pigment	Efficient heat transfer maintained through proper monitoring
DG Set (Standby)	1100 kVA	Diesel	Minimal, used only for emergencies	Operated sparingly to reduce emissions
Electrical Power	1000 kWh/day	TNEB Grid	~0.18 kWh/kg pigment	Energy-efficient motors and VFDs used

Total energy consumption per tonne of pigment: ~6–7 GJ/tonne, including thermal and electrical energy.

3. Global Standards in Pigment Manufacturing

- Average global energy consumption for inorganic pigments: 5–9 GJ/tonne (thermal + electrical).
- Use of natural gas or LPG/LNG/PNG is a common practice for energy-intensive processes to reduce carbon intensity.
- Adoption of waste heat recovery, high-efficiency burners, and advanced process control is standard for leading pigment manufacturers in Europe, Japan, and the USA.

4. Comparative Analysis

Parameter	Proposed Unit	Global Best Practices	Remarks
Thermal energy consumption	5.3–6 GJ/tonne	5–7 GJ/tonne	Within global benchmark range
Electrical energy consumption	0.18 kWh/kg pigment	0.15–0.20 kWh/kg pigment	Comparable to global standard
Fuel type	LPG/LNG/PNG	LPG / Natural Gas	Clean fuel; lower carbon intensity
Emission control	Wet scrubbers, bag filters	Wet/dry scrubbers, bag filters	Matching global pollution control norms
Process efficiency	Modern rotary kiln & TFH	Advanced rotary kiln with process optimization	Near-global efficiency with scope for further energy recovery

Observation: The proposed plant’s energy efficiency is on par with global benchmarks, with thermal energy slightly optimized via use of LPG/LNG/PNG and emission control measures. Electrical consumption is within the global range, aided by VFDs and energy-efficient motors.

5. Energy Conservation Measures

1. **Use of LPG/LNG/PNG** over higher carbon fuels like coal or furnace oil to reduce energy wastage.
2. **Insulation of kilns, boilers, and pipelines** to minimize heat loss.
3. **Implementation of VFDs on pumps and motors** to reduce electrical energy consumption.
4. **Periodic energy audits** to identify energy-saving opportunities.
5. **Greenbelt development** around plant to reduce indirect cooling load.

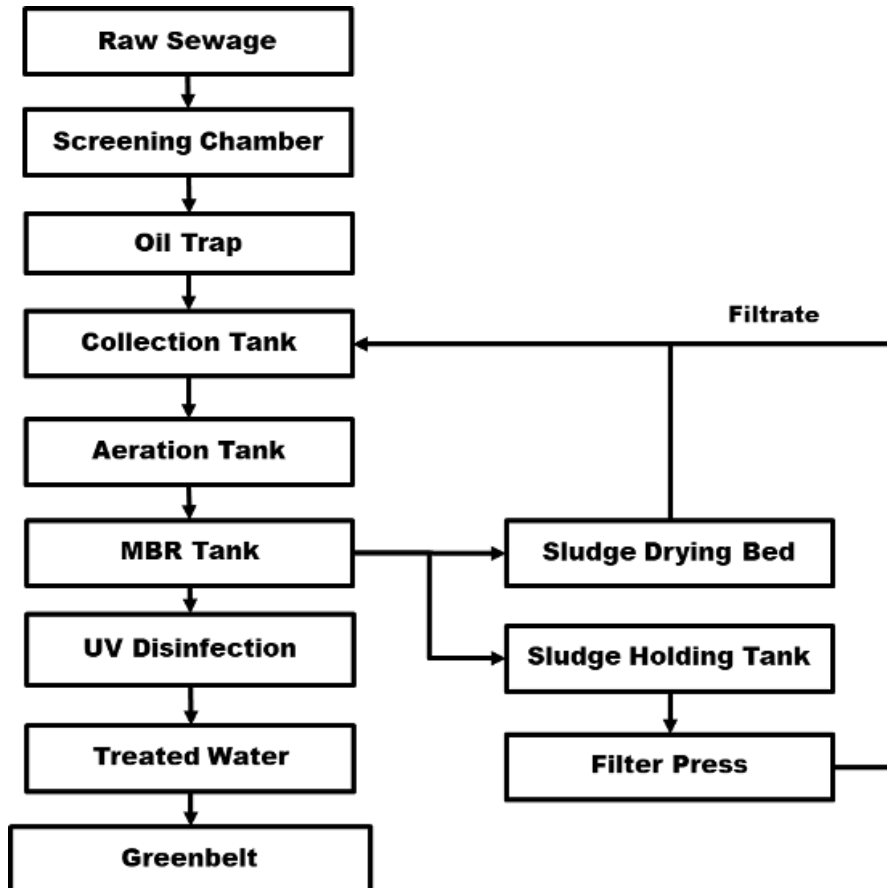
6. Conclusion

The proposed pigment manufacturing plant demonstrates energy efficiency that meets or exceeds global standards. By combining modern equipment, clean fuel, and process optimization, the plant ensures reduced energy consumption per unit of product while maintaining compliance with environmental and emission norms. Continuous monitoring and periodic audits will further enhance energy performance.

ANNEXURE VI

Complete Scheme of STP & ETP

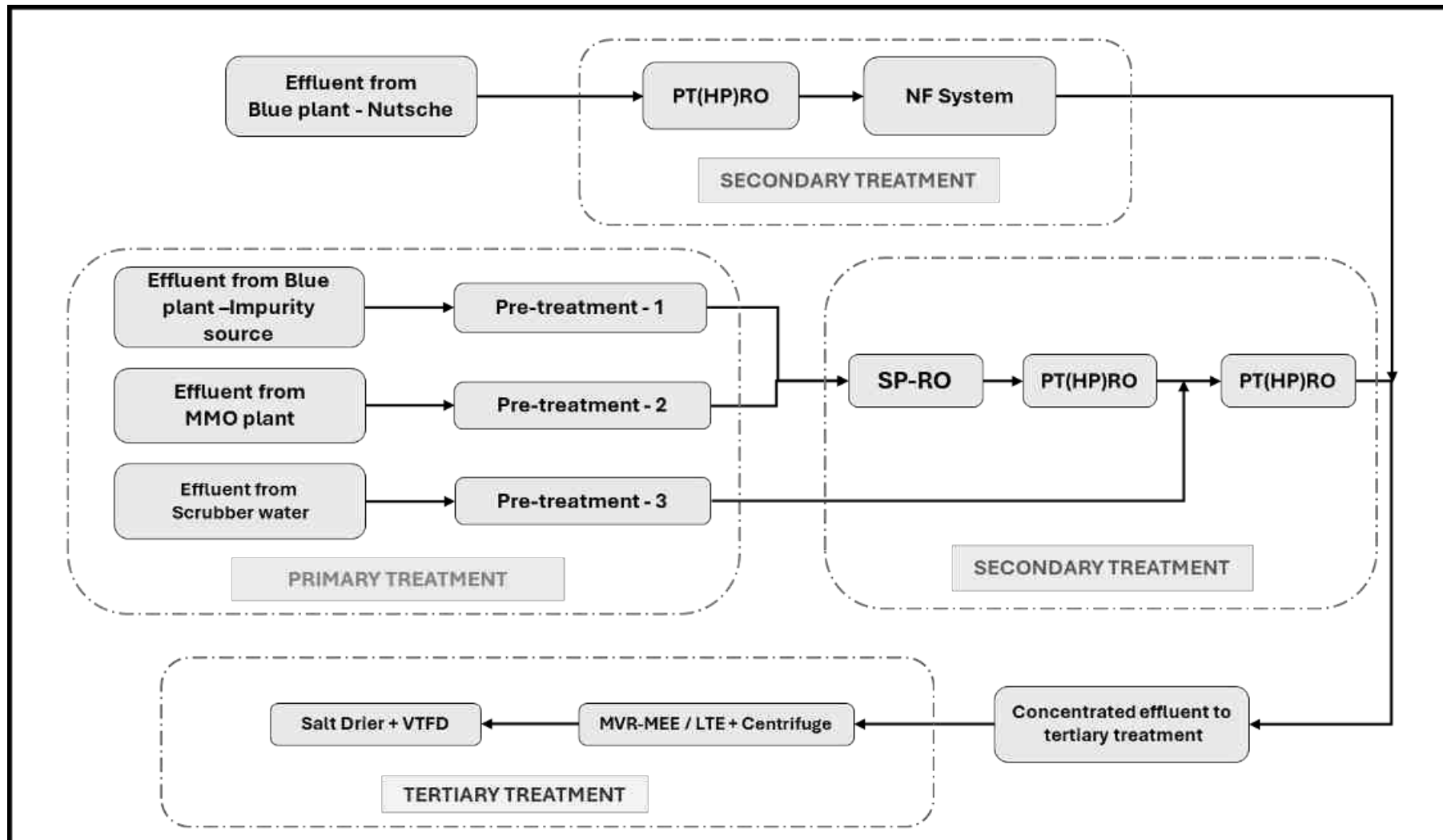
SEWAGE TREATMENT PLANT



CIVIL DESIGN FOR SEWAGE TREATMENT PLANT

Description	Civil (Size in m)					Qty.	MOC
	L	B	H	F.B	Cap(m3)		
Screen Chamber	1.00	1.50	2.00	0.30	3.00	1	RCC
Oil Trap	1.00	1.00	1.50	0.30	1.50	1	RCC
Collection Tank	4.90	1.50	3.60	0.30	26.00	1	RCC
Aeration Tank	3.00	2.10	3.00	0.30	18.90	1	RCC
MBR Tank	2.00	2.00	3.00	0.30	12.00	1	RCC
Treated Water Tank	2.10	2.40	3.00	0.30	15.12	1	RCC
Sludge Holding Tank	1.00	1.00	2.00	--	2.00	1	RCC
Sludge Drying Bed	1.50	1.50	1.20	--	2.70	2	RCC

EFFLUENT TREATMENT PLANT



ETP EQUIPMENT LIST AND DIMENSIONS

PTP 1

S. No.	Description	L (m)	W (m)	SWD / H (m)	Dia (m)	FB (m)	Capacity (m ³)	Qty	MOC
1	Collection Tank			6.0	5.65		150.0	2	SS 304
2	Equalization / Reaction Tank	1.75	1.75	1.65		0.5	5.0	1	Inside MS-FRP & Outside MS-EP
3	Lime Dosing Tank			1.275	1.35		1.5	1	HDPE
4	Dolomite Dosing Tank			1.275	1.35		1.5	1	HDPE
5	Soda Ash Dosing Tank			1.275	1.35		1.5	1	HDPE
6	HRSCC			3.50	4.60	0.6	58	1	RCC
7	Poly Dosing Tank			1.24	1.10		1.0	1	HDPE
8	Neutralization Tank			3.58	2.55		15.0	1	HDPE
9	HCl Dosing Tank			1.24	1.10		1.0	1	HDPE
10	Pressure Sand Filter			1.75	1.5		3.0	1	Inside MS-FRP & Outside MS-EP
11	Activated Carbon Filter			1.75	1.5		3.0	1	Inside MS-FRP & Outside MS-EP
12	Sludge Sump	2.0	2.0	1.90		0.5	7.6	1	Inside MS-FRP & Outside MS-EP
13	Filter Press	3.95	1.3	1.19		1.0	1.5	1	MS & PP
14	Poly Dosing Tank			1.24	1.10		1.0	1	HDPE

PTP 2

S. No	Description	L (m)	W (m)	SWD / H (m)	Dia (m)	FB (m)	Capacity (m ³)	Qty	MOC
15	Collection Tank			6.0	5.0		100	4	SS 304
16	Homogenization Tank			1.90	2.60	0.350	10.0	1	SS 304
17	Reaction Tank	1.45	1.45	1.55		0.400	3.2	1	Inside MS-FRP & Outside MS-EP
18	SMBS Dosing Tank			1.60	1.35		2.0	1	HDPE
19	H2SO4 Dosing Tank	1.35	1.35	1.20		0.500	2.0	1	Inside MS-FRP & Outside MS-EP
20	Reaction Tank	1.45	1.45	1.45		0.500	3.0	1	Inside MS-FRP & Outside MS-EP
21	Lime Dosing Tank			1.24	1.10		1.0	1	HDPE
22	HRSCC			3.50	3.60	0.500	35	1	RCC
23	Poly Dosing Tank			1.24	1.10		1.0	1	HDPE

PTP 3

S. No	Description	L (m)	W (m)	SWD / H (m)	Dia (m)	FB (m)	Capacity (m ³)	Qty	MOC
24	Collection Tank			4.30	4.00	0.400	50	1	SS 304
25	Reaction Tank	1.10	1.10	0.90		0.400	1.0	1	Inside MS-FRP & Outside MS-EP
26	Alum Dosing Tank			0.88	0.75		0.30	1	HDPE
27	Poly Dosing Tank			0.88	0.75		0.30	1	HDPE
28	Tube Settler	1.35	2.0	2.0		0.300	5.40	1	HDPE
29	Treated Water Tank			3.7	4.90	0.300	75	1	SS 304
30	Filter Press Filtrate Collection Tank			1.91	2.0		5.0	1	HDPE
31	Cooling Tower blowdown	3.0	1.7	2.0		0.500	10.0	1	RCC with Acid proof tiles
32	Boiler Blowdown	3.0	1.7	2.0		0.500	10.0	1	RCC with Acid proof tiles
33	Scrubber Blowdown	3.0	2.0	2.0		0.700	12.0	1	RCC with Acid proof tiles
34	Smoke Channel Pit	3.0	1.5	1.0		0.400	4.5	1	RCC with Acid proof tiles
35	MCC Panel Room	7.0	5.0	3.15			35 Sqm	1	RCC
36	Filter press Room	7.0	5.0	3.15			35 Sqm	1	Brick Wall with GI sheet

PROCESS 1 – HPRO-PTNF

S. No.	Description	L (m)	W (m)	Dia (m)	H (m)	Qty (Nos)	MOC
1	Component Frame	1.2	1.0			1	SS 304
2	Sand Filter			1.1	1.75	1	FRP
3	Cartridge Filter	0.4	0.4			1	FRP
4	High Pressure Pump	1.4	0.9			2	SS 316
5	PT Module Frame	1.745	0.505			1	SS 304
6	NF Module Frame	3.215	0.505			2	SS 304
7	Booster Pump	0.940	0.322			2	SS 316
8	Acid Dosing Tank			0.580	0.900	1	LDPE
9	Acid Dosing pump	0.280	0.200			1	PP
10	Antiscalant Dosing Tank			0.515	0.625	1	LDPE
11	Antiscalant Dosing Pump	0.280	0.200			1	PP
12	GRP Grating Frame	0.800	0.400			1	SS 304
13	Intermediate Tank			1.350	1.600	1	HDPE
14	Intermediate Pump	0.250	0.200			1	SS 316
15	NF Intermediate Tank			1.350	1.600	1	HDPE
16	NF Intermediate Pump	0.250	0.200			1	SS 316
17	Permeate Tank			0.200	0.240	1	HDPE
18	Permeate Pump	0.210	0.150			1	SS 316
19	Degasser			0.300			FRP
	Rinsing Pump	0.250	0.200				SS 316
20	Feed Pump	0.250	0.200			1	SS 316
21	MCC Panel	1.200	0.500			1	CRCA
22	PLC panel	1.200	0.500			1	CRCA
23	Drain Pit	3.000	1.400	2.500		1	RCC with acid proof tiles
24	Drain Pit Pump	0.250	0.200			1	SS 316
25	Collection Tank			5.600	6.000	3	SS 304
26	NF Reject Tank			5.600	6.000	1	SS 304
27	NF Permeate Tank			4.200	3.600	1	SS 304
28	RO Plant	23.00	11.00	5.100		1	Brick Wall with GI sheet

PROCESS 1 – SPRO

S. No	Description	L (m)	W (m)	Dia (m)	H (m)	Qty (Nos)	Moc
1	Component Frame	0.800	0.800			1	SS 304
2	Cartridge Filter	0.400	0.400			1	FRP
3	High Pressure Pump	0.210	0.150			1	SS 316
4	SPRO Module Frame	4.000	0.400			1	SS 304
5	Antiscalant Dosing Tank			0.515	0.625	1	LDPE
6	Antiscalant Dosing Pump	0.280	0.200			1	PP

PROCESS 2 – SPRO

S. No	Description	L (m)	W (m)	Dia (m)	H (m)	Qty (Nos)	MOC
1	Component Frame	1.400	1.000			1	SS 304
2	Cartridge Filter	0.500	0.500			1	FRP
3	High Pressure Pump	0.250	0.200			2	SS 316
4	SPRO Module Frame	3.500	0.580			1	SS 304
5	Acid Dosing Tank			0.515	0.625	1	LDPE
6	Acid Dosing Pump	0.280	0.200			1	PP
7	Antiscalant Dosing Tank			0.515	0.625	1	LDPE
8	Antiscalant Dosing Pump	0.280	0.200			1	PP
9	SMBS Dosing Tank			0.515	0.625	1	LDPE
10	SMBS Dosing Pump	0.280	0.200			1	PP
11	Permeate Tank			2.550	2.950	1	HDPE
12	Permeate Pump	0.250	0.200			1	SS 316
13	Degasser			0.45	3.100	1	FRP
14	Reject Tank			1.400	3.300	1	HDPE
15	Reject Pump	0.210	0.150			1	SS 316
16	MCC Panel	1.200	0.500			1	CRCA
17	PLC Panel	1.200	0.500			1	CRCA

PROCESS 2 – PTRO

S. No.	Description	L (m)	W (m)	Dia (m)	H (m)	Qty (Nos)	MOC
1	Component Frame	1.200	0.800			1	SS 304
2	Sand Filter			0.340	1.750	3	FRP
3	High Pressure Pump	1.400	0.900			1	SS 316
4	PT Module Frame	1.255	0.505				SS 304
5	Booster Pump	0.940	0.322			1	SS 316
6	Acid Dosing Tank			0.515	0.625	1	HDPE
7	Acid Dosing Pump	0.280	0.200			1	PP
8	Antiscalant Dosing Tank			0.515	0.625	1	HDPE
9	Antiscalant Dosing Pump	0.280	0.200			1	PP
10	Degasser			0.300	3.100		FRP
11	Permeate Tank	1.470	0.790		0.400	1	HDPE
12	Permeate Pump	0.210	0.150			1	SS 316
13	Filter Pump	0.210	0.150			1	SS 316
14	Control Panel	1.000	0.300			1	CRCA
15	Base Skid	3.000	1.900			1	SS 304
16	Feed Pump	0.210	0.150			1	SS 316
17	Collection Tank			5.600	6.000	1	SS 304

PROCESS 2 – HPPTRO

S. No	Description	L (m)	W (m)	Dia (m)	H (m)	Qty (Nos)	MOC
1	Component Frame	1.200	0.800			1	SS 304
2	Sand Filter			0.340	1.75	2	FRP
3	High Pressure Pump	1.400	0.900			1	SS 316
4	PT Module Frame	2.200	0.505			1	SS 304
5	Acid Dosing Tank			0.515	0.625	1	LDPE
6	Acid Dosing Pump	0.280	0.200			1	PP
7	Antiscalant Dosing Tank			0.515	0.625	1	HDPE
8	Antiscalant Dosing Pump	0.280	0.200			1	PP
9	Grating Frame	0.800	0.400			2	FRP
10	Degasser			0.300	3.100	1	FRP
11	Permeate Tank	1.470	0.790		0.400	1	HDPE
12	Permeate Pump	0.210	0.150			1	SS 316
13	Filter Pump	0.210	0.150			1	SS 316
14	Control Panel	1.000	0.300			1	CRCA
15	Base Skid	3.000	1.900			1	SS 304
16	Feed Pump	0.210	0.150			1	SS 316
17	Collection Tank			5.600	6.00	1	SS 304

ANNEXURE VII
Site Photographs



ANNEXURE VIII
MOU for Hazardous Wastes



A Latha Group Company
**GREEN GENE ENVIRO PROTECTION AND
INFRASTRUCTURE LIMITED**
CIN - U73300MH2005PLC267100

Dated : 17.12.2025

From,

GREEN GENE ENVIRO PROTECTION AND INFRASTRUCTURE LIMITED,
Plot No. S-60, Phase-III,
Sipcot Industrial Estate,
Ranipet, Vellore,
Tamil Nadu, 632405

To,

ULTRAMARINE & PIGMENTS LTD,
Kannudaiyanpatti Village,
SIPCOT Industrial Park,
Manapparai Taluk,
Tiruchirappalli District, Tamil Nadu.

Dear Sir,

Subject : Memorandum of Understanding (MOU) – Establishment of New Site

As per the mail Received on the dated 03.12.2025 the MOU for New Site is attached with the process flow chart and also refer the waste wise details in which MOU is provided

1. Scum from Pigment Washing
2. Wastes or Residues Containing Oil
3. Used or Spent Oil
4. ATFD salt

Yours Truly,

For Green Gene Enviro protection and Infrastructure Limited Unit-Ranipet.



Unit Location

Plot No. S-60, Phase-III,
Sipcot Industrial Estate, Ranipet, Vellore,
Vellore, Tamil Nadu, 632405
Phone : +91 80399 73897
Email : ranipet@lathagroups.com

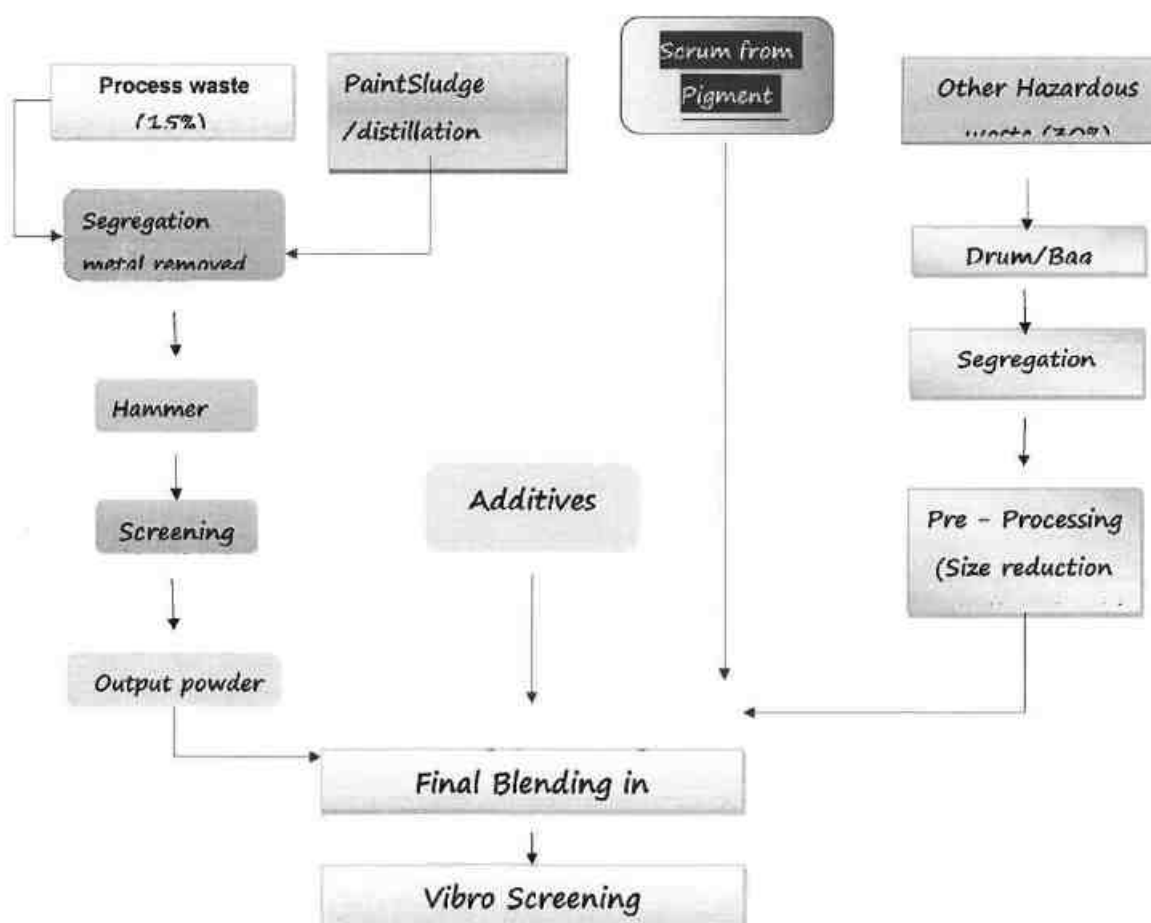
Corporate Office

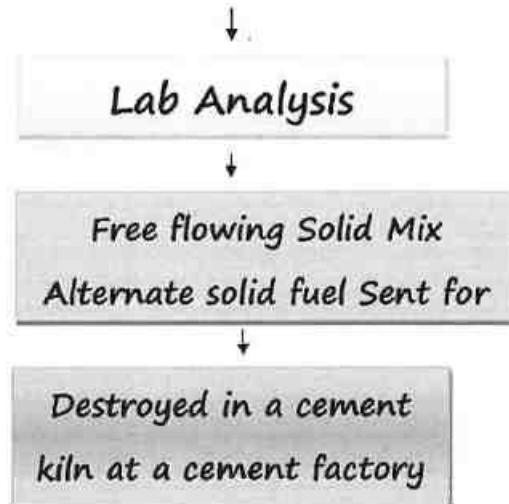
COE Building, Gujarat Eco Textile Park,
Block No. 18/1B, Village Binsethwar,
Taluka Palansa, Surat - 394315
Phone : +91 70690 84907
Website : www.lathagroups.com

Registered Office

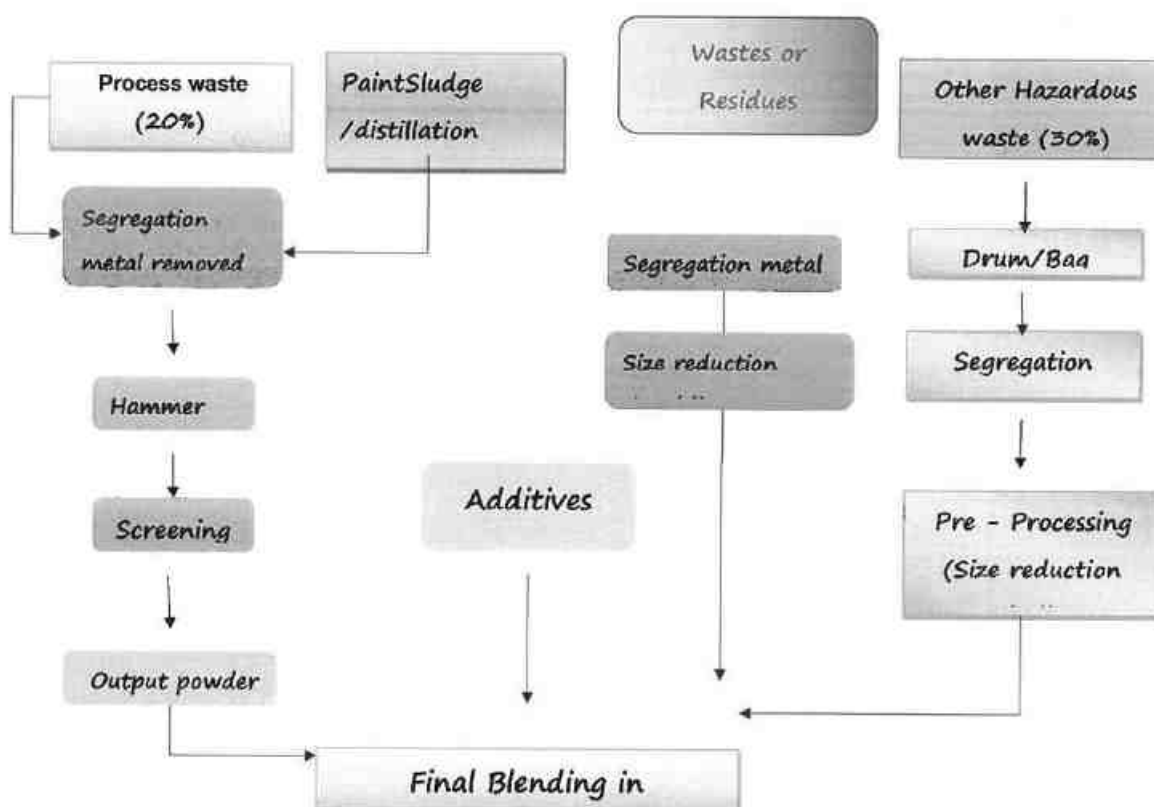
Unit 5017, 16th Floor, Latha Codename No. 1,
One Latha Plaza, Ranipet Bapat Marg,
Upper Worli, Lower Parel, Deltale Road, Mumbai,
Mumbai-400013, Maharashtra

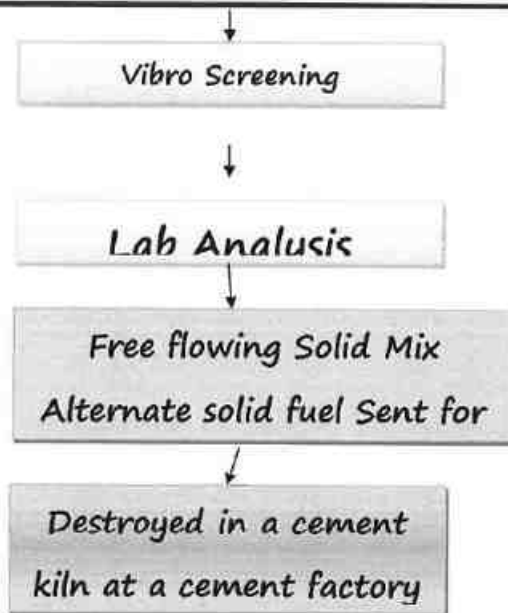
*Process Flow chart -Waste name Scrum from
 Pigment Washing from M/s. Ultramarine &
 Pigments Limited, at Trichy, Tamil Nadu.*





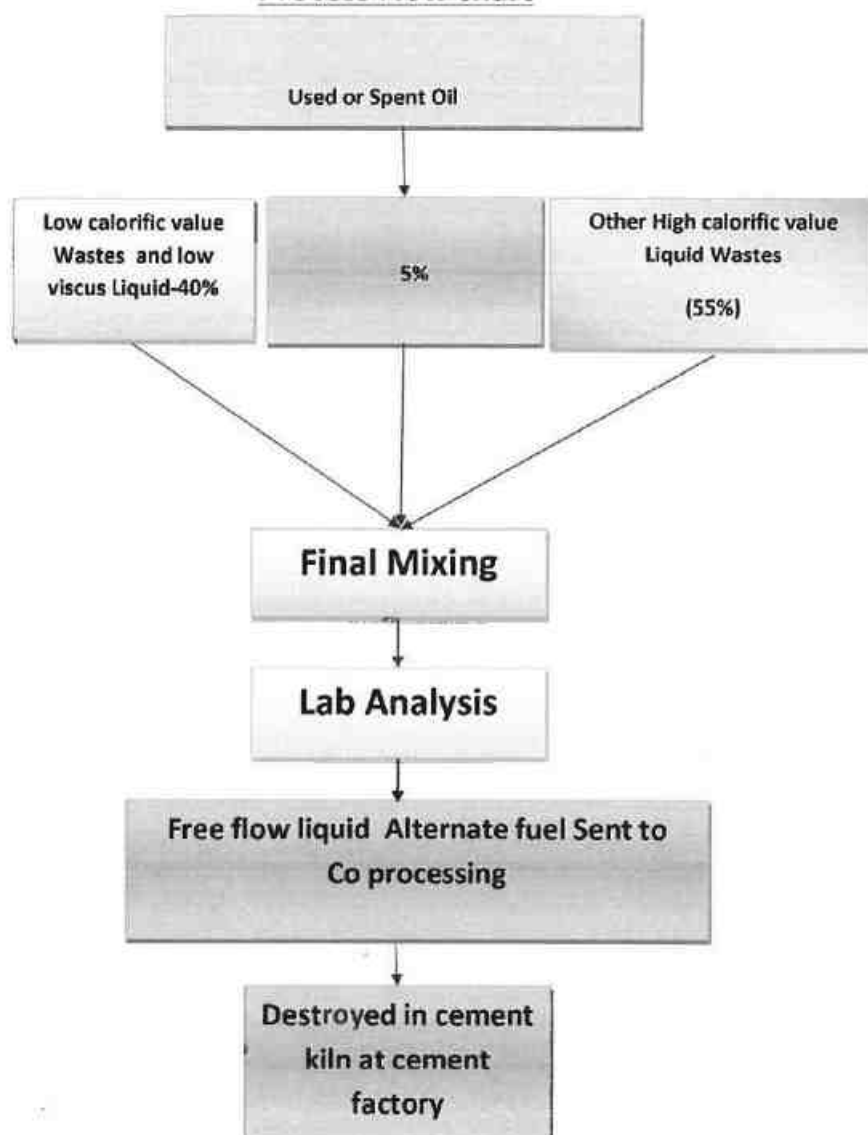
Process Flow chart -Waste name Wastes or
 Residues Containing Oil from M/s.
Ultramarine & Pigments Limited, at Trichy,
Tamil Nadu.



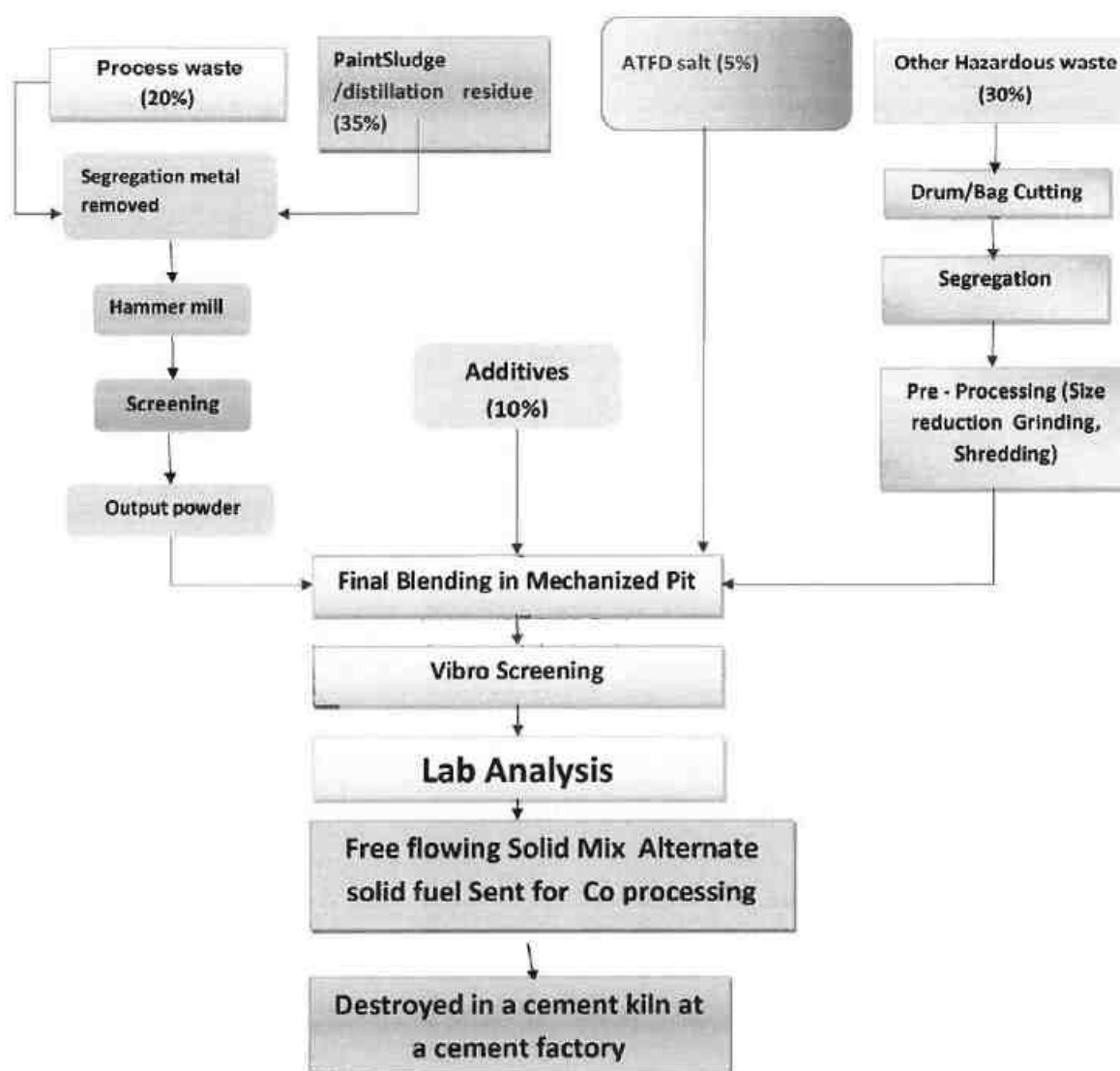


**Waste Name Used or Spent Oil- M/s.
Ultramarine & Pigments Limited, at Trichy,
Tamil Nadu.**

Process Flow chart



Process Flow chart- ATFD salt from M/s. Ultramarine & Pigments Limited, at Trichy, Tamil Nadu.



ANNEXURE IX

Material Safety Data Sheet (MSDS) for Raw Materials

ThermoFisher
SCIENTIFIC

SAFETY DATA SHEET

Creation Date 30-Oct-2009

Revision Date 14-Apr-2022

Revision Number 7

1. Identification

Product Name Ammonium chloride

Cat No. : AC123340000; AC123340010; AC123340050; AC123340250;
AC123340251

CAS No 12125-02-9

Synonyms Ammonium Chloratum; Ammonium Chloridum; Ammonium Muriate

Recommended Use Laboratory chemicals.

Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information US call: 001-800-ACROS-01 / Europe call: +32 14 57 52 11
Emergency Number US:001-201-796-7100 / Europe: +32 14 57 52 99
CHEMTREC Tel. No.US:001-800-424-9300 / Europe:001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Serious Eye Damage/Eye Irritation	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed
Causes serious eye irritation

SAFETY DATA SHEET

Creation Date: 22-Dec-2009

Revision Date: 09-Feb-2024

Revision Number: 7

1. Identification

Product Name Antimony(III) oxide
Cat No. : A860-100; A860-500
CAS No 1309-64-4
Synonyms Antimony trioxide
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Carcinogenicity

Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Suspected of causing cancer

SAFETY DATA SHEET

Creation Date: 17-Nov-2009

Revision Date: 24-Dec-2021

Revision Number: 4

1. Identification

Product Name Bismuth(III) oxide
Cat No. : B339-500
CAS No 1304-76-3
Synonyms Bismuth trioxide
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

None required

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients



Material Safety Data Sheet
Calcium carbonate, ACS

Section 1 - Chemical Product and Company Identification

MSDS Name:

Calcium carbonate, ACS

Catalog Numbers:

LC12690

Synonyms:

Precipitated chalk, aragonite, agricultural limestone, calcite, dolomite, franklin.

Company Identification:

LabChem, Inc.
200 William Pitt Way
Pittsburgh, PA 15238

Company Phone Number:

(412) 826-5230

Emergency Phone Number:

(800) 424-9300

CHEMTREC Phone Number:

(800) 424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name:	Percent
471-34-1	Calcium carbonate	100%

Section 3 - Hazards Identification

Emergency Overview

Appearance: white solid

Warning! Causes eye, skin, and respiratory tract irritation. May cause central nervous system effects. May cause kidney damage.

Target Organs: Kidneys, central nervous system.

Potential Health Effects

Eye:

May cause eye irritation.

Skin:

Causes skin irritation

Ingestion:

Ingestion of large amounts may cause gastrointestinal irritation. Expected to be a low ingestion hazard.

Inhalation:

Low hazard for industrial use. Excessive inhalation may cause minor respiratory irritation.

Material Safety Data Sheet (MSDS) - Caustic Soda lye

1. Chemical Product and Company Identification

Product Name	: Caustic Soda lye
Catalog Codes	: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705
CAS#	: 1310-73-2
RTECS	: WB4900000
TSCA	: TSCA 8(b) inventory: Sodium hydroxide
CI#	: Not available.
Synonym	: Caustic Soda
Chemical Name	: Sodium Hydroxide
Chemical Formula	: NaOH

2. Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

3. Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to mucous membranes, upper

Page 1 of 8
Introduced Date: 01.05.2022

MSDS - Caustic Soda lye
Revision Date: 01.05.2025



Safety Data Sheet

Anhydrous

Date of First Issue: 1/24/2024

Date of Revision: 4/26/2024

SECTION 1 - IDENTIFICATION, PRODUCT AND COMPANY

1.1 Product Identifier Trade Name: OPTIPOZZ

Other name(s): Calcined Kaolin, Anhydrous Aluminum Silicate, China Clay

REACH Status: Substance is exempt in accordance with Annex V.7.

1.2 Relevant identified uses of the substance and uses advised against:

Use of this substance: Used in mortar compounds and cement compounds

Restrictions on use: This substance is manufactured for industrial use only. This substance is not USP/Food grade.

1.3 Details of the Supplier of the safety data sheet:

Company: Burgess Pigment Company, 525 Beck Boulevard, P.O. Box 349, Sandersville, Georgia 31082 U.S.A.

Telephone: +14785522544

Internet: www.burgesspigment.com

Email: technicalcenter@burgesspigment.com

1.4 Emergency telephone number: Burgess Pigment Company, +14785522544, Hours of Operation

P.O. Box 349 | 525 Beck Blvd. | Sandersville, GA 31082 USA | 1.800.841.8099 USA Only
478.552.2544 | Fax 478.552.4274 | info@burgesspigment.com



MATERIAL SAFETY DATA SHEET

Kaolin (China Clay)

SECTION 1. Product and Company Identification

Product Name and Synonym: Kaolin (China Clay)
 Product Code: K2502
 Material Uses:
 Manufacturer: Science Stuff
 1104 Newport Ave
 Austin, TX 78753
 (512) 837-6020
 Entry Date: 6/7/2013
 Print Date: 6/7/2013
 24 Hour Emergency Assistance: Chemtrec 800-424-9300
 Canutec 613-996-6666

Health:	1
Flammability:	0
Reactivity:	0
Hazard Rating: Least Slight Moderate High Extreme 0 1 2 3 4	
Material Application NE=Not Established	

SECTION 2 HAZARD IDENTIFICATION

Generally not hazardous in normal handling, however good laboratory practices should always be used. Avoid long term exposure to skin or by inhalation.

SECTION 3 MIXTURE COMPONENTS

SARA 313	Component	CAS Number	Percent Comp.	Dimension	Exposure Limits
☐	Kaolin (China Clay)	CAS# 1332-58-7	100%	W/W	None established

SECTION 4 FIRST AID MEASURES

Generally not hazardous in normal handling, however good laboratory practices should always be used. Avoid long term exposure to skin or by inhalation.
 FIRST AID: SKIN: Wash exposed area with soap and water. If irritation persists, seek medical attention.
 EYES: Wash eyes with plenty of water for at least 15 minutes, lifting lids occasionally. Seek Medical Aid. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
 INGESTION: Give several glasses of milk or water. Vomiting may occur spontaneously, but it is not necessary to induce. Never give anything by mouth to an unconscious person.

SECTION 5 FIRE FIGHTING MEASURES

Fire Extinguisher Type: Any means suitable for extinguishing surrounding fire
 Fire / Explosion Hazards: None Known.
 Fire Fighting Procedure: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and clothing.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Safety Data Sheet

According to regulation (EC) No. 1907/2006 (REACH)



44200 Chrome Oxide Green

Page 1

Revised edition: 01.06.2021

Version: 2.0

Printed: 14.11.2022

1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1. Product Identifier

Product Name: Chrome Oxide Green

Article No.: 44200

UFI: —

1.2. Relevant Identified Uses of the Substance or Mixture and Uses advised against

Identified uses: Coloring agent (pigment and dyes), inorganic.

Uses advised against:

1.3. Details of the Supplier of the Safety Data Sheet (Producer/Importer)

Company: Kremer Pigmente GmbH & Co. KG

Address: Hauptstr. 41-47, 88317 Aichstetten, Germany

Tel./Fax.: Tel +49 7565 914480, Fax +49 7565 1606

Internet: www.kremer-pigmente.com

EMail: info@kremer-pigmente.com

Importer: —

1.4. Emergency No.

Emergency No.: +49 7565 914480 (Mon-Fri 8:00 - 17:00)

1.4.2 Poison Center:

2. Hazards Identification

2.1. Classification of the Substance or Mixture

Classification according to Regulation
(EC) No. 1272/2008 (CLP/GHS)

This product does not require classification and labelling as hazardous according to CLP/GHS.

Possible Environmental Effects:

2.2. Label Elements

Classification according to Regulation
(EC) No. 1272/2008 (CLP/GHS)

No classification required according to the CLP/GHS guidelines.

Hazard designation:

Not applicable.

Signal word:

Hazard designation:

Safety designation:

Hazardous components for labelling:

2.3. Other Hazards

3. Composition/Information on Ingredients

Substance

next page: 2



PO Box 32 • 105 Liberty Street • Winona, MN 55987 • Phone: 800-533-0027 or 507-454-5640 • Fax: 507-454-5641

FOR CHEMICAL EMERGENCY
Involving Shipping and Handling Spills, Leak, Fire, Exposure or Accident
Call CHEMTREC 1-800-424-9300

Complies with OSHA's Hazard Communication Standard 29 CFR 1910.1200

Section 1 - Product Identification

Product Name: Citric Acid, all sizes.

Product ID: 0203X

Section 2 - Composition/Information on Ingredients

CHEMICAL NAME (COMMON NAME)

CAS NO.

Citric Acid Anhydrous

77-92-9

Section 3 - Hazards Identification

HMIS: Health 1 Flammability 0 Reactivity 0 PPE: E

EMERGENCY OVERVIEW: Irritating to eyes. May cause skin irritation and respiratory tract irritation.

Section 4 - First Aid Measures

GENERAL ADVICE: Consult a physician.

MAJOR EFFECTS OF EXPOSURE: Irritating to eyes. May cause skin irritation in susceptible persons.

EYES: Immediately flush eyes with water, remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes lifting the upper and lower eyelids intermittently. If irritation develops or persists, seek medical attention.

SKIN: Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. If skin irritation persists, seek medical attention.

INHALATION: Remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, give oxygen.

INGESTION: Never give anything by mouth to an unconscious or convulsive person. If swallowed, do not induce vomiting. Give large amounts of water. If vomiting occurs spontaneously, keep airway clear. Give more water when vomiting stops.

Section 5 - Fire Fighting Measures

FLASHPOINT: Not Available.

LOWER FLAMMABLE LIMITS: 8% at 65° C / 149° F

UPPER FLAMMABLE LIMITS: Not available

AUTO-IGNITION TEMPERATURE: 345° C / 653° F

SUITABLE EXTINGUISHING MEDIA: Water, Water Spray, Dry Powder, Foam, Carbon Dioxide (CO₂).

EXTINGUISHING MEDIA WHICH MUST NOT BE USED FOR SAFETY REASONS: None

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon oxides

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS: Use personal protective equipment.

SPECIFIC METHODS: Standard procedure for chemical fires.

Section 6 - Accidental Release Measures

PERSONAL PRECAUTIONS: Use personal protective equipment. Avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS: No special environmental precautions required.

METHODS FOR CLEANING UP: Sweep up and shovel. After cleaning, flush away traces with water.

Section 7 - Handling and Storage

HANDLING: Avoid breathing vapor or mist. Minimize dust generation and accumulation. Do not get in eyes, on skin, or on clothing. Avoid contact with heat, sparks and flame. Wash thoroughly after handling. When mixing, slowly add chemical to water. Never add water to chemical.

STORAGE: Do not store near combustible materials. Store in a cool, dry place. Keep container tightly closed and properly labeled. Keep separated from incompatible substances (see Section 10 of the MSDS).

Section 8 - Exposure Controls and Personal Protection

ENGINEERING MEASURES TO REDUCE EXPOSURE: Ensure adequate ventilation, especially in confined areas.

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION: Effective Dust Mask

HAND PROTECTION: Gloves

EYE PROTECTION: Safety Glasses

SKIN AND BODY PROTECTION: Lightweight protective clothing

HYGIENE MEASURES: Handle in accordance with good industrial hygiene and safety practice.



Industrial Química del Nalón, S.A.
NalónChem

Avda. de Galicia 31 / 33005 Oviedo - Spain
Phone: +34 98.598.26.00 / Fax: +34 98.598.26.26 / Telex: 84303 NALÓN E

DATE: April, 2010

EDITION: 5th.

REVISION: 0.

MATERIAL SAFETY DATA SHEET

(1907/2006/EC, Article 31)

COAL TAR PITCH

1.- IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

1.1.- Identification of the substance

Trade name: Coal Tar Pitch

Molecular formula: N/A

1.2.- Use of the substance/preparation

Binding and impregnating agent for carbon manufacturing in the aluminium and graphite industries.

1.3.- Company/undertaking identification

Industrial Química del Nalón, S.A.

Avda. Galicia 31

E-33005 Oviedo

Spain

Tel: +34 98.598.26.00

Fax: +34 98.598.26.26

(See item 16.2 -Contact-)

1.4.- Emergency information

Tel: +34 98.598.26.61

Fax: +34 98.598.26.66

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH)
according to Regulation (EU) No. 2020/878



Trade name : 121030 - Cobalt carbonate 51-52%

Revision date : 04/11/2022

Print date : 15/12/2022

Version (Revision) :

2.0.0 (1.0.0)

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Cobalt carbonate 51-52% (121030)

Cobalt carbonate 51-52% ; CAS No. : 51839-24-8 ; EC No. : 208-169-4 ; Index No. : 027-010-00-8 ; REACH No. : 01-2119513233-54-XXXX

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses

For manufacturing, processing, laboratory or repacking use only.

Uses advised against

Uses other than those recommended.

1.3 Details of the supplier of the safety data sheet

Supplier (manufacturer/importer/only representative/downstream user/distributor)

DC Fine Chemicals Ltd

Street : 88 Hill Top

Postal code/City : NW13 6DY London United Kingdom

Telephone : +44 (0)20 7586 6800

Telefax : +44 (0)20 7504 1701

Information contact : info@dcfinechemicals.com

1.4 Emergency telephone number

(Only available during office hours; Monday-Friday; 08:00-18:00)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [CLP]

Acute Tox. 4 ; H302 - Acute toxicity (oral) : Category 4 ; Harmful if swallowed.

Resp. Sens. 1 ; H334 - Sensitisation to the respiratory tract : Category 1 ; May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin Sens. 1 ; H317 - Skin sensitisation : Category 1 ; May cause an allergic skin reaction.

Muta. 2 ; H341 - Germ cell mutagenicity : Category 2 ; Suspected of causing genetic defects.

Carc. 1B ; H350 - Carcinogenicity : Category 1B ; May cause cancer.

Repr. 1B ; H360 - Reproductive toxicity : Category 1B ; May damage fertility or the unborn child.

Aquatic Chronic 1 ; H410 - Hazardous to the aquatic environment : Chronic 1 ; Very toxic to aquatic life with long lasting effects.

2.2 Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms

SAFETY DATA SHEET

Revision Date 24-Dec-2021

Revision Number 5

1. Identification

Product Name	Cobalt oxide
Cat No. :	C382500
CAS No	1308-06-1
Synonyms	Tricobalt tetraoxide; Cobaltic-cobaltous oxide; Cobaltous oxide
Recommended Use	Laboratory chemicals.
Uses advised against	Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Respiratory Sensitization	Category 1
Carcinogenicity	Category 1B

Label Elements

Signal Word
Danger

Hazard Statements
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause cancer by inhalation



COPPER (II) OXIDE

Alpha Resources LLC

Safety Data Sheet

Issue Date: 08/12/2021

SECTION 1 Identification

Product Identifier

Product Name	COPPER (II) OXIDE
Chemical Name	Copper (II) Oxide
Part Numbers	AEB1002, AEB1002-500, AR01029, AR01029B, AR01039
Chemical Formula	CuO
CAS Number	1317-38-0

Company Information

Registered Company Name	Alpha Resources LLC
Address	3090 Johnson Road, Stevensville, MI 49127 United States
Telephone	(800) 833-3083
Fax	(269) 465-3629
Website	https://www.alpharesources.com
Email	sales@alpharesources.com

Emergency Phone Number

Association / Organization	CHEMTREC
Emergency Telephone No.	(800) 424-9300

SECTION 2 Hazard(s) Identification

Classification of the Substance or Mixture

NFPA 704 Diamond



Note: The hazard category numbers found in GHS classification in section 2 of this SDS are NOT to be used to fill in the NFPA 704 diamond. Blue = Health, Red = Fire, Yellow = Reactivity, White = Special (Oxidizer or water reactive substances)

Classification	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Eye Irritation Category 2A, Specific target organ toxicity – single exposure Category 3 (respiratory tract irritation), Specific target organ toxicity – repeated exposure Category 2, Chronic Aquatic Hazard Category 1
----------------	--

Label Elements

Hazard Pictogram(s)	
Signal Word	Warning

Hazard Statement(s)

H302	Harmful if swallowed
H332	Harmful if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation

Material Safety Data Sheet for HYDROCHLORIC ACID

VAN WATERS & ROGERS -- HYDROCHLORIC ACID, 37% - HYDROCHLORIC ACID, TECHNICAL
MATERIAL SAFETY DATA SHEET
NSN: 6810002372920
Manufacturer's CAGE: DSTMS
Part No. Indicator: A
Part Number/Trade Name: HYDROCHLORIC ACID, 37%

General Information

Item Name: HYDROCHLORIC ACID, TECHNICAL
Company's Name: VAN WATERS AND ROGERS INC
Company's Street: 6100 CARILLON PT
Company's P. O. Box: NONE
Company's City: KIRKLAND
Company's State: WA
Company's Country: US
Company's Zip Code: 98033
Company's Emerg Ph #: 206-889-3712
Company's Info Ph #: 206-889-3400
Distributor/Vendor # 1: CHEMICAL COMMODITIES AGENCY, INC.
Distributor/Vendor # 1 Cage: 60777
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 012
Status: SE
Date MSDS Prepared: 13AUG93
Safety Data Review Date: 26MAR96
Supply Item Manager: CX
MSDS Serial Number: BYHHQ
Specification Number: O-C-265
Spec Type, Grade, Class: NONE
Hazard Characteristic Code: C1
Unit Of Issue: BT
Unit Of Issue Container Qty: PINT
Type Of Container: 1P.2 IN 4G BX
Net Unit Weight: 500 GRAMS
NRC/State License Number: NONE
Net Propellant Weight-Amps: NONE

Ingredients/Identity Information

Proprietary: NO
Ingredient: HYDROGEN CHLORIDE (HYDROCHLORIC ACID) (SARA III)
Ingredient Sequence Number: 01
Percent: 37
NIOSH (RTECS) Number: MW4025000
CAS Number: 7647-01-0
OSHA PEL: C 5 PPM
ACGIH TLV: C 5 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, COLORLESS FUMING LIQUID - PUNGENT ODOR OF
HYDROGEN CHLORIDE

MATERIAL SAFETY DATA SHEET

INDFLOC 238

1) IDENTIFICATION OF CHEMICAL PRODUCT AND COMPANY

Chemical Product Name : **INDFLOC 238**
Company Identification : ION EXCHANGE (I) Ltd,
19/A, Phase II, Indl. Development Area,
Patancheru – 502319, Medak (Dist),
Andhra Pradesh, INDIA.
Telephone Nos. : (+91)(8455) – 306601, 306608
(+91)(40) – 30663101
Fax Nos. : (+91)(8455) – 306603
(+91)(40) – 30663104
Time Zone : + 5Hrs 30 Mints GMT

2) COMPOSITION AND INFORMATION ON INGREDIENTS

Identification of the preparation : Cationic polymer in solution.

3) HAZARD IDENTIFICATION

Aqueous solutions render surfaces extremely slippery.

4) FIRST AID MEASURES

Inhalation : Move to fresh air.
Skin Contact : Wash with water and soap as a precaution. In case of persistent skin irritation, consult a physician.
Eye Contact : Rinse thoroughly with plenty of water, also under the eyelids. In case of persistent eye irritation, consult a physician.
Ingestion : The product is not considered toxic based on studies on laboratory animals.



LTS Research Laboratories, Inc.
Safety Data Sheet
Iron Oxide

1. Product and Company Identification

Trade Name: Iron oxide
Chemical Formula: Fe_3O_4
Recommended Use: Scientific research and development

Manufacturer/Supplier: LTS Research Laboratories, Inc.
Street: 2001 Oaks Pkwy
City: Belmont
State: North Carolina
Zip Code: 28012
Country: USA
Tel #: 855-587-2436 / 855-lts-chem

24-Hour Emergency Contact: 800-424-9300 (US & Canada)
+1-703-527-3887 (International)

2. Hazards Identification

Signal Word: None
Hazard Statements: None
Precautionary Statements: None

HMIS Health Ratings (0-4):

Health: 1
Flammability: 0
Physical: 1



3. Composition

Chemical Family: Ceramic
Additional Names: Iron(II)iron(III) oxide, Iron(II,III) oxide, Ferrous ferric oxide, Ferrus
Ferric oxide, Magnetite, black iron oxide, lodestone, rust,
Iron(II) dinon(III) oxide

Iron oxide(Fe_3O_4):
Percentage: 100 wt%
CAS #: 1317-61-9
EC #: 215-277-5

4. First Aid Procedures

General Treatment: Seek medical attention if symptoms persist.
Special Treatment: None
Important Symptoms: None

Inhalation: Remove victim to fresh air. Supply oxygen if breathing is difficult.
Ingestion: Seek Medical Attention.
Skin: Wash affected area with mild soap and water. Remove any
contaminated clothing.
Eyes: Flush eyes with water, blinking often for several minutes. Remove
contact lenses if present and easy to do. Continue rinsing.

SAFETY DATA SHEET

Creation Date: 26-Sep-2009

Revision Date: 24-Dec-2021

Revision Number: 4

1. Identification

Product Name Lithium Carbonate
Cat No. : L119-500
CAS No 554-13-2
Synonyms carbonic acid lithium salt; Carbonic Acid Dilithium Salt
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Serious Eye Damage/Eye Irritation	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed
Causes serious eye irritation

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.4

Revision Date 28.04.2021

Print Date 14.05.2024

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Magnesium sulfate heptahydrate

Product Number : M1880
Brand : SIGALD
REACH No. : 01-2119486789-11-XXXX
CAS-No. : 10034-99-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Chemical Pvt Limited
Industrial Area, Anekal Taluka
Plot No 12,
12 Bommasandra - Jigani Link Road
560100 BANGALORE
INDIA

1.4 Emergency telephone

Emergency Phone # : 000 800 1007 141 (CHEMTREC)

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Not a hazardous substance or mixture according to Regulation (EC) No 1272/2008.

2.2 Label elements

Not a hazardous substance or mixture according to Regulation (EC) No 1272/2008.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients**3.1 Substances**

SIGALD- M1880

Page 1 of 9

The life science business of Merck operates as MilliporeSigma in the US and Canada





Safety Data Sheet
Magnesium sulfate, heptahydrate
Revision 4, Date 20 Aug 20

1. IDENTIFICATION

Product Name	Magnesium sulfate, heptahydrate
Other Names	Epsom Salt, Magnesium Sulfate; Magnesium sulphate - AGRICULTURE: Sulfuric acid magnesium salt (1:1), heptahydrate
Uses	Pharmaceuticals, bath soak, purgative, Industrial use; for correcting magnesium deficiency in crops and for use in animal feed.
Chemical Family	No Data Available
Chemical Formula	MgSO ₄ ·7H ₂ O
Chemical Name	Sulfuric acid, magnesium salt, heptahydrate
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-9733 3000
Redox Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506 222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-676-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Selangor, Malaysia	+60-3-5014-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcell	Australia	1800-127406 +64-4-9179886
Chemcell	Malaysia	+64-4-9179886
Chemcell	New Zealand	0800-243822 +64-4-9179886
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3667

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Not Scheduled

Globally Harmonised System

Writer: 187
Corporate Office Sydney
Locked Bag 15 Minto NSW 2566 Australia
12 Swettenham Road Minto NSW 2566 Australia
24 Delview Road Minto NSW 2566 Australia

Phone: +61 2 9733 3000
Fax: +61 2 9733 0111
E-Mail: info@redox.com
Web: www.redox.com
ABN: 62 000 762 545

Australia: New Zealand: Malaysia:
Adelaide Auckland Kuala Lumpur
Brisbane Christchurch USA
Brisbane Sydney Los Angeles
Perth UK Oakland
Sydney London Mexico
Salto



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Safety Data Sheet

Magnesium Oxide



Section 1: SUBSTANCE IDENTIFICATION AND SUPPLIER

Product Name:	Magnesium Oxide
Product Code:	0003100, 0003110, 0003112 & 0003120 (Magnesium Oxide bulk - fertiliser), 0003410 (Magnesium Oxide Fine - ANH).
Recommended Use:	Fertiliser additive and animal health supplement.
Restrictions of Use:	Refer to Section 15
Company Identification:	Ravensdown Limited
Address:	292 Main South Road, Hornby, Christchurch, 8042 PO Box 1049, Christchurch 8011
Customer Centre:	0800 100 123
National Poisons Information Centre:	0800 POISON (0800 764 766)
Emergency Phone Number:	0800 CHEMCALL (0800 243 622) (24hr) (Emergencies Only)
Transport Emergency Phone Number:	111 - tell operator what service is needed: Fire, Ambulance or Police
Date of SDS Preparation:	3 March 2023

Section 2: HAZARD IDENTIFICATION

This substance is NOT hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

Section 3: COMPOSITION INFORMATION

INGREDIENT	CAS No.	CONTENT %
Magnesium Oxide	1309-48-4	90-100%

Section 4: FIRST AID MEASURES

Routes of Exposure:	
If in eyes:	Rinse cautiously with water for 15 minutes. If eye irritation persists: Get medical advice.
If on skin:	Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
If Ingested:	Rinse mouth. Never give anything to the mouth of an unconscious person. If vomiting occurs, place victim face downwards, with the head turned to the side and lower than the hips to prevent vomit entering the lungs. Call a POISON CENTER or doctor/physician if you feel unwell.
If inhaled:	Remove person to fresh air. Remove contaminated clothing and loosen remaining clothing. Allow person to assume most comfortable position and keep warm. Keep at rest until fully recovered. Get medical advice if breathing becomes difficult.
Most important symptoms and effects, both acute and delayed	
Symptoms:	Refer to Section 11
Eyes:	Not applicable.
Skin:	Not applicable.
Ingested:	Not applicable.

Product Name: Magnesium Oxide
Date of SDS: 3 March 2023

SDS Prepared by: Technical Compliance Consultants (NZ) Ltd
Tel: 64 9 475 5240 www.techcomp.co.nz

SAFETY DATA SHEET

Creation Date: 08-Dec-2015

Revision Date: 24-Dec-2021

Revision Number: 5

1. Identification

Product Name Manganese(II) carbonate hydrate
Cat No. : AC222540000; AC222540010
CAS No 34156-69-9
Synonyms Hydrated manganese carbonate.
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company	
Fisher Scientific Company	Acros Organics
One Reagent Lane	One Reagent Lane
Fair Lawn, NJ 07410	Fair Lawn, NJ 07410
Tel: (201) 796-7100	

Emergency Telephone Number For information US call: 001-800-ACROS-01 / Europe call: +32 14 57 52 11
Emergency Number US:001-201-796-7100 / Europe: +32 14 57 52 99
CHEMTREC Tel. No.US:001-800-424-9300 / Europe:001-703-527-3887

2. Hazard(s) identification

Classification
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

Hazard Statements

Precautionary Statements
Hazards not otherwise classified (HNOC)
None identified

MATERIAL SAFETY DATA SHEET (MSDS) MANGANESE OXIDE

SECTION 1 – IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY

Manufacturer & Supplier: BEERSHEBA MINES & MINERALS PRIVATE LIMITED

Address: 7/2, At-Bramhani, Post-Borkhedi, Tah-Nagpur, Dist-Nagpur, State-Maharashtra, India.

Mob / Tel: +91 8007325000

E-Mail: beershebagroup@gmail.com

Web Site: www.beersheba.co.in

Emergency Contact: +91 8007325000

Chemical Name: Manganese Oxide: (CAS: 1313-13-9) (RTECS: OP0350000)

Catalog Codes: SLM3895, SLM1747

Formula: MnO

Synonyms: Manganous Oxide

% Range: 54 - 62%

Primary Use: Mineral nutrient additive for the feed industry.

SECTION 2 – HAZARDS IDENTIFICATION

Classification according to Regulation Acute toxicity:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation

GHS Pictogram:



Signal Word:

Danger

Hazard Statements:

H311: Toxic in contact with skin.
 H315: Causes skin irritation.
 H319: Causes serious eye irritation.
 H335: May cause respiratory irritation.



MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Trade name	MAXfloc
Brand name & code	MAXfloc 506
Validation Date	1/4/2013
Company Identification	M/s. Thermax Limited, Chemical Division, 97-E, General Block, MIDC Industrial Area, Bhosari, Pune 411 026 (India)
24 hr. Emergency Assistance	Tel: 0091 20 27120181, 0091 20 27120189, Fax: 0091 20 27120206

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS	% by wt.	Exposure guidelines
Cyanoguanidine polymer	55295-98-2	40-50%	Not available

3. HAZARDS IDENTIFICATION

a) Environmental hazards:	May be harmful when exceptionally high dose level are used
b) Physical / chemical Hazards	Corrosive to metals, may generate hydrogen gas. Air hydrogen mixture may be explosive. Do not mix with alkalis will evolve ammonia

4. FIRST AID MEASURES

1. Skin	Remove contaminated clothing. Wash skin thoroughly with soap and water
2. Eyes	Flush eyes liberally with low pressure water for at least 15 minutes; lift the eyelids occasionally to aid in removal of material
3. Inhalation	Immediately move personnel to area of fresh air. For respiratory distress, give air, oxygen or administer CPR (Cardiopulmonary Resuscitation), if necessary. Obtain medical attention immediately
4. Ingestion	Rinse mouth with water. Do not induce vomiting unless directed by medical personnel. Obtain medical attention

5. FIRE FIGHTING MEASURES

1. Fire extinguishing media	use extinguishing media appropriate for surrounding fire
2. Basic fire fighting procedure	Water spray is recommended to cool fire exposed surfaces and to protect personnel. Wear self contained breathing apparatus
3. Unusual fire & explosion hazards	As is not flammable but with heat & fire may evolve toxic fumes. With metal may evolve hydrogen gas. Air Hydrogen gas mixture may be explosive

6. ACCIDENTAL RELEASE MEASURES

Personnel precautions	Use personnel protective equipment, breathing apparatus required only in fire situation
Environmental precautions	Do not flush into surface area or sanitary sewer system, use absorbent like sand or absorbent materials, saw dust, waste cotton etc. to contain spill prevent material from entering soil and waterways

7. HANDLING AND STORAGE

Handling precautions	Avoid contact with skin / eyes. Avoid prolonged or repeated exposure. Wash thoroughly after handling. Use in ventilated areas only
Storage conditions	Store in a cool enclosed place. Avoid repeated freeze – thaw cycles. Keep away from source of ignition, alkalis, combustible substances, moisture

UNITED MINERAL & CHEMICAL -- MAGNESIUM CARBONATE
MATERIAL SAFETY DATA SHEET
NSN: 681000NG64202
Manufacturer's CAGE: 87730
Part No. Indicator: A
Part Number/Trade Name: MAGNESIUM CARBONATE

General Information

Company's Name: UNITED MINERAL AND CHEMICAL CORP
Company's Street: 1100 VALLEY BROOK AVE
Company's City: LYNDHURST
Company's State: NJ
Company's Country: US
Company's Zip Code: 07071
Company's Emerg Ph #: 800-624-9300 (CHEMTREK)
Company's Info Ph #: 201-507-3300
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 28JAN92
Safety Data Review Date: 19OCT95
MSDS Serial Number: B2KCN

Ingredients/Identity Information

Proprietary: NO
Ingredient: MAGNESIUM (II) CARBONATE (1:1); (MAGNESIUM CARBONATE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: OM2470000
CAS Number: 546-93-0
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: FINE WHITE POWDER; ODORLESS.
Boiling Point: N/A
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): N/A
Specific Gravity: 2.16
Solubility In Water: MAX 0.7% (COLD WATER)
Percent Volatiles By Volume: SUPDAT

Fire and Explosion Hazard Data

Flash Point: NOT APPLICABLE
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: WATER, FOAM, CO₂, DRY CHEMICAL.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NONE.

Reactivity Data

Material Safety data sheet
High Speed Diesel

MATERIAL SAFETY DATA SHEET
Diesel oil/HSD

1. Chemical identity

<i>Chemical name:</i> Diesel Oil		<i>Chemical classification:</i> Flammable liquid	
<i>Synonyms:</i> Automotive Diesel Oil		<i>Trade name:</i> HSD	
<i>Formula Range:</i> C ₁₂ - C ₁₈		<i>C.A.S. NO.</i> 68476-30-2	<i>U.N.NO.</i> 1202
<i>Regulated identification</i>		<i>Shipping name:</i> HSD	
<i>Codes/Label:</i> :		<i>Hazchem code:</i> class 3	
		<i>Hazardous waste:</i> N.A.	
<i>Hazardous ingredients</i>	<i>C.A.S.NO.</i>	<i>Hazardous ingredients</i>	<i>C.A.S.NO.</i>
Diesel	68476-30-2	Benzene Trace	71-43-2
		Naphthalene Trace	91-20-3
		Sulphur Trace	7704-34-9
Diesel is complex mixture of hydrocarbons. It's exact composition depends on the source of crude oil from which it is produced and the refining methods used			

2. Physical and chemical data

<i>Boiling point/Range (deg.C) :</i> 215 - 376.	<i>Physical state:</i> Liquid.	<i>Appearance:</i> yellowish brown.
<i>Melting/freezing point (deg.C) :</i> N. A.		
<i>Vapour pressure:</i> 2.12 to 26mm Hg at 21 deg C.		
<i>Odour:</i> Perceptible odour		
<i>Vapour density:</i> N.A.		
<i>Solubility in water @ 30 deg.C:</i> Insoluble		
<i>Specific gravity:</i> 0.86 - 0.90 at 20 deg C		
<i>Others:</i> Pour Point: 6 - 18 deg. C.		

3. Fire and explosion Hazard data

<i>Flammability:</i> Yes	<i>LEL:</i> 0.6%	<i>Flash point(deg C) :</i> 32 (OC)
<i>TDG Flammability:</i> class 3.	<i>UEL:</i> 6%	<i>Flash point(deg C) :</i> N.A. (CC)
<i>Auto Ignition Temp :</i> 225 deg. C		
<i>Explosion sensitivity to impact:</i> not sensitive to Mechanical Impact.		
<i>Explosion sensitivity to static electricity:</i> For vapors sensitivity exist		
<i>Hazardous Combustion Products:</i> carbon monoxide, Nitrogen oxide. and other aromatic hydrocarbons		
<i>Hazardous Polymerization:</i> N.A.		



Material Safety Data Sheet

Product Name: Caustic Soda

Revision date: R2- 01/09/2021

Section1: Manufacturer and Substance Identification:

CHEMFAB ALKALIS LIMITED

Gnanananda place
Kalapet
Puducherry- 605014
India.

Product Identifier: CAUSTIC SODA LIQUID (31-5 % and 48%)

Caustic soda Solution Sodium hydroxide liquid Caustic Soda lye	
CAS #: 1310-73-2 RTECS #: WB4900000 UN #: 1823 EC #: 011-002-00-6 EINECS #: 215-185-5	Formula: NaOH Molecular mass: 40.0 g/mol

SECTION 1. Product d company identification

Emergency Contact number:0413- 2655111
Email: chemfabalkalis@draaholings.com
Website:www.chemfabalkalis.com
AMAI CERN NO (Emergency Contact Number): 1800-11-1735

SECTION 2: Composition/Information on Ingredients

Component	Percent [%]	CAS Number
Water		7732-18-5
Sodium Hydroxide	31- 48 %	1310-73-2

SECTION 3: Hazard identification

Material Safety Data Sheet

Product Name	Citric Acid Monohydrate
---------------------	--------------------------------

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**1.1. Product identification:****Product Description:** Citric Acid Monohydrate**Cat No.:** 70490, 96490, 10490, 50490, 98490, 90490, 97490**Synonyms:** Citric Acid Monohydrate**CAS No:** 5949-29-1**EC-No.:** 201-069-1**Molecular Formula:** $C_6H_8O_7 \cdot H_2O$

REACH Registration No: A registration number is not available for this substance as the substance or its use are exempted from registration according to Article 2 REACH Regulation (EC) No 1907/2006, the annual tonnage does not require a registration, or the registration is envisaged for a later registration deadline.

1.2. Relevant identified uses of the substance or mixture and uses advised against:**Recommended Use:****1.3. Details of the supplier of the safety data sheet:**

- Company** **Finar Limited**
184-186/P, Chacharwadi Vasna,
Sarkhej-Bavla Highway,
Ta.: Sanand, Dist.: Ahmedabad,
Email: info@finarchemicals.com
Web: www.finarchemicals.com
- E-Mail Address** safety@finarchemicals.com; info@finarchemicals.com

1.4. Emergency Telephone Number:

- For Emergency contact on: +91 - 2717 - 616 717
- Registered office No: +91 - 79 - 40040085

SAFETY DATA SHEET

Creation Date: 20-Jan-2010

Revision Date: 24-Dec-2021

Revision Number: 4

1. Identification

Product Name Sodium sulfite

Cat No. : AC219270000; AC219270010; AC219270050; AC219270250;
AC219272500

CAS No 7757-83-7

Synonyms Sulfurous acid, disodium salt

Recommended Use Laboratory chemicals.

Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company	Acros Organics
Fisher Scientific Company	One Reagent Lane
One Reagent Lane	Fair Lawn, NJ 07410
Fair Lawn, NJ 07410	
Tel: (201) 796-7100	

Emergency Telephone Number For information US call: 001-800-ACROS-01 / Europe call: +32 14 57 52 11
Emergency Number US:001-201-796-7100 / Europe: +32 14 57 52 99
CHEMTREC Tel. No.US:001-800-424-9300 / Europe:001-703-527-3887

2. Hazard(s) identification

Classification
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

None required

Hazards not otherwise classified (HNOC)

None identified

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1. Product identifier**

Product Name **Sodium Sulphate**

Substance Name Sodium sulphate
CAS No 7757-82-6
EC No 231-820-9
REACH registration number 01-2119519226-43-0010

Pure substance/mixture Substance

1.2. Relevant identified uses of the substance or mixture and uses advised against

Industrial Industrial manufacturing. Manufacture of substances. Distribution and storage. Formulations. Use: as a detergent, as an intermediate including transfers and lab activities, in laboratories (small scale), in non-spraying formulations, in spraying formulations, in syntheses as a process chemical (not as a reactant)

Professional Use: as a detergent, in laboratories (small scale), in non-spraying formulations, in spraying formulations

Consumer Use: in cardboard, in consumer products (private household uses)

Uses advised against Not identified.

1.3. Details of the supplier of the safety data sheet**Manufacturer**

Perstorp Specialty Chemicals AB
SE-204 90 Perstorp, Sweden
Tel. +46 435 380 00
www.perstorp.com

E-mail address productinfo@perstorp.com

1.4. Emergency telephone number

Europe (+)1 760 476 3961 (contract no: 334101)

United Kingdom (+)44 8 08 189 0979 (contract no: 334101)

SECTION 2: Hazards identification**2.1. Classification of the substance or mixture**

Classification according to Regulation (EC) No. 1272/2008 [CLP]

This substance is classified as not hazardous according to regulation (EC) 1272/2008 [CLP]

2.2. Label elements

This substance is classified as not hazardous according to regulation (EC) 1272/2008 [CLP]

Symbols/Pictograms

Not applicable

Signal word

None

MATERIAL SAFETY DATA SHEET

CALCIUM CARBONATE (CALCITE)

CHHAVI MICROFINE PRODUCTS (A unit of MLA Group Of Industries).

111/230, HARSH NAGAR, KANPUR-208012 (U.P.), INDIA

TEL: 91-20512-2291408/09/10, FAX: 91-0512-2290057

E-MAIL: sales@mlagroup.com WEB: www.mlagroup.com

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CALCIUM CARBONATE

FORMULA: CaCO_3

FORMULA WT: 100.09

COMMON SYNONYMS: LIMESTONE; MARBLE; CALCITE; CHALK; CARBONIC ACID, CALCIUM SALT

EFFECTIVE: 10/22/03

PRECAUTIONARY LABELLING

HEALTH - 0 NONE

FLAMMABILITY - 0 NONE

REACTIVITY - 0 NONE

CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 - NO HAZARD; 4 - EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION

MAY CAUSE IRRITATION

MAY BE HARMFUL IF SWALLOWED

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

2 - HAZARDOUS COMPONENTS

COMPONENT % CAS NO.

CALCIUM CARBONATE



MATERIAL SAFETY DATA SHEET

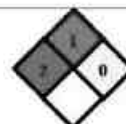
SULPHUR



Section 1 – Chemical Product and Company Identification

Chemical Name : Sulphur
Chemical Formula : S₈
CAS Number :
Synonyms : Brimstone, Bensulfoid, Colsul
General Use : Production of inorganic compounds, acids

Manufacture's Name : Bharat Petroleum Corporation Limited
Address : Refinery, Mahul, Chembur, Mumbai 400074
Telephone Number for Info : 25533888 / 25533999 / 25524888 / 25524999
MSDS No. :
Date Prepared : June 2006
Revision # : 1



NEPA 704 (Rev 16)

Section 2 – Composition / Information on Ingredients

Composition : Sulphur, H₂S
Hazardous Components : Hydrogen Sulphide
ACGIH TLV : H₂S - 10 ppm

Section 3 – Hazards Identification

Primary Entry Routes : Inhalation, skin and eyes
Acute Effects : When the product is handled in liquid conditions it would be hot hence skin burns are the most likely health hazard. Product vapours may contain H₂S or SO_x and hence casualties due to its exposure should be removed immediately to fresh air and medical attention sought. Sulphur dust can irritate respiratory system

Carcinogenicity : Not listed as carcinogenic
Chronic Effects : No data available

Section 4 – First Aid Measures

Eyes : Flush with water for 15 min. Get medical attention.
Skin : In case of accidental contact with skin, treat for burns
Inhalation : Product vapours may contain H₂S and hence casualties due to its exposure should be removed immediately to fresh air Consult a physician if irritation persists.

Section 5 – Fire Fighting Measures

Flash Point : > 207 °C
Flash Point Method : Cleveland Open Cup
Auto Ignition Temperature : 230 °C
LEL : Data not available

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.8

Revision Date 04.03.2024

Print Date 14.05.2024

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Nickel carbonate, basic hydrate

Product Number : 544183

Brand : Aldrich

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

CAS-No. : 958638-02-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Chemical Pvt Limited
Industrial Area, Anekal Taluka
Plot No 12,
12 Bommasandra - Jigani Link Road
560100 BANGALORE
INDIA

1.4 Emergency telephone

Emergency Phone # : 000 800 1007 141 (CHEMTREC)

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Acute toxicity, (Category 4) H302: Harmful if swallowed.

Acute toxicity, (Category 4) H332: Harmful if inhaled.

Skin irritation, (Category 2) H315: Causes skin irritation.

Respiratory sensitization, H334: May cause allergy or asthma

Aldrich- 544183

Page 1 of 13

The life science business of Merck operates as MilliporeSigma in the US and Canada



SAFETY DATA SHEET

Creation Date: 24-Nov-2010

Revision Date: 24-Dec-2021

Revision Number: 4

1. Identification

Product Name Nickel(II) oxide
Cat No. : N69-100; N69-500
CAS No 1313-99-1
Synonyms Nickel monoxide; Nickelous oxide
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Sensitization	Category 1
Carcinogenicity	Category 1A
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Lungs.	

Label Elements

Signal Word
Danger

Hazard Statements
May cause an allergic skin reaction
May cause cancer by inhalation
Causes damage to organs through prolonged or repeated exposure

SAFETY DATA SHEET

Creation Date: 12-Mar-2009

Revision Date: 24-Dec-2021

Revision Number: 9

1. Identification

Product Name Nitric acid (67 - 70%)
Cat No. : A467-1, A467-2, A467-250, A467-500
CAS No 7697-37-2
Synonyms Azotic acid; Engraver's acid; Aqua fortis
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number Chemtrec US: (800) 424-9300
Chemtrec EU: 001-703-527-3887

2. Hazard(s) Identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Acute Inhalation Toxicity - Vapors	Category 3
Skin Corrosion/Irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Description: Orthophosphoric acid
Cat No.: O/0500/PC17, O/0500/25, O/0500/27, O/0500/PB08, O/0500/PB15, O/0500/PB17;
O/0500/PB17CN
Synonyms Orthophosphoric acid
Index No 015-011-00-6
CAS No 7664-38-2
EC No 231-633-2
Molecular Formula H3 O4 P

Unique Formula Identifier (UFI) KQWY-02HJ-CX0G-23KJ

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Laboratory chemicals.
Uses advised against No Information available

1.3. Details of the supplier of the safety data sheet

Company
UK entity/business name
Fisher Scientific UK
Bishop Meadow Road, Loughborough,
Leicestershire LE11 5RG, United Kingdom

EU entity/business name
Thermo Fisher Scientific
Janssen Pharmaceuticaaan 3a
2440 Geel, Belgium

E-mail address begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

Chemtrec US: (800) 424-9300
Chemtrec EU: 001-703-527-3887
Tel: 01509 231166

Poison Centre - Emergency Information services
Ireland: National Poisons Information Centre (NPIC) -
01 809 2166 (8am-10pm, 7 days a week)
Malta: +356 2395 2000
Cyprus: +357 2240 5611

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

FSUO0500

SAFETY DATA SHEET

Orthophosphoric acid

Revision Date: 20-Oct-2023

		Qualifying Quantities for Major Accident Notification	Qualifying Quantities for Safety Report Requirements
Orthophosphoric acid	7664-38-2	Not applicable	Not applicable
Water	7732-18-5	Not applicable	Not applicable

Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals
Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
Not applicable

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

Take note of Directive 2000/39/EC establishing a first list of indicative occupational exposure limit values

National Regulations

UK - Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment

WGK Classification Water endangering class = 1 (self classification)

Component	Germany - Water Classification (AwSV)	Germany - TA-Luft Class
Orthophosphoric acid	WGK1	

Component	Switzerland - Ordinance on the Reduction of Risk from handling of hazardous substances preparation (SR 814.81)	Switzerland - Ordinance on Incentive Taxes on Volatile Organic Compounds (OVOC)	Switzerland - Ordinance of the Rotterdam Convention on the Prior Informed Consent Procedure
Orthophosphoric acid 7664-38-2 (>= 85 %)	Prohibited and Restricted Substances		

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has been conducted by the manufacturer/importer. Chemical Safety Assessment/Reports (CSA/CSR) are not required for mixtures.

SECTION 16: OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3

H290 - May be corrosive to metals
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage

Legend

CAS - Chemical Abstracts Service

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

FSUO0500

Page 11 / 12

Material Safety Data Sheet (MSDS) - Pine oil

1. Chemical Product and Company Identification

Product Name : Pine oil
Catalog Codes : SLP4090
CAS# : 8002-09-3
RTECS : TK5100000
TSCA : TSCA 8(b) inventory: Pine oil
CI# : Not available.

Synonym:

Chemical Name : Not available.
Chemical Formula : Not available.

COMPANY IDENTIFICATION

Supplier: **Pure Chemicals Group.**
 CHENNAI, TAMILNADU, INDIA
24 Hour Health Emergency (91) 8939878447
 (91) 9444038694
Transportation Emergency Phone (91) 8939768680

Company Name	Place	EMERGENCY TELEPHONE NUMBER
Pure Chemicals Group.	India	Day Emergency - 044-26161803-26161809

2. Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pine oil	8002-09-3	100

Toxicological Data on Ingredients: Pine oil: ORAL (LD50): Acute: 3200 mg/kg [Rat].
 DERMAL (LD50): Acute: 5000 mg/kg [Rabbit].

3. Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.7

Revision Date 15.06.2023

Print Date 14.05.2024

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Potassium carbonate

Product Number : 209619

Brand : SIGALD

REACH No. : 01-2119532646-36-XXXX

CAS-No. : 584-08-7

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Chemical Pvt Limited
Industrial Area, Anekal Taluka
Plot No 12,
12 Bommasandra - Jigani Link Road
560100 BANGALORE
INDIA

1.4 Emergency telephone

Emergency Phone # : 000 800 1007 141 (CHEMTREC)

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****Classification according to Regulation (EC) No 1272/2008**

Skin irritation (Category 2), H315

Eye irritation (Category 2), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements**Labelling according Regulation (EC) No 1272/2008**

Pictogram



Signal Word

Warning

SIGALD- 209619

Page 1 of 12

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Canada



Material Safety Data Sheet

Product Name	Potassium Chloride
---------------------	---------------------------

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**1.1. Product identification:****Product Description:** Potassium Chloride**Synonyms:** NA**CAS-No:** 7447-40-7**EC-No.:** 231-211-8**Molecular Formula:** KCl

REACH Registration No: A registration number is not available for this substance as the substance or its use are exempted from registration according to Article 2 REACH Regulation (EC) No 1907/2006, the annual tonnage does not require a registration, or the registration is envisaged for a later registration deadline.

1.2. Relevant identified uses of the substance or mixture and uses advised against:**Recommended Use:** Laboratory chemicals**1.3. Details of the supplier of the safety data sheet:**

- **Company** **Finar Limited**
184-186/P, Chacharwadi Vasna,
Sarkhej-Bavla Highway,
Ta.: Sanand, Dist.: Ahmedabad,
Email: info@finarchemicals.com
Web: www.finarchemicals.com
- **E-Mail Address** safety@finarchemicals.com; info@finarchemicals.com

1.4. Emergency Telephone Number:

- For Emergency contact on: +91 - 2717 - 616 717
- Registered office No: +91 - 79 - 40040085

Safety data sheet
complying with Regulation 1907/2006/EC (REACH Regulation),
EU 2020/878 and Regulation No 1272/2008/EC (CLP)

Printing date 05.07.2021

Version number 5 (replaces version 4)

Revision: 05.07.2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifier****Trade name:** QUARTZ POWDER**CAS Number:**

14464-46-1

EC number:

238-455-4

Registration number: The product is exempted from REACH Regulation 1907/2006/EC.**1.2 Relevant identified uses of the substance or mixture and uses advised against**

No further relevant information available.

Application of the substance / the mixture:

Filling in coatings, paints and polymers, sealants and adhesive products, cement, ceramics and enamel investments. Production of materials for use in printing in foundry additives, in feed production etc.

1.3 Details of the supplier of the safety data sheet**Manufacturer/Supplier:**

PENETRON HELLAS S.A.

50, THRAKOMAKEDONON AV., 136 79 ACHARNES, GREECE

TEL.: +30 210 2448250 - FAX: + 30 210 2476803

Email: info@penetron.gr Site: www.penetron.gr

1.4 Emergency telephone number:

European Emergency Tel.: 112

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

This product contains respirable crystalline silica (quartz - cristobalite) as impurity and therefore is classified as STOT RE2 according to criteria defined in the EC Regulation 1272/2008.

Classification according to Regulation EC No 1272/2008 CLP:

GHS08 health hazard

STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.

2.2 Label elements**Labelling according to Regulation EC No 1272/2008 CLP:**

The substance is classified and labelled according to the CLP regulation.

Hazard pictograms:

GHS08

Signal word: Warning

(Contd. on page 2)

GHS

MATERIAL SAFETY DATA SHEET

PRODUCT: SILICON DIOXIDE (SILICA)

1. PRODUCT AND COMPANY IDENTIFICATION

Commercial Product Name

Mesoporous silicate

Synonyms

SILICA (powder)

Company Identification

Glantreo Ltd
ERI Building
Lee Road
Cork City
IRELAND
T; +353 21 4901965
F; +353 21 4901932
E; info@glantreo.com

2. COMPOSITION / INFORMATION ON INGREDIENTS

Consists of SILICA (powder)
Chemical name : SILICA
· Classification : Xi, R36
· CAS No. : 7631-86-9
· Reach No. : 01-2119379499-16-0036
· Weight : >99%
· Form : Powder
· Colour : White
· Odour : Odourless
Hazards Identification : Irritating to eyes.

3. HAZARDS IDENTIFICATION

Generally not hazardous in normal handling.

4. FIRST AID MEASURES

Inhalation

Remove to fresh air. Get medical attention for any breathing difficulty.

Skin contact

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact

Rinse immediately with plenty of water, also under eyelids, for at least 15 minutes. Get prompt medical attention.

Ingestion

Drink lots of water. If large amounts were swallowed, get medical attention.

The information given has been obtained from numerous measures and is for guidance only. No guarantee is given or implied. For more information please contact Glantreo Ltd, ERI Building, Lee Road, Cork City, IRELAND +353 21 4901965



TATA CHEMICALS LIMITED
SAFETY DATA SHEET (SDS)

Name of chemical: Soda Ash

1. PRODUCT IDENTIFICATION / COMPANY ADDRESS

Trade Name	Soda Ash	Common Name	Washing Soda	Synonyms	Crystal Carbonate
Company Name / Address / Phone / Fax		Tata Chemicals Limited, Mithapur District: Devbhoomi Dwarka (Gujarat) 361 345 INDIA <u>Contact In case of Emergency Only:</u> No : +91(02892 675802 /03) Contact Person :+91 9227676113 Mr. Devendra Thakur			
Chemical Name		Sodium Bicarbonate			

2. HAZARD IDENTIFICATION

Hazard Classification	NFPA Classification: Health Hazard: 2 Fire Hazard: 0 Reactive Hazard: 1 Special Hazard:
LABEL ELEMENTS	<u>HAZARD PICTOGRAMS</u>  GHS07
Signal word	Danger
Hazard statement	
Precautionary statement	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.3

Revision Date 08.02.2022

Print Date 13.05.2024

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Sodium bicarbonate

Product Number : S5761

Brand : Sigma

REACH No. : 01-2119457606-32-XXXX

CAS-No. : 144-55-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Chemical Pvt Limited
Industrial Area, Anekal Taluka
Plot No 12,
12 Bommasandra - Jigani Link Road
560100 BANGALORE
INDIA

1.4 Emergency telephone

Emergency Phone # : 000 800 1007 141 (CHEMTREC)

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients**3.1 Substances**

Sigma- S5761

Page 1 of 8

The life science business of Merck operates as MilliporeSigma in the US and Canada



Material Safety Data Sheet(MSDS) -

Sodium hexametaphosphate

1. Chemical Product and Company Identification

Product Name : Sodium hexametaphosphate
Catalog Codes : SLS2209
CAS# : 10124-56-8 or 68915-31-1
RTECS : OY3675000
TSCA : TSCA 8(b) inventory: Sodium hexametaphosphate
CI# : Not available.
Synonym : Calgon, HMP, Medi-Calgon, SHMP; Sodium Polyphosphates; Glassy; Sodium Polymetaphosphate; Sodium phosphate glass; Polyphosphoric Acids, sodium salts
Chemical Name: Metaphosphoric Acid, hexasodium salt
Chemical Formula: (NaPO₃)_n or (NaPO₃)*6 or O18-P6.6Na

COMPANY IDENTIFICATION

Supplier: Pure Chemicals Group.
 CHENNAI, TAMILNADU, INDIA
24 Hour Health Emergency (91) 8939878447
 (91) 9444038694
Transportation Emergency Phone (91) 8939768680

Company Name	Place	EMERGENCY TELEPHONE NUMBER
Pure Chemicals Group.	India	Day Emergency - 044-26161803-26161809

2. Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hexametaphosphate	10124-56-8 or	100
	68915-31-1	

Toxicological Data on Ingredients: Sodium hexametaphosphate: ORAL (LD50):
 Acute: 6200 mg/kg [Rat], 4320 mg/kg [Mouse], 3053 mg/kg [Rat].

Material Safety Data Sheet for SODIUM HYDROXIDE

LOS ANGELES CHEMICAL -- SODIUM HYDROXIDE, 50% LIQUID - SODIUM HYDROXIDE,
TECHNICAL
MATERIAL SAFETY DATA SHEET
NSN: 6810001746581
Manufacturer's CAGE: 75656
Part No. Indicator: A
Part Number/Trade Name: SODIUM HYDROXIDE, 50% LIQUID

General Information

Item Name: SODIUM HYDROXIDE, TECHNICAL
Company's Name: LOS ANGELES CHEMICAL CO
Company's Street: 4545 ARDINE STREET
Company's P. O. Box: 1987
Company's City: SOUTH GATE
Company's State: CA
Company's Country: US
Company's Zip Code: 90280
Company's Emerg Ph #: 800-424-9305/800-356-3129 POISON CT
Company's Info Ph #: 213-562-9500
Record No. For Safety Entry: 022
Tot Safety Entries This Stk#: 025
Status: SH
Date MSDS Prepared: 18FEB93
Safety Data Review Date: 07NOV94
Supply Item Manager: GSA
MSDS Preparer's Name: M GANNON
Preparer's Company: LOS ANGELES CHEMICAL CO
Preparer's St Gr P. O. Box: 4545 ARDINE STREET; PO BOX 1987
Preparer's City: SOUTH GATE
Preparer's State: CA
Preparer's Zip Code: 90280
MSDS Serial Number: BVYGV
Specification Number: A-A-895
Hazard Characteristic Code: NX
Unit Of Issue: DR
Unit Of Issue Container Qty: 100 LB DR
Type Of Container: METAL

Ingredients/Identity Information

Proprietary: NO
Ingredient: SODIUM HYDROXIDE (CA 50% WATER SOLUTION)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: WB4900000
CAS Number: 1310-73-2
OSHA PEL: 2 MG/M3 (CEILING)
ACGIH TLV: 2 MG/M3 (CEILING)
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: ODORLESS, CLEAR LIQUID
Boiling Point: 284F, 140C

SAFETY DATA SHEET

Creation Date: 20-Jun-2011

Revision Date: 20-Apr-2022

Revision Number: 7

1. Identification

Product Name Sodium perborate tetrahydrate

Cat No. : AC223200000; AC223200010; AC223200050; AC223200250;
AC223202500

CAS No 10486-00-7

Synonyms No information available

Recommended Use Laboratory chemicals.

Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company	Acros Organics
Fisher Scientific Company	One Reagent Lane
One Reagent Lane	Fair Lawn, NJ 07410
Fair Lawn, NJ 07410	
Tel: (201) 796-7100	

Emergency Telephone Number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11

Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99

CHEMTREC Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-627-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Serious Eye Damage/Eye Irritation	Category 1
Reproductive Toxicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes serious eye damage



Coal Tar Pitch Solid

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations
Date of Issue: 09/02/2020

Version: 1.0

SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Substance

Product Name: Coal Tar Pitch Solid

Chemical Name: Pitch, coal tar

CAS-No.: 65996-92-1

Synonyms: Binder pitch, binder pitch blend, impregnation pitch, impregnation pitch blend, 23 soft pitch, 925 pitch, 425 pitch, 80 pitch, 15 vac pitch, electrode binder

1.2. Intended Use of the Product

Use of the Substance/Mixture: Waterproofing; roofing; specialty carbon products

1.3. Name, Address, and Telephone of the Responsible Party

Company

Lone Star Specialty Products, LLC

6412 U.S. Highway 259 South

Lone Star, TX 75668 USA

Phone #: 903-656-2536

Fax #: 903-656-2151

www.lonestarspecialties.net

1.4. Emergency Telephone Number

Emergency Number : 800-424-9300 (CHEMTREC)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

Skin Irrit. 2 H315

Skin Sens. 1 H317

Muta. 1B H340

Carc. 1B H350

Repr. 2 H361

Aquatic Acute 1 H400

Aquatic Chronic 1 H410

Comb. Dust

Full text of hazard classes and H-statements : see section 16

2.2. Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US)



Signal Word (GHS-US)

: Danger

Hazard Statements (GHS-US)

: May form combustible dust concentrations in air.
H315 - Causes skin irritation.
H317 - May cause an allergic skin reaction.
H340 - May cause genetic defects.
H350 - May cause cancer.
H361 - Suspected of damaging fertility or the unborn child.
H400 - Very toxic to aquatic life.
H410 - Very toxic to aquatic life with long lasting effects.

Precautionary Statements (GHS-US)

: P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P261 - Avoid breathing dust, vapors.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P272 - Contaminated work clothing must not be allowed out of the workplace.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, and eye protection.
P302+P352 - If on skin: Wash with plenty of water.
P308+P313 - If exposed or concerned: Get medical advice/attention.

09/02/2020

EN (English US)

1/10



SAFETY DATA SHEET

Coal Tar Pitch Solid

1/24/2019 ver 8

SOS No. 8

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Coal Tar Pitch Solid		
Chemical Name:	Pitch, coal tar	Synonyms:	Binder pitch, Binder pitch blend, impregnation pitch solid, impregnation pitch blend solid, 925 pitch, 425 pitch, 100 pitch, 80 pitch, 15 Vac pitch, 30 Medium pitch
CAS Number:	65986-92-1	Product Use:	waterproofing; roofing; specialty carbon products
Manufacturer Information:	Lone Star Specialties, LLC 6412 U.S. HWY 259 S Lone Star, Texas USA 75688	Emergency Phone Number (24 hr.): (800) 424-9300 CHEMTREC Non-Emergency Phone Number: (903)656-2536 Non-Emergency Fax Number: (903)656-2151	

SECTION 2: HAZARDS IDENTIFICATION

Emergency Overview:

A black solid with a slight aromatic odor, which intensifies into a tarry odor upon melting.
Carcinogen, Toxic, Irritant, Sensitizer (skin).

Signs and Symptoms of Potential Overexposure:

Coal tar pitch vapors and dust are irritating to the skin, eyes and respiratory tract. Direct skin contact with coal tar pitch dust and/or high vapor concentrations may cause burning and itching, changes in pigmentation, and skin eruptions. When accentuated by sunlight, skin exposure may result in a phototoxic skin reaction. Direct eye contact with the dust may cause inflammation, discomfort, conjunctivitis, and possible abrasion of the cornea. In general, acute oral toxicity is expected to be moderate, but ingestion is not likely to be a primary route of exposure. Symptoms of systemic poisoning after ingestion of other coal tar products include salivation, nausea, vomiting, and abdominal discomfort, respiratory difficulties, dizziness, and headache, loss of pupillary reflex, cyanosis, hypothermia, and mild convulsions. It is assumed that ingestion of pitch would produce similar symptoms. Care should be taken to ensure that exposure limits for dust are not exceeded if pitch dust is present (OSHA PEL for particulates = 15 mg/m³ for total dust; 5 mg/m³ for respirable fraction).



Primary Route(s) of Entry:

skin contact, skin absorption, eye contact, inhalation, ingestion

Medical Conditions

Persons with pre-existing skin disorders or central nervous functional illnesses may be at increased risk from overexposure. Exposure to vapors may aggravate pre-existing lung conditions. This is not likely to be a problem when appropriate procedures are used to minimize exposure.

Aggravated by Exposure:

SECTION 3: COMPOSITION AND INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Concentration (%)	Exposure Limits	
			OSHA PEL	ACGIH TLV
Coal Tar Pitch	65986-92-1	100 %	0.2 mg/m ³ as 8-hr TWA (for coal tar pitch volatiles)	0.2 mg/m ³ as 8-hr TWA (for coal tar pitch volatiles)

SECTION 4: FIRST AID MEASURES

Skin Contact:

For contact with solid pitch, remove contaminated clothing and wash exposed area twice with waterless hand cleaner, soap and water, or a mild detergent. Do not use solvents on skin, as they may promote absorption of this material. The exposed area should be examined by medical personnel if irritation or pain persists after washing.

Eye Contact:

Rinse eyes immediately with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. GET MEDICAL ATTENTION.

Inhalation:

Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION.

SAFETY DATA SHEET

Creation Date: 22-Sep-2009

Revision Date: 03-Nov-2023

Revision Number: 6

1. Identification

Product Name Tin(IV) oxide
Cat No. : AC223680000; AC223681000; AC223685000
CAS No 18282-10-5
Synonyms Stannic oxide
Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company	
Fisher Scientific Company	Acros Organics
One Reagent Lane	One Reagent Lane
Fair Lawn, NJ 07410	Fair Lawn, NJ 07410
Tel: (201) 796-7100	

Emergency Telephone Number

For information **US** call: 001-800-227-6701 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No. **US**:001-800-424-9300 / **Europe**:001-703-527-3887

2. Hazard(s) identification

Classification

Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

None required

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients

SAFETY DATA SHEET

spectrum®



Revision date 17-May-2022

Revision Number 2

1. Identification

Product identifier

Product Name TITANIUM DIOXIDE, USP

Other means of identification

Product Code(s) TI140

Synonyms None

Recommended use of the chemical and restrictions on use

Recommended use No information available

Restrictions on use No information available

Details of the supplier of the safety data sheet

Supplier Address

Spectrum Chemical Mfg. Corp.
14422 South San Pedro St.
Gardena, CA 90248
(310) 518-8000

Emergency telephone number

Emergency Telephone Chemtrec 1-800-424-9300

2. Hazard(s) identification

Classification

Carcinogenicity Category 2

Hazards not otherwise classified (HNOC)

Not applicable

Label elements

Warning

Hazard statements

Suspected of causing cancer

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: TUNGSTEN (VI) OXIDE

CAS number: 1314-35-8

EINECS number: 215-231-4

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of substance / mixture: PC21: Laboratory chemicals, PROC15: Use as laboratory reagent

1.3. Details of the supplier of the safety data sheet

Company name: Elemental Microanalysis Ltd
1 Hameidown Road Okehampton
Okehampton
Devon
EX20 1UB
United Kingdom

Tel: 44(0)183754446

Fax: 44(0)183754544

Email: info@microanalysis.co.uk

1.4. Emergency telephone number

Emergency tel: +44 (0) 7990 767375
(office hours only)

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CLP: This product has no classification under CLP.

2.2. Label elements

Label elements: * This product has no label elements.

2.3. Other hazards

PBT: This product is not identified as a PBT/vPvB substance.

Section 3: Composition/information on ingredients

3.1. Substances

Chemical identity: TUNGSTEN (VI) OXIDE

CAS number: 1314-35-8

[cont...]



LTS Research Laboratories, Inc.
Safety Data Sheet
Vanadium Pentoxide

1. Product and Company Identification

Trade Name:	Vanadium pentoxide
Chemical Formula:	V_2O_5
Recommended Use:	Scientific research and development
Manufacturer/Supplier:	LTS Research Laboratories, Inc.
Street:	2001 Onks Pkwy
City:	Charlotte
State:	North Carolina
Zip Code:	28012
Country:	USA
Tel #:	855-587-2436 / 855-lts-chem
24-Hour Emergency Contact:	800-424-9300 (US & Canada) +1-703-527-3887 (International)

2. Hazards Identification

Signal Word: Danger



Hazard Statements:

H302 + H332: Harmful if swallowed or if inhaled
H318: Causes serious eye damage
H341: Suspected of causing genetic defects
H351: Suspected of causing cancer
H361: Suspected of damaging fertility or the unborn child
H372: Causes damage to organs (Respiratory Tract) through prolonged or repeated exposure if inhaled
H400: Very toxic to aquatic life
H411: Toxic to aquatic life with long lasting effects

Precautionary Statements:

P202: Do not handle until all safety precautions have been read and understood
P260: Do not breathe dust/fume/gas/mist/vapors/spray
P264: Wash face, hands, and any exposed skin thoroughly after handling
P270: Do not eat, drink, or smoke when using this product
P271: Use only outdoors or in a well-ventilated area
P273: Avoid release to the environment
P280: Wear protective gloves/ protective clothing/ eye protection/ face protection
P281: Use personal protective equipment as required
P301 + P312 + P330: IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth
P304 + P340 + P312: IF INHALED: Remove victim to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell
P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.

Zochem LLC (Zochem South)
600 Printwood Drive
Dickson, TN 37055, USA
CustomerService@Zochem.com
PHONE (615) 446-8791
FAX (615) 446-8789
www.zochem.com



Zochem ULC (Zochem North)
1 Tilbury Court, Brampton
Ontario, L6T 3T4, Canada
CustomerCare@Zochem.com
PHONE (800) 324-1806
FAX (905) 453-2920
www.zochem.com

SAFETY DATA SHEET

ZINC OXIDE

This SDS Compliant for use in P.R.C., Japan, Republic of Korea (ROK), Singapore and where zinc oxide is transportation regulated. This SDS is **not** valid in North America, Europe and most other jurisdictions where ZnO is not transportation regulated.

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product name: ZINC OXIDE

Product Code: This SDS is valid for all zinc oxide product codes or grades

Synonyms: Chinese white

1.2 Relevant identified uses of the substance/mixture and uses advised against:

Common uses include:

- Rubber compound
- Coloring agents, pigments
- Food/feedstuff additives
- Fuels and fuel additives
- Intermediates
- Laboratory chemicals
- Lubricants and lubricant additives
- Plating agents and metal surface treating agents
- Process regulators, other than polymerization or vulcanization processes
- Component in batteries
- Corrosion inhibitors and anti-scaling agents
- Fertilizers
- Pharmaceutical substance
- Photosensitive agents and other photo-chemicals
- Process regulators, used in vulcanization or polymerization processes
- Processing aid, not otherwise listed
- Semiconductors

No uses advised against

1.3 Manufacturer/Supplier of the safety data sheet: (website: www.zochem.com)

Zochem LLC (South Plant) (Responsible Party)	Zochem ULC (North Plant)
600 Printwood Drive	1 Tilbury Court, Brampton,
Dickson, TN 37055-3010 U.S.A.	ON, Canada, L6T 3T4
Phone: +1 615 446 8791	+1 800 324 1806
Contact: John Stourac +1 312-813-4620	Contact: Khalid Abdullah +1 905-453-4100 x4229

1.4 Emergency phone numbers (+1): 312-813-4620, 901-833-2118, 905-453-4100, 905-453-6477

SDS: Zinc Oxide. Page 1 of 8. Effective 07April2021

Safety data sheet Safety data sheet

acc. to Regulation (EC) No. 1907/2006 (REACH)



Zinc sulphate heptahydrate ≥97 %, extra pure

article number: **7316**

Version: **6.0 en**

Replaces version of: 2022-11-02

Version: (5)

date of compilation: 2016-03-30

Revision: 2024-03-01

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product Identifier

Identification of the substance	Zinc sulphate heptahydrate ≥97 %, extra pure
Article number	7316
Index No (GB CLP)	030-006-00-9
EC number	231-793-3
CAS number	7446-20-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses:	Laboratory chemical Laboratory and analytical use
Uses advised against:	Do not use for private purposes (household). Food, drink and animal feedingstuffs.

1.3 Details of the supplier of the safety data sheet

Carl Roth GmbH + Co. KG
Schoemperlenstr. 3-5
D-76185 Karlsruhe
Germany

Telephone: +49 (0) 721 - 56 06 0

Telefax: +49 (0) 721 - 56 06 149

e-mail: sicherheit@carlroth.de

Website: www.carlroth.de

Competent person responsible for the safety data sheet: Department Health, Safety and Environment

e-mail (competent person): sicherheit@carlroth.de

1.4 Emergency telephone number

Name	Street	Postal code/city	Telephone	Website
National Poisons Information Service City Hospital	Dudley Rd	B187QH Birmingham	844 892 0111	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification acc. to GHS

ANNEXURE X
Raw data of AAQ measurement for 12 weeks

CODE	DATE	LOCATION	PM10, µg/m3	PM2.5, µg/m3	SO2, µg/m3	NO2, µg/m3	CO, mg/m3
AAQ1	01-Mar-25	Project Site	43.10	21.55	7.20	11.34	< 0.2
AAQ2		Amayapuram	56.80	28.40	6.50	12.24	< 0.2
AAQ3		Manapparai	40.10	20.05	5.90	10.80	< 0.2
AAQ4	03-Mar-25	Periapatty	45.60	22.80	6.10	12.96	< 0.2
AAQ5		Kalarampatty	51.70	25.85	5.80	11.70	< 0.2
AAQ6		Samudram	46.30	23.15	6.20	10.62	< 0.2
AAQ7	04-Mar-25	Porundalur	44.70	22.35	6.70	10.98	< 0.2
AAQ8		Rajalipatty	53.40	26.70	5.90	10.44	< 0.2
AAQ1	05-Mar-25	Project Site	42.10	21.05	7.10	11.16	< 0.2
AAQ2		Amayapuram	55.80	27.90	6.40	12.06	< 0.2
AAQ3		Manapparai	39.10	19.55	5.80	10.62	< 0.2
AAQ4	06-Mar-25	Periapatty	44.60	22.30	6.10	12.78	< 0.2
AAQ5		Kalarampatty	50.70	25.35	5.70	11.52	< 0.2
AAQ6		Samudram	45.30	22.65	6.50	10.44	< 0.2
AAQ7	07-Mar-25	Porundalur	44.50	22.25	7.00	10.98	< 0.2
AAQ8		Rajalipatty	52.40	26.20	6.20	10.26	< 0.2
AAQ1	08-Mar-25	Project Site	45.10	22.55	7.40	11.70	< 0.2
AAQ2		Amayapuram	58.80	29.40	6.70	12.60	< 0.2
AAQ3		Manapparai	42.10	21.05	6.10	11.16	< 0.2
AAQ4	10-Mar-25	Periapatty	47.60	23.80	6.30	13.32	< 0.2
AAQ5		Kalarampatty	53.70	26.85	6.00	12.06	< 0.2
AAQ6		Samudram	48.30	24.15	6.50	10.98	< 0.2
AAQ7	11-Mar-25	Porundalur	46.70	23.35	6.70	11.34	< 0.2
AAQ8		Rajalipatty	55.40	27.70	5.90	10.80	< 0.2
AAQ1	12-Mar-25	Project Site	45.10	22.55	7.10	11.70	< 0.2
AAQ2		Amayapuram	56.00	28.00	6.40	12.06	< 0.2
AAQ3		Manapparai	39.30	19.65	5.80	10.62	< 0.2
AAQ4	13-Mar-25	Periapatty	44.80	22.40	6.00	12.78	< 0.2
AAQ5		Kalarampatty	50.90	25.45	5.70	11.52	< 0.2
AAQ6		Samudram	45.50	22.75	6.40	10.44	< 0.2
AAQ7	14-Mar-25	Porundalur	43.90	21.95	6.90	10.80	< 0.2
AAQ8		Rajalipatty	52.60	26.30	6.10	10.26	< 0.2
AAQ1	15-Mar-25	Project Site	44.10	22.05	7.30	11.52	< 0.2
AAQ2		Amayapuram	57.80	28.90	6.60	12.42	< 0.2
AAQ3		Manapparai	41.10	20.55	6.00	10.98	< 0.2
AAQ4	17-Mar-25	Periapatty	46.60	23.30	6.20	13.14	< 0.2
AAQ5		Kalarampatty	52.70	26.35	5.90	11.88	< 0.2
AAQ6		Samudram	47.30	23.65	6.40	10.80	< 0.2
AAQ7	18-Mar-25	Porundalur	45.70	22.85	6.90	11.16	< 0.2
AAQ8		Rajalipatty	54.40	27.20	6.10	10.62	< 0.2

CODE	DATE	LOCATION	PM10, µg/m3	PM2.5, µg/m3	SO2, µg/m3	NO2, µg/m3	CO, mg/m3
AAQ1	19-Mar-25	Project Site	44.10	22.05	7.50	11.52	< 0.2
AAQ2		Amayapuram	57.80	28.90	6.80	12.42	< 0.2
AAQ3		Manapparai	41.10	20.55	6.20	10.98	< 0.2
AAQ4	20-Mar-25	Periapatty	48.60	24.30	6.40	13.50	< 0.2
AAQ5		Kalarampatty	54.70	27.35	6.10	12.24	< 0.2
AAQ6		Samudram	49.30	24.65	6.60	11.16	< 0.2
AAQ7	21-Mar-25	Porundalur	47.70	23.85	7.10	11.52	< 0.2
AAQ8		Rajalipatty	56.40	28.20	6.30	10.98	< 0.2
AAQ1	22-Mar-25	Project Site	46.10	23.05	7.50	11.88	< 0.2
AAQ2		Amayapuram	59.80	29.90	6.80	12.78	< 0.2
AAQ3		Manapparai	43.10	21.55	6.20	11.34	< 0.2
AAQ4	24-Mar-25	Periapatty	48.60	24.30	6.40	13.50	< 0.2
AAQ5		Kalarampatty	54.70	27.35	6.10	12.24	< 0.2
AAQ6		Samudram	49.30	24.65	6.60	11.16	< 0.2
AAQ7	25-Mar-25	Porundalur	47.70	23.85	7.10	11.52	< 0.2
AAQ8		Rajalipatty	56.40	28.20	5.90	10.98	< 0.2
AAQ1	26-Mar-25	Project Site	46.10	23.05	7.10	11.88	< 0.2
AAQ2		Amayapuram	59.80	29.90	6.40	12.78	< 0.2
AAQ3		Manapparai	39.40	19.70	5.80	10.62	< 0.2
AAQ4	27-Mar-25	Periapatty	44.90	22.45	6.00	12.78	< 0.2
AAQ5		Kalarampatty	51.00	25.50	5.70	11.52	< 0.2
AAQ6		Samudram	45.60	22.80	6.20	10.44	< 0.2
AAQ7	28-Mar-25	Porundalur	44.00	22.00	6.70	10.80	< 0.2
AAQ8		Rajalipatty	52.70	26.35	5.90	10.26	< 0.2
AAQ1	29-Mar-25	Project Site	42.40	21.20	7.10	11.16	< 0.2
AAQ2		Amayapuram	56.10	28.05	6.40	12.06	< 0.2
AAQ3		Manapparai	39.40	19.70	5.80	10.62	< 0.2
AAQ4	31-Mar-25	Periapatty	44.90	22.45	6.00	12.78	< 0.2
AAQ5		Kalarampatty	51.00	25.50	5.70	11.52	< 0.2
AAQ6		Samudram	45.60	22.80	6.20	10.44	< 0.2
AAQ7	01-Apr-25	Porundalur	44.00	22.00	6.70	10.80	< 0.2
AAQ8		Rajalipatty	52.70	26.35	5.90	10.26	< 0.2
AAQ1	02-Apr-25	Project Site	42.40	21.20	7.10	11.16	< 0.2
AAQ2		Amayapuram	56.10	28.05	6.40	12.06	< 0.2
AAQ3		Manapparai	39.40	19.70	5.80	10.62	< 0.2
AAQ4	03-Apr-25	Periapatty	44.60	22.30	6.00	12.78	< 0.2
AAQ5		Kalarampatty	50.70	25.35	5.70	11.52	< 0.2
AAQ6		Samudram	45.30	22.65	6.20	10.44	< 0.2
AAQ7	04-Apr-25	Porundalur	43.70	21.85	6.70	10.80	< 0.2
AAQ8		Rajalipatty	52.40	26.20	5.90	10.26	< 0.2
AAQ1	05-Apr-25	Project Site	42.10	21.05	7.10	11.16	< 0.2
AAQ2		Amayapuram	55.80	27.90	6.40	12.06	< 0.2
AAQ3		Manapparai	39.10	19.55	5.80	10.62	< 0.2

CODE	DATE	LOCATION	PM10, µg/m3	PM2.5, µg/m3	SO2, µg/m3	NO2, µg/m3	CO, mg/m3
AAQ4	07-Apr-25	Periapatty	44.60	22.30	6.00	12.78	< 0.2
AAQ5		Kalarampatty	50.70	25.35	5.90	11.52	< 0.2
AAQ6		Samudram	45.30	22.65	6.40	10.44	< 0.2
AAQ7	08-Apr-25	Porundalur	43.70	21.85	6.90	10.80	< 0.2
AAQ8		Rajalipatty	54.60	27.30	6.10	10.62	< 0.2
AAQ1	09-Apr-25	Project Site	44.30	22.15	7.30	11.52	< 0.2
AAQ2		Amayapuram	58.00	29.00	6.60	12.42	< 0.2
AAQ3		Manapparai	41.30	20.65	6.00	10.98	< 0.2
AAQ4	10-Apr-25	Periapatty	46.80	23.40	6.20	13.14	< 0.2
AAQ5		Kalarampatty	52.90	26.45	5.90	11.88	< 0.2
AAQ6		Samudram	47.50	23.75	6.40	10.80	< 0.2
AAQ7	11-Apr-25	Porundalur	45.90	22.95	6.90	11.16	< 0.2
AAQ8		Rajalipatty	54.60	27.30	6.10	10.62	< 0.2
AAQ1	12-Apr-25	Project Site	44.30	22.15	7.10	11.52	< 0.2
AAQ2		Amayapuram	58.00	29.00	6.40	12.42	< 0.2
AAQ3		Manapparai	41.30	20.65	5.80	10.98	< 0.2
AAQ4	15-Apr-25	Periapatty	44.30	22.15	6.10	12.78	< 0.2
AAQ5		Kalarampatty	50.40	25.20	5.80	11.52	< 0.2
AAQ6		Samudram	45.00	22.50	6.30	10.44	< 0.2
AAQ7	16-Apr-25	Porundalur	44.40	22.20	6.80	10.98	< 0.2
AAQ8		Rajalipatty	53.10	26.55	6.00	10.44	< 0.2
AAQ1	17-Apr-25	Project Site	42.80	21.40	7.20	11.34	< 0.2
AAQ2		Amayapuram	56.50	28.25	6.50	12.24	< 0.2
AAQ3		Manapparai	39.80	19.90	5.90	10.80	< 0.2
AAQ4	18-Apr-25	Periapatty	45.30	22.65	6.10	12.96	< 0.2
AAQ5		Kalarampatty	51.40	25.70	5.80	11.70	< 0.2
AAQ6		Samudram	46.00	23.00	6.30	10.62	< 0.2
AAQ7	19-Apr-25	Porundalur	44.40	22.20	6.80	10.98	< 0.2
AAQ8		Rajalipatty	53.10	26.55	6.00	10.44	< 0.2
AAQ1	21-Apr-25	Project Site	42.80	21.40	7.20	11.34	< 0.2
AAQ2		Amayapuram	56.50	28.25	6.50	12.24	< 0.2
AAQ3		Manapparai	39.80	19.90	5.90	10.80	< 0.2
AAQ4	22-Apr-25	Periapatty	45.30	22.65	6.10	12.96	< 0.2
AAQ5		Kalarampatty	51.40	25.70	5.80	11.70	< 0.2
AAQ6		Samudram	46.00	23.00	6.30	10.62	< 0.2
AAQ7	23-Apr-25	Porundalur	44.40	22.20	6.80	10.98	< 0.2
AAQ8		Rajalipatty	53.10	26.55	6.00	10.44	< 0.2
AAQ1	24-Apr-25	Project Site	42.80	21.40	7.20	11.34	< 0.2
AAQ2		Amayapuram	56.60	28.30	6.50	12.24	< 0.2
AAQ3		Manapparai	39.90	19.95	5.90	10.80	< 0.2
AAQ4	25-Apr-25	Periapatty	45.40	22.70	6.10	12.96	< 0.2
AAQ5		Kalarampatty	51.50	25.75	5.80	11.70	< 0.2
AAQ6		Samudram	46.10	23.05	6.30	10.62	< 0.2

CODE	DATE	LOCATION	PM10, µg/m3	PM2.5, µg/m3	SO2, µg/m3	NO2, µg/m3	CO, mg/m3
AAQ7	26-Apr-25	Porundalur	44.50	22.25	6.80	10.98	< 0.2
AAQ8		Rajalipatty	53.20	26.60	6.00	10.44	< 0.2
AAQ1	28-Apr-25	Project Site	42.90	21.45	7.20	11.34	< 0.2
AAQ2		Amayapuram	56.60	28.30	6.50	12.24	< 0.2
AAQ3		Manapparai	39.90	19.95	6.20	10.80	< 0.2
AAQ4	29-Apr-25	Periapatty	45.40	22.70	6.40	12.96	< 0.2
AAQ5		Kalarampatty	51.50	25.75	6.10	11.70	< 0.2
AAQ6		Samudram	49.40	24.70	6.60	11.16	< 0.2
AAQ7	30-Apr-25	Porundalur	47.80	23.90	7.10	11.52	< 0.2
AAQ8		Rajalipatty	56.50	28.25	6.30	10.98	< 0.2
AAQ1	02-May-25	Project Site	46.20	23.10	7.50	11.88	< 0.2
AAQ2		Amayapuram	59.90	29.95	6.80	12.78	< 0.2
AAQ3		Manapparai	43.20	21.60	6.20	11.34	< 0.2
AAQ4	03-May-25	Periapatty	48.70	24.35	6.40	13.50	< 0.2
AAQ5		Kalarampatty	54.80	27.40	6.10	12.24	< 0.2
AAQ6		Samudram	49.40	24.70	6.60	11.16	< 0.2
AAQ7	05-May-25	Porundalur	47.80	23.90	7.10	11.52	< 0.2
AAQ8		Rajalipatty	56.50	28.25	6.30	10.98	< 0.2
AAQ1	06-May-25	Project Site	46.20	23.10	7.50	11.88	< 0.2
AAQ2		Amayapuram	59.90	29.95	6.80	12.78	< 0.2
AAQ3		Manapparai	43.20	21.60	6.20	11.34	< 0.2
AAQ4	07-May-25	Periapatty	48.70	24.35	6.40	13.50	< 0.2
AAQ5		Kalarampatty	54.80	27.40	6.10	12.24	< 0.2
AAQ6		Samudram	49.40	24.70	6.60	11.16	< 0.2
AAQ7	08-May-25	Porundalur	47.80	23.90	7.10	11.52	< 0.2
AAQ8		Rajalipatty	56.50	28.25	6.30	10.98	< 0.2
AAQ1	09-May-25	Project Site	46.20	23.10	7.50	11.88	< 0.2
AAQ2		Amayapuram	59.90	29.95	6.80	12.78	< 0.2
AAQ3		Manapparai	43.20	21.60	6.20	11.34	< 0.2
AAQ4	10-May-25	Periapatty	48.70	24.35	6.40	13.50	< 0.2
AAQ5		Kalarampatty	54.80	27.40	6.10	12.24	< 0.2
AAQ6		Samudram	49.40	24.70	6.40	11.16	< 0.2
AAQ7	12-May-25	Porundalur	47.80	23.90	6.90	11.52	< 0.2
AAQ8		Rajalipatty	56.50	28.25	6.10	10.98	< 0.2
AAQ1	13-May-25	Project Site	44.20	22.10	7.30	11.52	< 0.2
AAQ2		Amayapuram	57.90	28.95	6.60	12.42	< 0.2
AAQ3		Manapparai	41.20	20.60	6.00	10.98	< 0.2
AAQ4	14-May-25	Periapatty	46.70	23.35	6.20	13.14	< 0.2
AAQ5		Kalarampatty	52.80	26.40	5.90	11.88	< 0.2
AAQ6		Samudram	47.40	23.70	6.40	10.80	< 0.2
AAQ7	15-May-25	Porundalur	45.80	22.90	6.90	11.16	< 0.2
AAQ8		Rajalipatty	54.50	27.25	6.10	10.62	< 0.2
AAQ1	16-May-25	Project Site	44.20	22.10	7.30	11.52	< 0.2

CODE	DATE	LOCATION	PM10, µg/m3	PM2.5, µg/m3	SO2, µg/m3	NO2, µg/m3	CO, mg/m3
AAQ2		Amayapuram	57.90	28.95	6.60	12.42	< 0.2
AAQ3		Manapparai	41.20	20.60	6.00	10.98	< 0.2
AAQ4	17-May-25	Periapatty	46.70	23.35	6.20	13.14	< 0.2
AAQ5		Kalarampatty	52.80	26.40	5.90	11.88	< 0.2
AAQ6		Samudram	47.40	23.70	6.40	10.80	< 0.2
AAQ7	19-May-25	Porundalur	45.80	22.90	7.00	11.16	< 0.2
AAQ8		Rajalipatty	54.50	27.25	6.20	10.62	< 0.2
AAQ1	20-May-25	Project Site	44.20	22.10	7.40	11.52	< 0.2
AAQ2		Amayapuram	59.00	29.50	6.70	12.60	< 0.2
AAQ3		Manapparai	42.30	21.15	6.10	11.16	< 0.2
AAQ4	21-May-25	Periapatty	47.80	23.90	6.30	13.32	< 0.2
AAQ5		Kalarampatty	53.90	26.95	6.00	12.06	< 0.2
AAQ6		Samudram	48.50	24.25	6.50	10.98	< 0.2
AAQ7	22-May-25	Porundalur	46.90	23.45	7.00	11.34	< 0.2
AAQ8		Rajalipatty	55.60	27.80	6.10	10.80	< 0.2
AAQ1	23-May-25	Project Site	45.30	22.65	7.30	11.70	< 0.2
AAQ2		Amayapuram	59.00	29.50	6.60	12.60	< 0.2
AAQ3		Manapparai	41.10	20.55	6.00	10.98	< 0.2
AAQ4	24-May-25	Periapatty	46.60	23.30	6.20	13.14	< 0.2
AAQ5		Kalarampatty	52.70	26.35	5.90	11.88	< 0.2
AAQ6		Samudram	47.30	23.65	6.40	10.80	< 0.2
AAQ7	26-May-25	Porundalur	45.70	22.85	6.90	11.16	< 0.2
AAQ8		Rajalipatty	54.40	27.20	6.10	10.62	< 0.2
AAQ1	27-May-25	Project Site	44.10	22.05	7.30	11.52	< 0.2
AAQ2		Amayapuram	57.80	28.90	6.50	12.42	< 0.2
AAQ3		Manapparai	41.10	20.55	5.90	10.98	< 0.2
AAQ4	28-May-25	Periapatty	46.60	23.30	6.10	13.14	< 0.2
AAQ5		Kalarampatty	51.60	25.80	5.80	11.70	< 0.2
AAQ6		Samudram	46.20	23.10	6.30	10.62	< 0.2
AAQ7	29-May-25	Porundalur	44.60	22.30	6.80	10.98	< 0.2
AAQ8		Rajalipatty	53.30	26.65	6.00	10.44	< 0.2
AAQ1	30-May-25	Project Site	43.00	21.50	7.20	11.34	< 0.2
AAQ2		Amayapuram	56.70	28.35	6.50	12.24	< 0.2
AAQ3		Manapparai	40.00	20.00	5.90	10.80	< 0.2
AAQ4	31-May-25	Periapatty	45.50	22.75	6.40	12.96	< 0.2
AAQ5		Kalarampatty	51.60	25.80	6.10	11.70	< 0.2
AAQ6		Samudram	46.20	23.10	4.9	10.62	< 0.2
AAQ7	01-Jun-25	Porundalur	47.80	23.90	5.4	11.52	< 0.2
AAQ8		Rajalipatty	56.50	28.25	5.1	10.98	< 0.2