

**DRAFT ENVIRONMENTAL IMPACT ASSESSMENT
REPORT**

For

**BLACK GRANITE QUARRY
OVER AN EXTENT OF 20.95.5 Ha**

At

Survey No: 1193/1(Part-5) & 1193/1(Part-16)

Village: Kodakkal

Taluk: Sholinghur

District: Ranipet

State: Tamil Nadu

By



M/s. Tamil Nadu Minerals Limited

(Project termed under Schedule 1(a) Mining of Minerals 'B1' category as per EIA

Notification 2006 & 14.08.2018 and its Amendments and O.M

EIA Consultant

HUBERT ENVIRO CARE SYSTEMS (P) LTD, CHENNAI

April 2023

ACKNOWLEDGEMENT

The following personnel are gratefully acknowledged for their fullest support in collection, compilation of needful data regarding the project and kind cooperation in fulfilling the report on Environmental Impact Assessment (EIA) report of Black Granite Quarry, over an extent of 20.95.5 Ha at S.F. 1193/1 (Part-5) & 1193/1 (Part-16) at Kodakkal village, Sholinghur taluk, Ranipet District, Tamilnadu State.

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Declaration by the Project Proponent

I, Dr. E Ganesan, Deputy Manager (ML) of M/s Tamil Nadu Minerals Limited, declaration/undertaking that owing the contents (information and data) of the EIA report preparation has been undertaken in the compliance with Terms of Reference (ToR) for the “**Black Granite Quarry over the extent of 20.95.5 Hectares at S.F. 1193/1 (Part-5) &1193/1(Part-16) at Kodakkal village, Sholinghur Taluk, Ranipet District, Tamil Nadu State.**” and the information and content provided in the report are factually correct.

for Tamil Nadu Minerals Ltd,


Authorised signatory
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TAMIN - Chennai

Declaration by the Head of the Accredited Consultant Organization

I, Dr.J.R. Moses, hereby, confirm that the below mentioned experts prepared the EIA/EMP report for “**Black Granite Quarry over the extent of 20.95.5 Hectares at S.F. 1193/1 (Part-5) &1193/1 (Part-16) at Kodakkal village, Sholinghur Taluk, Ranipet District, Tamil Nadu State**”. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.



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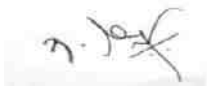
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Declaration of Experts contributing to the EIA

I, hereby, certify that I was involved in the EIA report for the project titled “**Black Granite Quarry over the extent of 20.95.5 Hectares at S.F. 1193/1 (Part-5) &1193/1(Part-16) at Kodakkal village, Sholinghur taluk, Ranipet District, Tamil Nadu State**”. I was a part of the EIA team in the following capacity that developed the above EIA with the support of the following functional area experts.




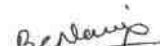
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LU - Land Use

AP - Air Pollution monitoring, prevention and control

AQ - Meteorology, air quality modeling and prediction

WP - Water pollution monitoring, prevention and control

EB - Ecology and biodiversity

NV - Noise & Vibration

SE - Socio-economics

HG - Hydrology, ground water and water conservation

GEO - Geology

RH - Risk assessment and hazards management

SHW - Solid and hazardous waste management

SC - Soil Conservation



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7	Environmental Policy
8	DSR

LIST OF ABBREVIATIONS

AAQ	Ambient Air Quality
AAQM	Ambient Air Quality Monitoring
AGL	Above Ground Level
AMSL	Above Mean Sea Level
BGL	Below Ground Level
CPCB	Central Pollution Control Board
CER	Corporate Environmental Responsibility
DMP	Disaster Management Plan
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environmental Management Plan
GLC	Ground Level Concentration
GO	Government Order
HECS	Hubert Enviro Care Systems
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
O. B	Over Burden
S. B	Side Burden
kWh	Kilowatt Hour
MSDS	Material Safety Data Sheet
MMR	Metalliferous Mines Regulations
MoEF&CC	Ministry of Environment, Forest and Climate Change
NAAQ	National Ambient Air Quality
NABET	National Accreditation Board for Education and Training
QCI	Quality Council of India
R & D	Research & Development
RA	Risk Assessment
ROM	Run of Mine
STP	Sewage Treatment Plant
SOM	Scheme of Mining
SEIAA	State Environmental Impact Assessment Authority
SEAC	State Expert Appraisal Committee
TAMIN	Tamilnadu Minerals Limited
TWAD	Tamilnadu Water Supply and Drainage Board
TDS	Total Dissolved Solids
TNPCB	Tamil Nadu Pollution Control Board
TNSEAC	Tamil Nadu State Expert Appraisal Committee
TOR	Terms of Reference
TANGEDCO	Tamil Nadu Generation and Distribution Corporation
kVA	kilovolt-ampere

1. INTRODUCTION

1.1 Purpose of the report

The granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers TAMIN's Client to provide in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks are produced and exported as raw blocks and some quantity is being processed at TAMIN's Granite polishing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up.

Around 30 people directly employed including mining operations, outside workshops, unit supported industries. Local villages residing in the nearby villages shall be employed as semi-skilled workers.

1.2 Project back ground

M/s. Tamil Nadu Minerals Ltd, (An undertaking of Government of Tamil Nadu) was established in the year 1978, to carry out systematic mining and development of different minerals all over the state. Ever since its inception TAMIN has developed expertise in the mining of granite dimensional stones of different varieties including Black Granite (Dolerite), Kashmir White (Leptynite), Paradiso (Migmatite Gneiss), Green Onyx (Syenite-porphry), Red wave (Pink Feldspathic Gneiss) Colombo Juparana (Pegmatitic Granite Gneiss of magmatic origin), Raw silk (Yellow Feldspathic Leptynite) and a number of other coloured granite varieties apart from other industrial minerals viz., Quartz and Feldspar, Graphite, Limestone, Vermiculite etc.,.

Precise area communication letter has been issued to grant lease for 20 years for extent of 20.95.5 Ha [6.37.5 Ha. at S.F. 1193/1 (Part-5) and 14.58.0 Ha at S.F.No.1193/1 (Part-16)] at Kodakkal Village, Sholinghur Taluk, Ranipet District, Tamil Nadu State vide Industries (MME.1) Department letter No. 3040/MME.1/2022-1, dated: 02.06.22. Accordingly, mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Rc.No.5123/MM4/2022, dated: 25.08.2022. Precise area communication letter is enclosed as **Annexure-I**. Mining plan is enclosed as **Annexure-II** and approval letter is enclosed as **Annexure-III**.

The area lies in the Eastern Longitude from 79°24'14.80812"E to 79°24'58.45205"E and Northern latitude from 13° 04'37.36450"N to 13° 04'55.00967"N. The Altitude of area is above 170m from MSL. The sectional plates are enclosed as **Annexure-IV**. The area is a Government Poramboke land and also it does not falls under forest land of any category.

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 1,86,802 m³. By applying 10% recovery the effective Geological reserves 18,680 m³.

Mineable Reserves have been computed as 1,10,266 m³. After deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406 m³ during the first five year of Mining plan period at the rate of 10% recovery. Open cast Semi mechanized method will be followed for proposed mining as per Mining plan.

Total waste to be generated during the five years of Mining Plan period will be around 2,00,367m³. These wastes are proposed to be dumped on the Southeren side of lease area with dimensions of 674.4m x 68.3 x 4.35m. The waste dump area has been identified as barren area. The waste dump has been maintained at 10m with slope will be maintained as per norms DGMS (Tech) (S & T) Circular No. 2 dated 06.07.2010. The waste dump at the end of the life of mine can be earmarked in the Mines Conceptual plan.

The total water requirement is 1.5KLD Water requirement for Drinking & Domestic purpose is 0.5 KLD and Wire Saw cutting is 0.3 KLD, Also water requirement for Dust suppression is 0.3 KLD & Greenbelt is 0.4KLD). The total water requirement will be met from private tankers and the existing borewell. The quarrying operation will be carried out during general shift only. The Power requirement is negligible due to limited scale of activities and the same is met from TNEB or from Solar light. Municipal Solid waste will be disposed into local municipal bins. Sewage will be disposed through septic tank followed by soak pit. Septic Tank will be cleaned periodically.

The project cost is Rs. 99.97 Lakhs. (Fixed Cost Rs. 2, 25,000/-, Operational Cost Rs. 95,67,000/- and EMP Cost Rs. 2,05,000/-

1.3 Identification of Project & Project Proponent

Project

The proposed Black Granite Mine is over an extent of 20.95.5 Ha located at S.F.No.1193/1, Part-5 & Part-16, Kodakkal village, Sholinghur taluk, Ranipet District, TamilNadu State for obtaining Environmental Clearance from SEIAA-Tamil Nadu Since, the project falls under B1 Category, Schedule 1(a) Mining of Minerals as per MoEF&CC Notification and its amendment vide S. O. 3977(E) dated; 14th Aug 2018. The land use classification of the project site is government poramboke land. TAMIN obtained precise area communication letter vide Government letter No.

3040/MME.1/2022-1, dated: 02.06.2022. Precise area communication letter is enclosed as **Annexure-I**.

The Mining Plan has been prepared for quarrying Black Granite (Dolerite) over an extent of 6.37.5 Ha. in S.F. 1193/1 (Part-5) & over an extent of 14.58.0 Ha in S.F.No.1193/1(Part-16) and a total extent of 20.95.5 Ha of Kodakkal Village, Sholinghur Taluk, Ranipet District, Tamil Nadu State. Tamil Nadu for 20 years. Mining plan is enclosed as **Annexure-II** and approval letter is enclosed as **Annexure-III**.

The area applied for quarry lease is exhibits hillock with height of about 86m (170m AMSL) surrounded by plain lands on South and it is surrounded by hillock on North and East side. Geologically, the lease applied area is a Dolerite dyke intruded into the Gneissic formation. The area lies in the Eastern Longitude from 79°24'14.80812"E to 79°24'58.45205"E and Northern latitude from 13°04'37.36450"N to 13°04'55.00967"N enclosed sectional plates as **Annexure-IV**. The area is marked in the survey of India Topo sheet No. 570/8.

1.3.1 Project Proponent

Tamil Nadu Minerals Limited (TAMIN) (An Undertaking of Government of Tamil Nadu) has been established in the year 1978. It entered the international granite market in the year 1979 and has secured a steady market for dimensional blocks of black and other color materials in countries like Japan, Germany, Italy, Australia, UK, Switzerland, Holland, USA etc. TAMIN had started the Captive Graphite Mine in the year 1986.

TAMIN is only organization recognized by Bureau of Indian Standard for manufacture and supply of I.S. Sand all over the country. TAMIN has also been marketing granite cubes with sides measuring 6cm to 12cm. TAMIN has developed expertise in the mining of granite dimensional stones of different varieties including black granite (Dolerite), Kashmir white (Leptynite), Paradiso (Migmatite gneiss), Green onyx (Syenite - porphyry) Red wave (Pink Feldspathic gneiss) Colombo Juparana (Pegmatitic granite gneiss of migmatitic origin), Raw silk (Yellow Feldspathic Leptynite) and a number of other color granite varieties apart from other industrial minerals viz. quartz and feldspar, graphite, lime stone, silica sand, vermiculite, etc.

TAMIN has also set up industrial units for polishing processing the granite stones one each at Manali (Chennai), Madhepalli at Krishnagiri District and Melur at Madurai District. A Beneficiation plant for the beneficiation of graphite ore has been established close to Sivaganga Graphite mine. An exfoliation plant for the processing of vermiculite mineral at Sevathur village Tirupathur district has also been established.

1.4 Letter of Intent (LoI) & Mining Plan approval details

- i. TAMIN obtained precise area communication letter vide Government letter No. 3040/MME.1/2022-1, dated: 02.06.2022. Precise area communication letter is enclosed as **Annexure-I**.
- ii. The Mining Plan has been prepared for quarrying Black Granite (Dolerite) over an extent of 6.37.5 Ha. in S.F. 1193/1 (Part-5) & over an extent of 14.58.0 Ha in S.F.No.1193/1(Part-16) and a total extent of 20.95.5 Ha of Kodakkal village, Sholinghur taluk, Ranipet District, Tamil Nadu State, for 20 years. Mining plan was approved by the Director of Geology & Mining, vide Rc.No.5123/MM4/2022, dated: 25.08.2022 and letter is enclosed as **Annexure-II**.

1.5 Land Acquisition Status

The entire mine lease area of 20.95.5 Ha is Government land which is leased by TAMIN. TAMIN obtained precise area communication letter vide Government letter No. 3040/MME.1/2022-1, dated: 02.06.2022. Precise area communication letter is enclosed as Annexure-I.

Table 3-1 Land Use Description

District and State	Taluk	Village	S.F. No	Area in (Ha)	Land Classification
Ranipet District, Tamil Nadu	Sholinghur	Kodakkal	S.F.No.1193/1, Part-5 & Part-16	20.95.5	Government Land

1.6 Purpose and Status of the Report

The Kodakkal Black Granite Quarry is over extent of 20.95.5 Ha. The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification dated 14th September 2006 and its subsequent amendments. The EC application was submitted to TN SEIAA vide File No.9648/2022. The proposal was appraised during 347th SEAC meeting held on 13.01.2023 Draft EIA report will be submitted for Public Hearing (PH) to Ranipet PCB.

Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

1.7 Brief Description of the Project

1.7.1 Nature of the Project

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification and its amendment. Hence, the project will appraise for Environmental Clearance from State Expert Appraisal Committee, Tamil Nadu. The EC application was submitted to TN SEIAA vide File No.9648/2022 & Proposal No. SIA/TN/MIN/409460/2022 dated 02.12.2022.

The TAMIN has obtained precise area communication letter vide Government letter No. 3040/MME.1/2022-1, dated: 02.06.2022. Precise area communication letter is enclosed as **Annexure-I**. The mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Rc.No.5123/MM4/2022, dated: 25.08.2022. Mining approval letter is enclosed as **Annexure-III**.

The proposal was appraised during 347th SEAC meeting held on 13.01.2023 and ToR was issued vide Lr No. SEIAA-TN/F.No.9648/SEAC/ToR-1344/2023, dated: 16.02.2023.

1.7.2 Size of the Project

The Proposed Black Granite Quarry over an extent of 20.95.5 Ha is located at SF.No.1193/1 (Part-5 & Part-16), Kodakkal village, Sholinghur Taluk, Ranipet District, Tamil Nadu State.

Black Granite Quarry area is over an extent of 20.95.5 Ha with the Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 1,86,802m³. By applying 10% recoveries the effective Geological reserves works out to 18,680m³.

Mineable Reserves have been computed as 1,10,266 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The average annual production per year would be 2,046m³ of ROM of saleable and 11,027m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery. Open cast Semi mechanized method will be followed for proposed mining as per mining plan. Sectional plates are enclosed as **Annexure-IV**.

Total waste (Granite Waste+Side Burden) to be generated during the five years of Mining Plan period will be around 2,00,367 m³. These wastes are proposed to be dumped on the Southeast side of lease area with dimensions of 674.4m x 68.3m x 4.35m. The method of mining is Open cast semi mechanized.

Table 1-2 Ultimate Pit Dimensional Details

S. No	Description	Average Ultimate Pit Dimensional Details (m)		
		Length	Width	Depth
1	Top	118	88.889	40
2	Bottom	46	40	

Table 1-3 Geological Reserves

Section	Average Measurements (m)			ROM (m ³)	Effective Reserves@ 10% (m ³)	Granite waste @90% (m ³)
	Length	Width	Depth			
PQ-AB	45.00	40.00	40.00	72,000	7,200	64,800
PQ-CD	41.50	40.00	40.00	66,400	6,640	59,760
PQ-EF	45.00	40.00	21.00	37,800	3,780	34,020
PLAN&EF	45.00	12.40	19.00	10,602	1,060	9,542
Total				1,86,802	18,680	1,68,122

1.7.3 Location of the project

Kodakkal Black Granite Quarry area is over an extent of 20.95.5 Ha, the lease area is located at S.F.No.1193/1 (Part-5 & Part-16) of Kodakkal village, Sholinghur taluk, Ranipet District, Tamil Nadu State. The boundary co-ordinates of the mine lease area are tabulated in **Table 1-4**.

Table 1-4 Boundary Coordinates of the project

S.No	Boundary Mark Point	Latitude	Longitude
1.	TM1	13° 4'48.70"N	79°24'58.45"E
2.	TM2	13° 4'41.83"N	79°24'51.09"E
3.	TM3	13° 4'37.87"N	79°24'42.49"E
4.	TM4	13° 4'37.36"N	79°24'35.25"E
5.	TM5	13° 4'37.67"N	79°24'28.28"E
6.	TM6	13° 4'39.50"N	79°24'28.24"E
7.	TM7	13° 4'39.59"N	79°24'24.64"E
8.	TM8	13° 4'39.06"N	79°24'14.81"E
9.	TM9	13° 4'40.06"N	79°24'20.09"E
10.	TM10	13° 4'52.37"N	79°24'15.11"E
11.	TM11	13° 4'54.22"N	79°24'17.22"E
12.	TM12	13° 4'55.01"N	79°24'19.41"E
13.	TM13	13° 4'41.01"N	79°24'24.13"E
14.	TM14	13° 4'42.11"N	79°24'28.55"E
15.	TM15	13° 4'43.07"N	79°24'32.68"E
16.	TM16	13° 4'44.07"N	79°24'36.96"E
17.	TM17	13° 4'44.98"N	79°24'40.74"E
18.	TM18	13° 4'45.73"N	79°24'44.55"E
19.	TM19	13° 4'46.41"N	79°24'48.24"E
20.	TM20	13° 4'47.35"N	79°24'51.96"E
21.	TM21	13° 4'48.26"N	79°24'56.18"E

1.7.4 Connectivity of the Project

The project is situated at a distance of ≈ 0.74 km to Pudukkudiyapur Village towards South West direction and ≈ 0.75 km South of Kodakkal Village, one approach road is running from SH 61 (Walajah – Sholinghur – Arakkonam) ≈ 0.82 km towards (WNW) side of the lease area. The

project site has well established connection facilities. The nearest railway station is Thalangai Railway station located at ≈ 8.59 km towards SSE direction. NH 40 (Kurnool-Chittoor-Ranipet) situated at distance of ≈ 17.63 km (SW).

1.7.5 Need for the project and its importance to the country and or region

The granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks is produced and exported as raw blocks and some quantity is being processed at TAMIN's Granite polishing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up.

Around 30 people directly employed including mining operations, outside workshops, unit supported industries. Local villagers residing in the nearby villages shall be employed as semi-skilled workers.

1.7.5.1 Demand –Supply Gap

As of now there is good demand for this granite blocks in foreign as well as local market. The quarried granite blocks are either exported as raw blocks or processed at TAMIN's factories as value added products such as slabs, tiles, fancy items, monuments, sawn slabs or local sales as raw block etc.

1.7.5.2 Imports Vs Indigenous

There is no import of this granite material at present in India as we are having huge resources of this granite material particularly in South India.

1.7.5.3 Export possibility

The quarried granite blocks are either exported as raw blocks or processed at TAMIN's factories as value added products such as slabs, tiles, fancy items, monuments, sawn slabs etc. Apart from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.7.5.4 Domestic/export markets

As of now there is good demand for this granite blocks in foreign as well as local market. The granite blocks are either exported as raw blocks or processed at TAMIN's as factories as value added

products such as slabs, tiles, fancy items, monuments, sawn slabs etc. Apart from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.8 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA-TN, TAMIN has appointed Environmental Consultant accredited by National Accreditation Board for Education and Training (NABET)-Quality Council of India (QCI), New Delhi. The work of undertaking field studies and preparation of EIA/EMP report under B1 category as obtained Terms of Reference from SEIAA-TN was assigned to M/s Hubert Enviro Care Systems (P) Ltd. (HECS) Chennai by the project proponent. HECS is accredited by NABET, vide possession of Certificate No. NABET/EIA/2224/SA0190, valid up to 27.07.2024.

1.9 EIA Cost

EIA study was undertaken by HECS for an amount of Rs.1,54,225.00/- Lakhs. The base line monitoring was done by M/s. HECS lab, Chennai, an NABL and MoEF& CC Accredited Laboratory.

1.10 Scope of the Study

The scope of the work mentioned includes an assessment study of proposed black Granite Quarry project and their impact on the region. This study puts forward the most effective ways to protect the environment from increasing pollution caused by the mining activities and recommendations for environmental-friendly development initiatives in the region.

An Environmental Impact Assessment (EIA) is an assessment of the possible impact, whether positive or negative that, the mining activities may have on the environment, together consisting of the natural, social and economic aspects, i.e., aiming at “Sustainable Development” due to the project activities.

This EIA report presents the existing baseline scenario and the assessment and evaluation of the environmental impacts that may arise during mining. This report also highlights the Environmental Monitoring Program during the operation phase of the project and the post mined management program. The generic structure of the EIA document will be as per the EIA Notification of the MoEF&CC dated 14th September 2006 and subsequent amendments. The basic structure of the report will be as under:

Chapter 1: Introduction

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

Chapter 2: Project Description

This chapter includes project description and infrastructure facilities delineating all the quarry operations and environmental aspect of the quarry activities.

Chapter 3: Description of the Environment

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

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures

This chapter presents the analysis of impacts on the environmental and social aspects of the project as a result of establishment of plan and thereby suggesting the mitigation measures.

Chapter 5: Analysis of Alternatives (Technology and Sites)

This chapter includes the justification for the selection of the project site from Environmental point of view as well as from economic point of view.

Chapter 6: Environmental Monitoring Program

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

Chapter 7: Additional Studies

This chapter will detail about the public consultation sought regarding the project. It will also identify the risks of the project in relation to the general public and the surrounding environment during quarry operation phase and thereby presents Disaster Management Plan, Social impact assessment and R&R action plans.

Chapter 8: Project Benefits

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

Chapter 9: Environmental Cost Benefit analysis

Not recommended during scoping

Chapter 10: Environmental Management Plan

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

Chapter 11: Summary and Conclusion

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

Chapter 12: Disclosure of the Consultant

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

1.10.1 Objectives of the Study

- To ensure environmental considerations are explicitly addressed and incorporated into the development decision-making process.
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of the above project proposal.
- To protect the productivity and capacity of natural systems and the ecological processes which maintain their respective functions
- To promote development that is sustainable and optimizes resource use as well as management opportunities.
- To fully recognize the scope and requirements of the ToR and comply with the same.
- The major objective of this study is to prepare a detailed Environmental Impact Assessment study within the study area i.e 10 km radius from the project.

1.10.2 Methodology adopted for the Study

An Environmental Impact Assessment (EIA) is an assessment of the possible impact, whether positive or negative, that a proposed project may have on the environment, together consisting of the natural, social and economic aspects, i.e., aiming at “Sustainable Development” due to the project activities.

1.10.3 Applicable Regulatory Framework

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

1. Study of project information.
2. Screening & Scoping.
3. Environmental pre-feasibility study & application for approval of ToR.
4. Collection of detailed project management plan/report.
5. Baseline data collection.
6. Impact identification, Prediction & Evaluation.
7. Mitigation measures & delineation of EMP.
8. Risk assessment and safety & disaster management plan.
9. Review & finalization of EIA Report based on the ToR requirements.

10. Submission of EIA report for implementation of mitigation measures & EMP as well as necessary clearances from relevant Authority.

1.10.4 Legal Complicability

The establishment and functioning of mining industry will be governed by Tamin Client to provide the following environmental acts/regulations besides the local zoning and landuse laws of the States.

1. The Water (Prevention and Control of Pollution) Act, 1974 as amended
2. The Water (Prevention and Control of Pollution) Cess Act, 1977, as amended
3. The Air (Prevention and Control of Pollution) Act, 1981 as amended (Air Act)
4. The Noise Pollution and Regulation Act: 2000as amended
5. The Environment (Protection) Act, 1986 (EPA)as amended
6. The Wildlife (Protection) Act, 1972
7. The Forest (Conservation) Act, 1980
8. The Public Liability Insurance Act, 1991
9. The Mines and Minerals (Regulation and Development) Act, 1957 as amended
10. Circulars issued by the Director-General Mines Safety (DGMS) as amended
11. Contract Labor Regulation and Abolition Act 1970as amended
12. The Motor Vehicles Act – 1989as amended
13. PESO – Explosives and handling of Hazardous Material: 1934

1.10.4.1 Terms of Reference Compliance

The Terms of Reference (ToR) issued by SEIAA-Tamil Nadu compliance is given as follows:

1.10.4.2 Standard Terms of Reference

S. No	Terms of Reference	Compliance																																																									
1	<p>Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t the highest production achieved prior to 1994.</p>	<p>It is a fresh quarry. Government has issued Precise area communication letter to grant of lease for 20 years vide Lr.No. 3D40/MME.1/2020-1, dated 02.06.2022</p> <p>Precise area communication letter is enclosed as Annexure-1.</p> <p>Granite Quarry Reserves</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Description</th> <th>Granite (m³)</th> <th>Recovery 10% (m³)</th> <th>Granite waste 90% (m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Geological Resource</td> <td>1,86,802</td> <td>18,680</td> <td>1,68,122</td> </tr> <tr> <td>2</td> <td>Mineable Reserves</td> <td>1,10,265</td> <td>11,027</td> <td>99,238</td> </tr> </tbody> </table> <p>Yearwise Production details</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Year</th> <th>ROM (m³)</th> <th>Recovery @10% (m³)</th> <th>Granite Waste @ 90% (m³)</th> <th>Side Burden (m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1stYear</td> <td>23,616</td> <td>2,361</td> <td>21,254</td> <td>15,552</td> </tr> <tr> <td>2</td> <td>2ndYear</td> <td>24,064</td> <td>2,406</td> <td>21,658</td> <td>8,880</td> </tr> <tr> <td>3</td> <td>3rd Year</td> <td>24,000</td> <td>2,400</td> <td>21,600</td> <td>15,408</td> </tr> <tr> <td>4</td> <td>4th Year</td> <td>18,105</td> <td>1,810</td> <td>16,294</td> <td>18,779</td> </tr> <tr> <td>5</td> <td>5th Year</td> <td>20,480</td> <td>2,048</td> <td>18,432</td> <td>42,510</td> </tr> <tr> <td colspan="2">Total</td> <td>1,10,265</td> <td>11,027</td> <td>99,238</td> <td>1,01,129</td> </tr> </tbody> </table> <p>The production details are provided in Chapter 2 Section 2.7.</p>	S. No	Description	Granite (m ³)	Recovery 10% (m ³)	Granite waste 90% (m ³)	1	Geological Resource	1,86,802	18,680	1,68,122	2	Mineable Reserves	1,10,265	11,027	99,238	S. No	Year	ROM (m ³)	Recovery @10% (m ³)	Granite Waste @ 90% (m ³)	Side Burden (m ³)	1	1 st Year	23,616	2,361	21,254	15,552	2	2 nd Year	24,064	2,406	21,658	8,880	3	3 rd Year	24,000	2,400	21,600	15,408	4	4 th Year	18,105	1,810	16,294	18,779	5	5 th Year	20,480	2,048	18,432	42,510	Total		1,10,265	11,027	99,238	1,01,129
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2	<p>A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.</p>	<p>It is a Government Poromboke Land Tamil Nadu Minerals limited has leased for 20 years. Precise area communication letter from Industries (MME.1) Department, Chennai vide Letter No. 3D40/MME.1/2020-1, dated 02.06.2022 is enclosed as Annexure-1.</p>																																																									
3	<p>All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.</p>	<p>Mining Plan Approval by Director, Department of Geology and Mining vide Rc.No. 5123/MM4/2022, Dated 25.08.2022 attached as Annexure-II.</p> <p>Mine Lease Area: 20.95.5 Ha</p> <p>Yearwise Production details</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Year</th> <th>ROM (m³)</th> <th>Recovery @10% (m³)</th> <th>Granite Waste @ 90% (m³)</th> <th>Side Burden (m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1st</td> <td>23616</td> <td>2362</td> <td>21254</td> <td>15552</td> </tr> <tr> <td>2</td> <td>2nd</td> <td>24064</td> <td>2406</td> <td>24658</td> <td>8880</td> </tr> <tr> <td>3</td> <td>3rd</td> <td>24000</td> <td>2400</td> <td>21600</td> <td>15408</td> </tr> </tbody> </table>	S. No	Year	ROM (m ³)	Recovery @10% (m ³)	Granite Waste @ 90% (m ³)	Side Burden (m ³)	1	1 st	23616	2362	21254	15552	2	2 nd	24064	2406	24658	8880	3	3 rd	24000	2400	21600	15408																																	
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Production Details:

Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406m³ of ROM of saleable and 20,480m³ of ROM during the first five year of mining plan period at the rate of 10% recovery.

Waste Generation and its management: 2,00,367 m³. These wastes will be proposed to dump on the North Eastern side of the lease area with dimensions of 674.4m X 68.3m X 4.35m.

The space available in the lease area for waste dump has been identified in the barren area.

Mining Technology: Open cast semi mechanized mining.

All the above mentioned documents are obtained in the name of Tamil Nadu Minerals only.

All corner co-ordinates of the mine lease area, superimposed in a High Resolution Imagery/ topo sheet, topographic sheet, geomorphology and geology of the area should be provided. Such a Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).

S.No	Boundary Mark Point	Latitude	Longitude
1.	TM1	13° 4'48.70"N	79°24'58.45"E
2.	TM2	13° 4'41.83"N	79°24'51.09"E
3.	TM3	13° 4'37.87"N	79°24'42.49"E
4.	TM4	13° 4'37.36"N	79°24'35.25"E
5.	TM5	13° 4'37.67"N	79°24'28.28"E
6.	TM6	13° 4'39.50"N	79°24'28.24"E
7.	TM7	13° 4'39.59"N	79°24'24.64"E
8.	TM8	13° 4'39.06"N	79°24'14.81"E
9.	TM9	13° 4'40.06"N	79°24'20.09"E
10.	TM10	13° 4'52.37"N	79°24'15.11"E
11.	TM11	13° 4'54.22"N	79°24'17.22"E
12.	TM12	13° 4'55.01"N	79°24'19.41"E
13.	TM13	13° 4'41.01"N	79°24'24.13"E
14.	TM14	13° 4'42.11"N	79°24'28.55"E
15.	TM15	13° 4'43.07"N	79°24'32.68"E
16.	TM16	13° 4'44.07"N	79°24'36.96"E
17.	TM17	13° 4'44.98"N	79°24'40.74"E
18.	TM18	13° 4'45.73"N	79°24'44.55"E
19.	TM19	13° 4'46.41"N	79°24'48.24"E
20.	TM20	13° 4'47.35"N	79°24'51.96"E
21.	TM21	13° 4'48.26"N	79°24'56.18"E

Topo sheet:570/8

All corners co-ordinates of the mine lease area are given in **Chapter 1** and

4

		<p>Section 1.7.3, Table 1-4, Topo map in Figure 2-8.</p> <p>Geology: Geologically, the lease area is a Dolerite Dyke intruded in the Gneissic formation. The major part of the district is covered by metamorphosed crystalline rocks of the Charnockite Group and the Migmatite Complex of Archaean age. South of Palar River, the area where the Charnockite Group of rocks are spread over comprises charnockite, pyroxene granulite, magnetite quartzites and younger basic dykes intruding into them. Source:https://cdn.s3waas.gov.in/s31651cf0d2f737d7adeab84d339dbabd3/uploads/2019/04/2019040961.pdf</p> <p><i>Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.</i></p> <p>Geomorphology of the study area consists of Denudational origin - pediment – pedi plain Complex- 84.94%, Denudational Origin-Moderately Dissected Hills and Valleys – 5.72% and Water bodies- 6.26%. The total Geographical area of the study area is 330.80sq.km. Geomorphology pattern of the study area is given in Figure 3.11.</p> <p>Geology and Geomorphology of the area is provided in Chapter 3 Section 3.5.6, Figure 3.12.</p>																																																								
<p>5</p>	<p>Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.</p>	<p>It is a fresh quarry and It is a government poramboke land. Topo map prepared in 1:50000 scale and given as Figure 2-8. Geomorphology Map of Study Area if given in Figure 3-12 Geomorphology pattern of the study area is shown in Chapter 3, Section 3.5.6, Figure 3-11. Hydrogeology of district is given in Chapter 3, Section 3.5.6 Figure 3-13. Drainage map is shown in Chapter 3, Section 3.5.8, Figure 3-14.</p> <table border="1"> <thead> <tr> <th>S.No</th> <th>Places</th> <th>Distance (~km)</th> <th>Direction</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Pond near Project Site</td> <td>0.16</td> <td>S</td> </tr> <tr> <td>2.</td> <td>Pond near Pudukkudiyannur</td> <td>0.46</td> <td>S</td> </tr> <tr> <td>3.</td> <td>Perunganji Lake</td> <td>1.74</td> <td>S</td> </tr> <tr> <td>4.</td> <td>Sholinghur Lake</td> <td>2.35</td> <td>N</td> </tr> <tr> <td>5.</td> <td>Kallar River</td> <td>3.43</td> <td>SE</td> </tr> <tr> <td>6.</td> <td>Nandi River</td> <td>7.52</td> <td>NE</td> </tr> <tr> <td>7.</td> <td>Paranji Lake</td> <td>10.32</td> <td>ENE</td> </tr> <tr> <td>8.</td> <td>Ponnai East Bank Main Canal</td> <td>11.55</td> <td>W</td> </tr> <tr> <td>9.</td> <td>Mahendravadi Channel</td> <td>11.65</td> <td>SSE</td> </tr> <tr> <td>10.</td> <td>Ponnai River</td> <td>12.19</td> <td>WSW</td> </tr> <tr> <td>11.</td> <td>Kaveripak Tank</td> <td>13.10</td> <td>SSE</td> </tr> <tr> <td>12.</td> <td>Mahendravadi Lake</td> <td>13.47</td> <td>SE</td> </tr> <tr> <td>13.</td> <td>Kaveripak N</td> <td>14.97</td> <td>SSE</td> </tr> </tbody> </table> <p>Geology: The major part of the district is covered by metamorphosed crystalline rocks of the Charnockite Group and the Migmatite Complex of Archaean age. South of Palar River, the area where the Charnockite Group of rocks are spread over comprises charnockite, pyroxene granulite, magnetite quartzites and younger basic dykes intruding into them.</p>	S.No	Places	Distance (~km)	Direction	1.	Pond near Project Site	0.16	S	2.	Pond near Pudukkudiyannur	0.46	S	3.	Perunganji Lake	1.74	S	4.	Sholinghur Lake	2.35	N	5.	Kallar River	3.43	SE	6.	Nandi River	7.52	NE	7.	Paranji Lake	10.32	ENE	8.	Ponnai East Bank Main Canal	11.55	W	9.	Mahendravadi Channel	11.65	SSE	10.	Ponnai River	12.19	WSW	11.	Kaveripak Tank	13.10	SSE	12.	Mahendravadi Lake	13.47	SE	13.	Kaveripak N	14.97	SSE
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6	<p>Details about the land proposed for mining activities should be given with information as to whether mining confirms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.</p>	<p>It is a fresh quarry. Government has issued precise area communication letter for 20 years vide Lr.No. 3D40/MME.1/2020-1, dated 02.06.2022. Precise area communication letter is enclosed as Annexure-1.</p> <p>Director of Geology and Mining has approved the Mining Plan to carryout the mining activities. Mining Plan is enclosed as Annexure-2 (Annexure page no. 20).</p> <p>The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 1,86,802.00 m³. By applying 10% recovery the effective Geological reserves works out 18,680m³.</p> <p>Mineable Reserves have been computed as 1,10,265 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective(Saleable) Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406m³ of ROM of saleable and 20,048m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery.</p> <p>The peak annual production per year would be 20,128 m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery.</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Year</th> <th>ROM (m³)</th> <th>Recovery@ 10% (m³)</th> <th>Granite Waste @ 90 % (m³)</th> <th>Side Burden (m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1st Year</td> <td>23616</td> <td>2362</td> <td>21254</td> <td>15552</td> </tr> <tr> <td>2</td> <td>2nd Year</td> <td>24064</td> <td>2406</td> <td>24658</td> <td>8880</td> </tr> <tr> <td>3</td> <td>3rd Year</td> <td>24000</td> <td>2400</td> <td>21600</td> <td>15408</td> </tr> <tr> <td>4</td> <td>4th Year</td> <td>18105</td> <td>1811</td> <td>16284</td> <td>18779</td> </tr> <tr> <td>5</td> <td>5th Year</td> <td>20480</td> <td>2048</td> <td>18432</td> <td>42510</td> </tr> <tr> <td colspan="2">Total</td> <td>1,10,295</td> <td>11,027</td> <td>99,238</td> <td>1,01,129</td> </tr> </tbody> </table> <p>The production details are provided in Chapter 2 Section 2.7.</p>	S. No	Year	ROM (m ³)	Recovery@ 10% (m ³)	Granite Waste @ 90 % (m ³)	Side Burden (m ³)	1	1 st Year	23616	2362	21254	15552	2	2 nd Year	24064	2406	24658	8880	3	3 rd Year	24000	2400	21600	15408	4	4 th Year	18105	1811	16284	18779	5	5 th Year	20480	2048	18432	42510	Total		1,10,295	11,027	99,238	1,01,129
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7	<p>It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved</p>	<p>Environmental Policy of TAMIN is given in Chapter 10 Section 10.15. Also enclosed as Annexure-6.</p> <p>➤ We develop safe working methods and practices, with as an objective</p>																																										

<p>by its Board of Directors? I so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/vibration of the environmental or forest norms/conditions? The hierarchical systems or administrative order of the Company to deal with the environmental issues and for ensuring compliances with the EC conditions may also be given. The system of reporting of non-compliances /violations of environmental norms to the Board of Directors of the Company and /or stakeholders at large, may also be detailed in the EIA Report.</p>	<p>of no injuries and accidents at the work place and provide a safe work place for our employees, contractors and other who perform their duties. We shall provide adequate Health care to our employees, and create processes to reduce the adverse effect of the operations on the health of the employees.</p> <ul style="list-style-type: none"> ➤ We provide safety appliances and continuous training in safety to our employees and contract workmen to ensure safe production and achieve the target of zero accidents. We are committed for supporting actions aimed at increase in employees' safety outside work hours. ➤ We protect the environment by control and prevention of pollution and promote green environment. ➤ We continuously evaluate and improve our conduct and carryout regular audit, analysis and studies to eliminate potential concerns and continuously improve upon our Safety, Health and Environmental standards. ➤ We communicate our Safety, Health and Environmental Policy to all our employees' contractors and to the public for better understanding and practice. ➤ Management has knowledge of relevant issues regarding Safety, Health and Environment and provides a foundation for setting objectives and targets. Management shall fulfill its responsibility to inform, educate and motivate employees and others to understand and comply with this policy and applicable laws. ➤ M/s. Tamil Nadu Minerals Ltd shall use its resources in order to live up to this policy and thereby promote our business.
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<p>8 Issues relating to Mine safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should be provided.</p>	<p>Mine Safety and Mitigation Measures:</p>																				
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		<p>No underground mining method is proposed. It is a Black Granite quarry an</p>																			

		<p>open cast Mining methodology will be followed. Workable depth of mining will be 40m AGL.</p> <p>Mining methodology is provided in Chapter 2 and Section 2.9 and Section 2.10.</p> <p>Safeguard measures are provided in Chapter-4, Section 7.2.2.8.</p> <ul style="list-style-type: none"> ➤ Adequate care has been taken in deciding the size of the bench for the working pit. ➤ The benches are properly sloped at an angle of 60 degree to avoid any spillage of benches. ➤ Adequate drainage system at the top of the pit and also on the benches shall be made to prevent erosion of the benches. ➤ The quarries will be protected by garland drains around the periphery for storm water drainage. 																																																												
<p>9</p>	<p>The study area will comprise of 10km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine/lease period.</p>	<p>The study area considered for the EIA study comprises of 10km zone of radial distance from the lease periphery.</p> <p>The data contained within the EIA including Production capacity, mineable capacity, Waste generation and other such details have been calculated for the lease period of five years as per the approved mining plan.</p> <p>The study area of 10km zone around the mines lease from lease periphery and furnished in Chapter 3.</p> <p>The production and waste generation details such as Mineable Reserves have been worked out as 11,027m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406 m³ of ROM of saleable and 24, 064 m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery.</p> <p>The total waste (Granite waste + Side Burden) to be generated during the 5 years of Mining plan period will be around 99,238 m³. These wastes are proposed to be dumped on the North eastern side of lease area with dimensions of 674.4m X 68.3m X 4.35m.</p> <p>Life time of the mine is 20years.</p>																																																												
<p>10</p>	<p>Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.</p>	<p>Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features are given below.</p> <p>Land use pattern of the Study Area:</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Area (sq.km)</th> <th>Area (Acres)</th> <th>Area (Hectares)</th> <th>Area (%)</th> </tr> </thead> <tbody> <tr> <td>Cropland</td> <td>220.68</td> <td>54531.13</td> <td>22068</td> <td>63.45</td> </tr> <tr> <td>Scrub land</td> <td>33.30</td> <td>8228.60</td> <td>3330</td> <td>9.57</td> </tr> <tr> <td>Rural</td> <td>26.82</td> <td>6627.36</td> <td>2682</td> <td>7.71</td> </tr> <tr> <td>Reservoirs/ Lakes/ Ponds</td> <td>22.09</td> <td>5458.55</td> <td>2209</td> <td>6.35</td> </tr> <tr> <td>Fallow land</td> <td>19.34</td> <td>4779.01</td> <td>1934</td> <td>5.56</td> </tr> <tr> <td>Forest Deciduous</td> <td>11.89</td> <td>2938.08</td> <td>1189</td> <td>3.42</td> </tr> <tr> <td>Urban</td> <td>3.3</td> <td>815.45</td> <td>330</td> <td>0.95</td> </tr> <tr> <td>Barren Rocky Area</td> <td>3.18</td> <td>785.79</td> <td>318</td> <td>0.91</td> </tr> <tr> <td>Mining</td> <td>2.37</td> <td>585.64</td> <td>237</td> <td>0.68</td> </tr> <tr> <td>Plantation</td> <td>2.21</td> <td>546.10</td> <td>221</td> <td>0.64</td> </tr> <tr> <td>Salt Affected Land</td> <td>1.57</td> <td>387.95</td> <td>157</td> <td>0.45</td> </tr> </tbody> </table>	Description	Area (sq.km)	Area (Acres)	Area (Hectares)	Area (%)	Cropland	220.68	54531.13	22068	63.45	Scrub land	33.30	8228.60	3330	9.57	Rural	26.82	6627.36	2682	7.71	Reservoirs/ Lakes/ Ponds	22.09	5458.55	2209	6.35	Fallow land	19.34	4779.01	1934	5.56	Forest Deciduous	11.89	2938.08	1189	3.42	Urban	3.3	815.45	330	0.95	Barren Rocky Area	3.18	785.79	318	0.91	Mining	2.37	585.64	237	0.68	Plantation	2.21	546.10	221	0.64	Salt Affected Land	1.57	387.95	157	0.45
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Everygreen/Semi - everygreen	0.67	165.56	67	0.19
River/ Stream/ Canals	0.39	96.37	39	0.11
Total	347.81	85945.59	34781	100.00

Land use/land cover of Study Areas given in **Chapter 3** and **Section 3.5.4.1, Table 3-4, Figure 3-7 & Figure 3-8.**

The impact on land pattern in the area has been and will be due to the following:

- Land degradation due to disposal of large volume of waste materials.
- Creation of infrastructural facilities like office, rest shelter, first-aid centre and other service facilities.
- Exposure of topsoil to wind and water erosion.

The details are provided in **Chapter 4 Section 4.1.2.**

Land use details of the quarry area:

S. No	Land Use	Area to be required during the mining plan (Ha)	Area Utilized in Percentage (%)
1	Area under Quarry	0.43.5 Existing	0.92.5
2	Waste Dump	1.12.5	4.61.0
3	Infrastructure	Nil	0.04.0
4	Mine Approach Road	0.85.0	0.85.0
5	Afforestation	-	0.06.5
6	Un utilized Area	18.54.5	14.46.5
Total		20.95.5	20.95.5

A Land use detail of the quarry areas provided in **Chapter 2, Section 2.6, Table 2.6.**

11	<p>Details of the land for any Over Burden dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R & R issues, if any, should be given.</p>	<p>As it is a new project there is no external dump for over burden, side burdens. Over burden, Side burden and granite rejects will be dump within the lease area/boundary only.</p> <p>The total waste (Granite waste + Side Burden) to be generated during the 5 years of mining plan period will be around 2,00,367 m³ (99,236 + 1,01,,129). These wastes are proposed to be dumped on the North eastern side of lease area with dimensions of 674.4m X 68.3m X 4.35m.</p>
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12	<p>A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests,</p>	<p>No Forest land involved in this project area.</p> <p>The proposed lease area is classified as Government poramboke land.</p> <p>TAMIN obtained Precise area communication from Industries (MME.1) Department, Chennai vide Letter No. 3D40/MME.1/2020-1, dated 02.06.2022 is enclosed as Annexure-1 to obtain lease period of mining for 20 years.</p>
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	the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.																																	
13	State of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	No forest clearance is required. As there is no forest land involved in the lease applied area.																																
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	No scheduled tribes and other traditional forest dwellers are observed.																																
15	The vegetation in the RF/ PF areas in the study area, with necessary details, should be given.	<p>Environmental sensitive areas covering within 15 km from project boundary.</p> <table border="1"> <thead> <tr> <th>S.No</th> <th>Description</th> <th>Distance (~km)</th> <th>Direction</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Ammur RF</td> <td>6.20</td> <td>SSW</td> </tr> <tr> <td>2</td> <td>Banavaram RF</td> <td>9.73</td> <td>SE</td> </tr> <tr> <td>3</td> <td>Santanavenugopalapuram Ext RF</td> <td>11.26</td> <td>NNE</td> </tr> <tr> <td>4</td> <td>Santanavenugopalapuram RF</td> <td>11.77</td> <td>NNE</td> </tr> <tr> <td>5</td> <td>Amudala RF</td> <td>11.81</td> <td>WNW</td> </tr> <tr> <td>6</td> <td>Vanganur RF</td> <td>14.11</td> <td>NNE</td> </tr> <tr> <td>7</td> <td>Pullur West PF</td> <td>14.81</td> <td>N</td> </tr> </tbody> </table> <p>The details of environmental sensitive areas covering within 15 km from project boundary are given in Chapter 3, Section 3.4, Table 3-1 and Figure 3-3.</p>	S.No	Description	Distance (~km)	Direction	1	Ammur RF	6.20	SSW	2	Banavaram RF	9.73	SE	3	Santanavenugopalapuram Ext RF	11.26	NNE	4	Santanavenugopalapuram RF	11.77	NNE	5	Amudala RF	11.81	WNW	6	Vanganur RF	14.11	NNE	7	Pullur West PF	14.81	N
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16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and	There are no protected wildlife areas within the 15km radius of the project. Impact study was carried out as per ToR and detailed mitigation measures are furnished in Chapter 4 Section 4.6.3.																																

	submitted.																																	
17	<p>Locations of National parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well proposed), if any, within 10km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.</p>	<p>There are no National parks, Sanctuaries, Biosphere Reserves; There is no Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves within the 10km radius.</p> <p>These are the only reserve forests within 15 km of the project site.</p> <p>The details of environmental sensitive areas covering within 15km from project boundary are given in Chapter 3 and section 3.4, Table 3-1 & Figure 3-3.</p> <table border="1"> <thead> <tr> <th>S.No</th> <th>Description</th> <th>Distance (~km)</th> <th>Direction</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Ammur RF</td> <td>6.20</td> <td>SSW</td> </tr> <tr> <td>2</td> <td>Banavaram RF</td> <td>9.73</td> <td>SE</td> </tr> <tr> <td>3</td> <td>Santanavenugopalapuram Ext RF</td> <td>11.26</td> <td>NNE</td> </tr> <tr> <td>4</td> <td>Santanavenugopalapuram RF</td> <td>11.77</td> <td>NNE</td> </tr> <tr> <td>5</td> <td>Amudala RF</td> <td>11.81</td> <td>WNW</td> </tr> <tr> <td>6</td> <td>Vanganur RF</td> <td>14.11</td> <td>NNE</td> </tr> <tr> <td>7</td> <td>Pullur West PF</td> <td>14.81</td> <td>N</td> </tr> </tbody> </table>	S.No	Description	Distance (~km)	Direction	1	Ammur RF	6.20	SSW	2	Banavaram RF	9.73	SE	3	Santanavenugopalapuram Ext RF	11.26	NNE	4	Santanavenugopalapuram RF	11.77	NNE	5	Amudala RF	11.81	WNW	6	Vanganur RF	14.11	NNE	7	Pullur West PF	14.81	N
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18	<p>A detailed biological study of the study area [core zone and buffer zone (10km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary filed survey, clearly indicating the schedule of the fauna present. In case of any Schedule-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds implementing the same should be made as part of the project cost.</p>	<p>Detailed study on Biological Environment of the study area is given in Chapter 3, Section 3.11.</p> <p>Flora: The ecology and diversity survey were conducted in the core area and buffer area extend 10 km radius in the study area. It is observed that human settlements present in and surround the project site and within the study area of 10 km radius vegetation area is in agricultural, horticultural land and private plantation and some natural vegetation observed near the Kallar river and Ammur reserve forest. Total 263 species and 191 genres under 68 families were found in the study area.</p> <p>The details are provided in Chapter 3, Section 3.11.3</p> <p>The lists of floral species are provided in Chapter 3, Section 3.11.3.1, Table 3.21.</p> <p>Fauna:</p> <p>Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area.</p> <ul style="list-style-type: none"> ➤ Bird species ➤ Mammals ➤ Reptiles & Amphibians ➤ Butterfly Species ➤ Aquatic Ecology <p>List of Fauna in the Study Area are provided in Chapter 3, Section 3.11.4, Table 3.22 to Table 3.27.</p>																																
19	<p>Proximity to Areas declared as “Critically Polluted” or the Project areas likely to come under the ‘Aravali Range’, (attracting court restriction for mining operations), should also</p>	<p>Ranipet (CEPI)- This is located at 15.7km in the SW direction.</p>																																

	<p>be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.</p>	
<p>20</p>	<p>Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority)</p>	<p>There is no Coastal Zone within 15km radius of the project site.</p>
<p>21</p>	<p>R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs/Sts and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to access their requirements and action programmes prepared submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R & R and socio-economic aspects should be discussed in the Report.</p>	<p>The lease area is classified as Government Poramboke land. Precise area communications from Industries (MME.1) Department, Chennai vide Letter No. 3D40/MME.1/2020-1, dated 02.06.2022 is obtained from Govt.of Tamil Nadu for 20 years.</p> <p>There will be no Rehabilitation and Resettlement involved.</p> <p>Precise area communication letter is enclosed as Annexure-1.</p>

22

One season (non-monsoon) [i.e March–May (Summer Season); October–December (Post Monsoon Season); December–February (Winter Seasons)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented data-wise in the EIA and EMP report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

The primary baseline data monitored covered three (3) months i.e., from **mid of January 2023 – mid of April 2023**, and secondary data was collected from Government and Semi-Government organizations.

The primary baseline data results and discussions are furnished in **Chapter 3**.

Ambient Air Quality:

Monitoring Locations

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Directions
A1	Project Site	-	Within Site	
A2	Erumbi	c/w	3.92	N
A3	Kondapalaiyam	u/w	1.49	NE
A4	Karikkal	c/w	4.46	E
A5	Kattarikuppam	c/w	1.78	SE
A6	Perunganji	c/w	2.84	S
A7	Kallankuppam	d/w	1.74	SW
A8	Rendadi	d/w	3.86	SW

The details of Ambient Air Quality Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.7, Table 3.8- Table 3.10, Figure 3.18 & Figure 3.19**.

The average baseline levels of PM₁₀ (52.4-57.6 µg/m³).

Noise:

Monitoring Locations

Station Code	Location	Distance (~km) from Project boundary	Directions
N1	Project Site	Within Site	
N2	Erumbi	3.92	N
N3	Kondapalaiyam	1.49	NE
N4	Karikkal	4.46	E
N5	Kattarikuppam	1.78	SE
N6	Perunganji	2.84	S
N7	Kallankuppam	1.74	SW
N8	Rendadi	3.86	SW

The details of Noise Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.8, Table 3.11, Figure 3.20**.

Water:

i. Surface Water:

Location Code	Locations	Distance from Project Boundary (~km)	Direction
SW1	Erumbi Lake	4.85	N
SW2	Sholinghur Lake	3.56	N
SW3	Lake near Viranattur	7.05	NE
SW4	Nandi R	8.60	NE
SW5	Lake near Talikkal	6.46	E
SW6	Lake near Nandimangalam	2.62	SSE
SW7	Perunganji Lake	2.40	S
SW8	Periya Nagapundi Lake	6.31	NW

The details of Surface Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.9.1, Table 3.12 & Table 3.13, Figure 3.21.**

ii. Ground Water:

Station Code	Location	Distance (km) from Project boundary	Directions
GW1	Project Site	Within Site	
GW2	Erumbi	3.92	N
GW3	Kondapalayam	1.49	NE
GW4	Karikkal	4.46	E
GW5	Kattarikuppam	1.78	SE
GW6	Perunganji	2.84	S
GW7	Kallankuppam	1.74	SW
GW8	Rendadi	3.86	SW

The details of Ground Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.9.3, Table 3.17 to Table 3.18, Figure 3.22.**

Soil:

Location Code	Location	Distance (~km) from Project boundary	Directions
S1	Project Site	Within the Site	
S2	Erumbi	3.92	N
S3	Kondapalayam	1.49	NE
S4	Karikkal	4.46	E
S5	Kattarikuppam	1.78	SE
S6	Perunganji	2.84	S
S7	Kallankuppam	1.74	SW
S8	Rendadi	3.86	SW

The details of soil Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.10, Table 3.19 & Table 3.20, Figure 3.23.**

23

Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of Vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind

Total maximum GLCs from emissions:

Pollutant	Max. Base Line Conc. ($\mu\text{g}/\text{m}^3$)	Estimated Incremental Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. ($\mu\text{g}/\text{m}^3$)	NAAQ standard	% contribution of concentration above Base line
TSPM	167.38	4.64	172.02	500	2.77
PM10	66.95	1.04	67.99	100	1.55
PM2.5	45.30	0.62	45.92	60	1.37
SO2	23.18	0.16	23.34	80	0.69
NOX	20.22	1.48	21.70	80	7.32

The maximum ground level concentration observed due to mining activities and traffic movement through Air Modelling for TSPM, PM₁₀, PM_{2.5}, SO₂ and NO_x are 173 $\mu\text{g}/\text{m}^3$, 69 $\mu\text{g}/\text{m}^3$, 39 $\mu\text{g}/\text{m}^3$, 17 $\mu\text{g}/\text{m}^3$, and 35 $\mu\text{g}/\text{m}^3$ respectively.

The details are provided in **Chapter 4, Section 4.2.5, Table 4.15.**

Predominant wind direction South west.

	<p>direction may also be indicated on the map.</p>	<p>Map showing the Ambient Air Quality monitoring locations are given in Chapter 3, Section 3.7.1 Figure 3.18.</p> <p>Wind rose diagram considered for dispersion modeling is shown in Chapter 4, Section 4.2.3 Figure 4.1.</p> <p>Traffic Volume after Implementation of the Project:</p> <table border="1"> <thead> <tr> <th>For the Road</th> <th>Volume of Traffic</th> <th>Volume (V)</th> <th>Road Capacity (C)</th> <th>V/C Ratio</th> <th>LOS Category*</th> <th>Traffic Classification</th> </tr> </thead> <tbody> <tr> <td>Existing</td> <td>252</td> <td>457.85</td> <td>1500</td> <td>0.31</td> <td>“A”</td> <td>Free Flow Traffic</td> </tr> <tr> <td>After implementation</td> <td>272</td> <td>505.8</td> <td>1500</td> <td>0.34</td> <td>“A”</td> <td>Free Flow Traffic</td> </tr> </tbody> </table> <p>*LOS (Level Of Service) categories are A-Free Flow, B- Reasonably Free Flow, C-Stable Flow, D-Approaching unstable flow, E- Unstable flow, F- Forced or breakdown flow</p> <p>Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be Free Flow.</p> <p>The details are provided in Chapter 4, Section 4.2.5, Table 4.16 & Table 4.17.</p>	For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification	Existing	252	457.85	1500	0.31	“A”	Free Flow Traffic	After implementation	272	505.8	1500	0.34	“A”	Free Flow Traffic
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<p>24</p>	<p>The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.</p>	<p>The water requirement for the project is addressed in Chapter 2 and Section 2.11.2. Table 2.12.</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Description</th> <th>Water Requirement (KLD)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Drinking & Domestic purpose</td> <td>0.5</td> </tr> <tr> <td>2</td> <td>Wire Saw Cutting</td> <td>0.3</td> </tr> <tr> <td>3</td> <td>Dust suppression</td> <td>0.3</td> </tr> <tr> <td>4</td> <td>Green Belt</td> <td>0.4</td> </tr> <tr> <td colspan="2" style="text-align: right;">Total</td> <td>1.5</td> </tr> </tbody> </table> <p>The total water requirement is sourced from Private tank suppliers.</p> <p>The Schematic Diagram of Water requirement:</p> <p>The details are shown in Chapter 4, Section 4.3, Figure 4.49.</p>	S. No	Description	Water Requirement (KLD)	1	Drinking & Domestic purpose	0.5	2	Wire Saw Cutting	0.3	3	Dust suppression	0.3	4	Green Belt	0.4	Total		1.5			
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<p>25</p>	<p>Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.</p>	<p>No ground water withdrawal to meet the water requirement is proposed.</p> <p>The total water requirement will be sourced from Private tank suppliers.</p>																					

<p>26</p>	<p>Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.</p>	<p>Water conservation measures: Ground water occurrence in this area is 20m BGL due to scanty rainfall and subtropical climate. The quarry operation confined to well above the water table for the entire lease period; hence the quarry operation will not be affected by the ground water in any manner.</p> <p>Rainwater harvesting: The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting.</p> <ul style="list-style-type: none"> ➤ Construct barriers at suitable intervals along the path of the drains. ➤ Divert the water to de-silting cum rainwater harvesting pond in the mine area. <p>Provide necessary overflow arrangement to maintain the natural drainage system.</p> <p>Rainwater harvesting details are provided in Chapter 4 Section 4.3.4.2</p>
<p>27</p>	<p>Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.</p>	<p>The Proposed depth the quarry is 40m AGL of a hill of 86m and the ground water is in 15m. So there will be no impact on the Ground water.</p> <p>There are no major surface water bodies in the surrounding the project area but the following measures will be taken to prevent the runoff water from polluting.</p> <p>Surface Water Pollution Control Measures:</p> <ul style="list-style-type: none"> ➤ Odai is passes through the site. As per the mining plan, a safety distance of 50mts shall be maintained for the odai. ➤ Construction of garland drains of suitable size around mine area and dumps to prevent rain water descent into active mine areas. ➤ During monsoon season, the rain water will be collected by natural slope of area to water fed tank of the mine and it will be utilized for dust suppression and greenbelt development. ➤ The dump tops will be provided with inner slopes to control water flow to prevent erosion washouts. The dumps tops and slopes of in active areas will be covered with grasses, shrubs, mulching, etc, to prevent erosion, till final backfilling of dumps into mined out areas. ➤ Retaining walls of adequate dimensions will be provided at the top of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels. ➤ The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water. ➤ The worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes. ➤ The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB. <p>Ground Water Pollution Control Measures</p> <ul style="list-style-type: none"> ➤ The proposed mining project will not generate any effluent. The domestic sewage from the toilets will be routed to septic tanks. ➤ Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out. <p>The details are provided in Chapter 4, Section 4.3.4.2.</p>

28	<p>Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should be obtained and copy furnished.</p>	<p>The mining activity proposed in depth of 40m from the top of the hill. (AGL as per mining plan)</p> <p>Ground water table is available at 15m BGL as per Mining plan.</p> <p>Mining activities will not intersect with ground water table as the proposed depth of mining will be above ground level (from the top of the hill). Workable depth will be 40m from the top of the hill of 86 m height.</p>																																				
29	<p>Details of any stream, seasonal or otherwise, passing through the lease area and modification/diversion proposed, if any, and the impact of the same on the hydrology should be brought out.</p>	<ul style="list-style-type: none"> ➤ A safety distance of 50m shall be maintained for the odai. ➤ A safety distance of 50m shall be maintained for the village pond, kulam and check dam in S.F.No: 1193/1 (Part 13). ➤ Details are provided in area precise communication letter is provided as Annexure-2. 																																				
30	<p>Information on site elevation, working depth, groundwater table etc. Should be provided both in ASML and bgl. A schematic diagram may also be provided for the same.</p>	<p>Site Elevation: 170m above MSL</p> <p>Groundwater level is 15m depth in the summer and 10m in rainy season from ground level (As per mining plan).</p> <p>Proposed Depth of Mining is 40m AGL given in the Mining Plan enclosed as Annexure-4.</p>																																				
31	<p>A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for</p>	<p>About 0.06.5 Ha of area is proposed for Green Belt development. It is proposed to plant 20 No's of trees per year. Detailed Green Belt Development plan is given in Chapter 2 section 2.16.8. Table 2.18</p> <p>Species of ecological value and good utility value to the local population with emphasis on local and native species are proposed as part of the afforestation.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>No. of trees proposed to be planted</th> <th>Name of the species</th> <th>Area(M3)</th> <th>Survival rate expected</th> <th>No. of trees expected to be grown</th> </tr> </thead> <tbody> <tr> <td>1stYear</td> <td>20</td> <td>Neem/ Pungam</td> <td>130</td> <td>50%</td> <td>10</td> </tr> <tr> <td>2ndYear</td> <td>20</td> <td>Neem/ Pungam</td> <td>130</td> <td>50%</td> <td>10</td> </tr> <tr> <td>3rdYear</td> <td>20</td> <td>Neem/ Pungam</td> <td>130</td> <td>50%</td> <td>10</td> </tr> <tr> <td>4thYear</td> <td>20</td> <td>Neem/ Pungam</td> <td>130</td> <td>50%</td> <td>10</td> </tr> <tr> <td>5th Year</td> <td>20</td> <td>Neem/ Pungam</td> <td>130</td> <td>50%</td> <td>10</td> </tr> </tbody> </table>	Year	No. of trees proposed to be planted	Name of the species	Area(M3)	Survival rate expected	No. of trees expected to be grown	1 st Year	20	Neem/ Pungam	130	50%	10	2 nd Year	20	Neem/ Pungam	130	50%	10	3 rd Year	20	Neem/ Pungam	130	50%	10	4 th Year	20	Neem/ Pungam	130	50%	10	5 th Year	20	Neem/ Pungam	130	50%	10
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	<p>greenbelt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.</p>																																									
<p>32</p>	<p>Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.</p>	<p>Traffic volume after implementation of the project</p> <table border="1"> <thead> <tr> <th>For the Road</th> <th>Volume of Traffic</th> <th>Volume (V)</th> <th>Road Capacity (C)</th> <th>V/C Ratio</th> <th>LOS Category*</th> <th>Traffic Classification</th> </tr> </thead> <tbody> <tr> <td>Existing</td> <td>252</td> <td>457.85</td> <td>1500</td> <td>0.31</td> <td>“A”</td> <td>Free Flow Traffic</td> </tr> <tr> <td>After implementation</td> <td>272</td> <td>505.8</td> <td>1500</td> <td>0.34</td> <td>“A”</td> <td>Free Flow Traffic</td> </tr> </tbody> </table> <p>*LOS (Level of Service) categories are A-Free Flow, B- Reasonably Free Flow, C-Stable Flow, D-Approaching unstable flow, E- Unstable flow, F- Forced or breakdown flow. Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be Free Flow.</p> <p>Impact and Mitigation on local transport: The increment in the dust emissions will be mainly due to transportation activity. Therefore, emissions due to mineral handling during mining operation are not much and restricted to the lease area only. Proper mitigation measures are practiced during mining activities to control air pollution load below the prescribed limits are as follows:</p> <ul style="list-style-type: none"> ➤ Regular water sprinkling on haul and access roads. ➤ Watering of haul roads and other roads at regular intervals ➤ Provision of green belt by vegetation for trapping dust. ➤ Greenbelt development along the haul roads, dumps and along the boundaries of the lease area. ➤ Utmost care will be taken to prevent spillage of sand and stone from the trucks. <p>Impacts and mitigation measures on transportation is given in Chapter 4, Section 4.2.5.1.</p>	For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification	Existing	252	457.85	1500	0.31	“A”	Free Flow Traffic	After implementation	272	505.8	1500	0.34	“A”	Free Flow Traffic																			
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<p>33</p>	<p>Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.</p>	<p>Sanitation facilities are provided to mines workers. The details are provided in Mining plan and the same is enclosed as Annexure-2 (Table 2.5). An area of 0.04.0 Ha, of land is allocated for infrastructure within the lease area.</p> <p>Land use details of the quarry area:</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Land Use</th> <th>Present Area (Ha)</th> <th>Area to be required during the mining plan (Ha)</th> <th>Area at the end of quarrying period (Ha)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Area under Quarry</td> <td>0.43.5 (Existing)</td> <td>0.75.0</td> <td>0.92.5</td> </tr> <tr> <td>2</td> <td>Waste Dump</td> <td>1.12.5</td> <td>4.61.0</td> <td>4.61.0</td> </tr> <tr> <td>3</td> <td>Infrastructure</td> <td>Nil</td> <td>0.04.0</td> <td>0.04.0</td> </tr> <tr> <td>4</td> <td>Road</td> <td>0.85.0</td> <td>-</td> <td>0.85.0</td> </tr> <tr> <td>5</td> <td>Green Belt</td> <td>-</td> <td>0.06.5</td> <td>0.06.5</td> </tr> <tr> <td>6</td> <td>Un utilized Area</td> <td>18.54.5</td> <td>13.08.0</td> <td>14.46.5</td> </tr> <tr> <td colspan="2">Total</td> <td>20.95.5</td> <td>18.54.5</td> <td>20.95.5</td> </tr> </tbody> </table>	S. No	Land Use	Present Area (Ha)	Area to be required during the mining plan (Ha)	Area at the end of quarrying period (Ha)	1	Area under Quarry	0.43.5 (Existing)	0.75.0	0.92.5	2	Waste Dump	1.12.5	4.61.0	4.61.0	3	Infrastructure	Nil	0.04.0	0.04.0	4	Road	0.85.0	-	0.85.0	5	Green Belt	-	0.06.5	0.06.5	6	Un utilized Area	18.54.5	13.08.0	14.46.5	Total		20.95.5	18.54.5	20.95.5
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		Land use details of the quarry area are given in Chapter-2, Section 2.6.
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	<p>There will be no reclamation and restoration.</p> <p>It is proposed not to fill back the ultimate pit, in as much as good quantity of reserve is available below the workable depth.</p>
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	<p>Impacts on Occupational Health due to project operations:</p> <p>Anticipated occupational illness sequel to mining activities involved in the project. Occupational health problems due to dust & noise and Occupational illness by quarry activities as follows;</p> <ul style="list-style-type: none"> ➤ Dust related pneumonia ➤ Tuberculosis ➤ Rheumatic arthritis ➤ Segmental vibration <p>Mitigate Measures for Occupational Health</p> <ul style="list-style-type: none"> ➤ Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc. ➤ Plantation ➤ Avoid blasting during unfavorable wind & atmospheric conditions. ➤ Use of personal protective equipment. Compliance with DGMS circulars. ➤ Emergency response plan that includes installation of emergency response equipment to combat events such as fire. ➤ All personnel required to handle hazardous materials will be provided with personal protective equipment suitable for the hazardous material being handled. ➤ On-site first aid facilities will be provided and employees will be extended to the local community in emergencies. <p>Occupational Health impacts & preventive measures detail given in Chapter 4 Section 4.7.3</p> <p>Granite stone does not contain any toxic elements. Further this being a semi-mechanized mine, production is by semi-mechanized means and waste material handling partly by mechanized way, there shall be marginal impact on air and noise qualities. Therefore, the possibilities of any health hazards are minimal.</p> <ul style="list-style-type: none"> ➤ Awareness and planning are keys to prevention of occupational health hazards. ➤ Conducting air monitoring to measure worker exposures and to ensure that provided controls are adequate for protection of workers. ➤ Adequate respiratory protection will be provided to the workers. ➤ Periodic medical examinations for all workers. ➤ Provide workers with training that includes information about health effects, work practices, and use of protective equipments. <p>The EMP details are given separately as Chapter 10 along with EMP Cost details are provided in Section 10.14.</p>
36	Public health implications of the Project and related activities for the population in the impact zone should be	<p>Occupational Health impacts & preventive measures details are given in Chapter 4 Section 4.7.1.</p> <p>Granite stone does not contain any toxic elements. Further this being a</p>

	<p>systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.</p>	<p>semi-mechanized mine, production is by semi-mechanized means and waste material handling partly by mechanized way, there shall be marginal impact on air and noise qualities. Therefore, the possibilities of any health hazards are minimal.</p> <ul style="list-style-type: none"> ➤ Awareness and planning are keys to prevention of occupational health hazards. ➤ Conducting air monitoring to measure worker exposures and to ensure that provided controls are adequate for protection of workers. ➤ Adequate respiratory protection will be provided to the workers. ➤ Periodic medical examinations for all workers. ➤ Provide workers with training that includes information about health effects, work practices, and use of protective equipments. <p>The EMP details are given as a separately as Chapter 10 along with EMP Cost details are provide in Section 10.14.</p> <table border="1"> <thead> <tr> <th colspan="3">EMP COST</th> </tr> <tr> <th>S.No</th> <th>Description</th> <th>Amount in Rs.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Afforestation</td> <td>30,000/-</td> </tr> <tr> <td>2</td> <td>Water Sprinkling</td> <td>50,000/-</td> </tr> <tr> <td>3</td> <td>Water Quality Test</td> <td>25,000/-</td> </tr> <tr> <td>4</td> <td>Air Quality Test</td> <td>25,000/-</td> </tr> <tr> <td>5</td> <td>Noise / Vibration Test</td> <td>25,000/-</td> </tr> <tr> <td>6</td> <td>CSR Activity</td> <td>50,000/-</td> </tr> <tr> <td colspan="2">Total EMP Cost</td> <td>2,05,000/-</td> </tr> </tbody> </table>	EMP COST			S.No	Description	Amount in Rs.	1	Afforestation	30,000/-	2	Water Sprinkling	50,000/-	3	Water Quality Test	25,000/-	4	Air Quality Test	25,000/-	5	Noise / Vibration Test	25,000/-	6	CSR Activity	50,000/-	Total EMP Cost		2,05,000/-
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<p>37</p>	<p>Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.</p>	<p>A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status with secondary sources in the study area. The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.</p> <ul style="list-style-type: none"> • It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses. • The quarrying activities in this belt will benefit to the local people both directly 30 persons & indirect persons are 20 Nos. • The direct beneficiaries will be those who got employed in the mines as skilled and unskilled workers. 																											
<p>38</p>	<p>Detailed Environmental Management Plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.</p>	<p>The EMP details are given as a separately as Chapter 10 along with EMP Cost details are provided in Section 10.14.</p> <table border="1"> <thead> <tr> <th colspan="3">EMP COST</th> </tr> <tr> <th>S.No</th> <th>Descriptions</th> <th>Amount in Rs.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Afforestation</td> <td>30,000/-</td> </tr> <tr> <td>2</td> <td>Water Sprinkling</td> <td>50,000/-</td> </tr> <tr> <td>3</td> <td>Water Quality Test</td> <td>25,000/-</td> </tr> <tr> <td>4</td> <td>Air Quality Test</td> <td>25,000/-</td> </tr> <tr> <td>5</td> <td>Noise / Vibration Test</td> <td>25,000/-</td> </tr> <tr> <td>6</td> <td>CSR Activity</td> <td>50,000/-</td> </tr> <tr> <td colspan="2">Total EMP Cost</td> <td>2,05,000/-</td> </tr> </tbody> </table>	EMP COST			S.No	Descriptions	Amount in Rs.	1	Afforestation	30,000/-	2	Water Sprinkling	50,000/-	3	Water Quality Test	25,000/-	4	Air Quality Test	25,000/-	5	Noise / Vibration Test	25,000/-	6	CSR Activity	50,000/-	Total EMP Cost		2,05,000/-
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<p>39</p>	<p>Public Hearing points raised and commitment of the Project Proponent on the same along with time bound action Plan</p>	<p>Public Hearing points raised and commitment of the Project Proponent is discussed in Chapter 7, Section 7.2 and Table 7.1</p>																											

	with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.																																																																															
40	Details of litigation pending against the project, if any, with direction/order passed by any Court of Law against the Project should be given.	No litigation pending against the project as per Project Proponent.																																																																														
41	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	<table border="1"> <thead> <tr> <th>S. No</th> <th>Description of the Cost</th> <th>Amount in Rs.</th> </tr> </thead> <tbody> <tr> <td colspan="3">A. Fixed Cost</td> </tr> <tr> <td>1</td> <td>Land Cost</td> <td>Nil. Because Govt. land</td> </tr> <tr> <td>2</td> <td>Labour shed</td> <td>50,000/-</td> </tr> <tr> <td>3</td> <td>Sanitary facilities</td> <td>50,000/-</td> </tr> <tr> <td>4</td> <td>Fencing Cost</td> <td>1,25,000/-</td> </tr> <tr> <td colspan="2">Total</td> <td>2,25,000/-</td> </tr> <tr> <td colspan="3">B. Operational Cost</td> </tr> <tr> <td>1</td> <td>Jack Hammers</td> <td>1,98,000/-</td> </tr> <tr> <td>2</td> <td>Compressor</td> <td>19,82,000/-</td> </tr> <tr> <td>3</td> <td>Diamond wire saw</td> <td>4,87,000/-</td> </tr> <tr> <td>4</td> <td>Diesel General</td> <td>4,00,000/-</td> </tr> <tr> <td>5</td> <td>Excavators</td> <td>6,00,000/-</td> </tr> <tr> <td>6</td> <td>Tippers</td> <td>58,00,000/-</td> </tr> <tr> <td>7</td> <td>Drinking water facilities for the labours</td> <td>50,000/-</td> </tr> <tr> <td>8</td> <td>Safety kits</td> <td>50,000/-</td> </tr> <tr> <td colspan="2">Total Operational Cost</td> <td>95,67,000/-</td> </tr> <tr> <td colspan="3">C. EMP Cost</td> </tr> <tr> <td>1</td> <td>Afforestation</td> <td>30,000/-</td> </tr> <tr> <td>2</td> <td>Water Sprinkling</td> <td>50,000/-</td> </tr> <tr> <td>3</td> <td>Water Quality test</td> <td>25,000/-</td> </tr> <tr> <td>4</td> <td>Air Quality test</td> <td>25,000/-</td> </tr> <tr> <td>5</td> <td>Noise/Vibration test</td> <td>25,000/-</td> </tr> <tr> <td>6</td> <td>CSR activities</td> <td>50,000/-</td> </tr> <tr> <td colspan="2">Total EMP Cost</td> <td>2,05,000/-</td> </tr> <tr> <td colspan="2">Total Cost of the Project (A+B+C)</td> <td>99,97,000/- (Say 1 Crore)</td> </tr> </tbody> </table> <p>The project Cost is Rs.99,97,000/- as addressed in Chapter 2 and Section 2.8</p>	S. No	Description of the Cost	Amount in Rs.	A. Fixed Cost			1	Land Cost	Nil. Because Govt. land	2	Labour shed	50,000/-	3	Sanitary facilities	50,000/-	4	Fencing Cost	1,25,000/-	Total		2,25,000/-	B. Operational Cost			1	Jack Hammers	1,98,000/-	2	Compressor	19,82,000/-	3	Diamond wire saw	4,87,000/-	4	Diesel General	4,00,000/-	5	Excavators	6,00,000/-	6	Tippers	58,00,000/-	7	Drinking water facilities for the labours	50,000/-	8	Safety kits	50,000/-	Total Operational Cost		95,67,000/-	C. EMP Cost			1	Afforestation	30,000/-	2	Water Sprinkling	50,000/-	3	Water Quality test	25,000/-	4	Air Quality test	25,000/-	5	Noise/Vibration test	25,000/-	6	CSR activities	50,000/-	Total EMP Cost		2,05,000/-	Total Cost of the Project (A+B+C)		99,97,000/- (Say 1 Crore)
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42	A Disaster Management Plan shall be prepared and include in the EIA/EMP Report.	<p>Disaster Management Plan:</p> <ul style="list-style-type: none"> ➤ Effect the rescue and medical treatment of casualties ➤ Safeguard other people ➤ Minimize damage to property and the environment ➤ Initially contain and ultimately bring the incident under control ➤ Identify any dead ➤ Provide for the needs of relatives ➤ Provide authoritative information to the news media ➤ Secure the safe rehabilitation of affected area ➤ Preserve relevant records and equipment for the subsequent inquiry 																																																																														

		<p>into the cause and circumstances of the emergency</p> <ul style="list-style-type: none"> ➤ In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy. <p>Detailed Disaster management plan are provided in Chapter 7 and Section 7.2.3.</p>
43	<p>Benefits of the Project if the Project is implemented should be spelt out. The benefits of the project shall clearly indicate environmental, social, economic, employment potential, etc.</p>	<ul style="list-style-type: none"> ➤ The quarrying activities in this belt will benefit to the local people both directly 30 persons & indirect persons are 20 Nos. ➤ The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers. ➤ Improvement in Per Capita Income. ➤ The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters. ➤ It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.

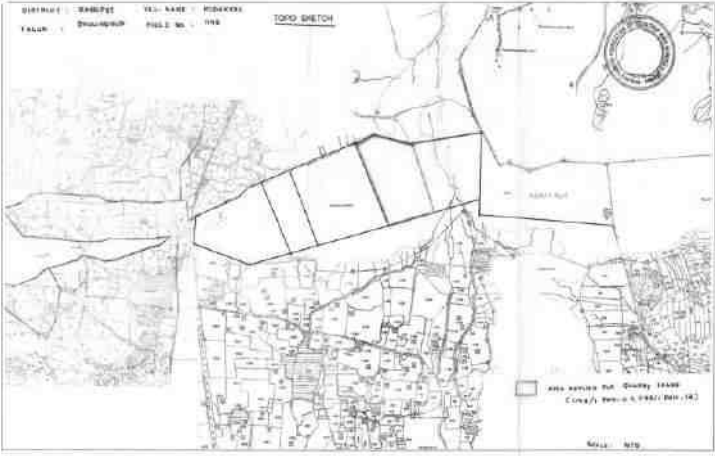
44	Besides the above, the below mentioned general points are also to be followed:	
a)	Executive Summary of the EIA/EMP report.	Executive Summary of EIA Report enclosed separately
b)	All documents to be properly referenced with index and continuous page numbering.	Noted and all documents addressed with properly referenced with index and continuous page numbers.
c)	Where data are presented in the report especially in Tables, the period in which the data were collected and the sources should be indicated.	Noted and sources for all tables are addressed.
d)	Project Proponent shall enclose all the analysis/testing reports of Water, Soil, Air, Noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	<p>All the analysis/testing reports of Water, Soil, Air, and Noise etc. are conducted by MoEF&CC& NABL accredited laboratories.</p> <p>The disclosure of Consultant is given in Chapter 12.</p>
e)	Where the documents provided are in a language other than English, an English translation should be provided.	The entire document is prepared in English.
f)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the ministry shall also be filled and submitted.	Questionnaire for environmental appraisal of mining projects is prepared as per prescribed format.
g)	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 be followed.	EIA is Prepared as per O.M No. J-11013/41/2006-IA. II (I) dated 4th August, 2009 given by MoEF&CC and the generic structure prescribed in Appendix-III of EIA Notification 2006 and covered all ToR Compliances.
h)	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	Noted

	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.	
i)	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 condition 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.	Not Applicable, as it is a new project
j)	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoin area.	All the Sectional Plates are enclosed as Annexure-5

1.10.4.3 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 point:

S. No	ToR Point	Compliance
1	Project name and location (village, District, State, Industrial Estate (if applicable))	The same has been complied in the Executive Summary.
2	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous waste.	The gaseous emission, liquid effluent and solid and hazardous wastes are discussed in Chapter 4
3	Measures for mitigation the impacts on the environment and mode of discharge or disposal	The Mine waste in the mine includes the over burden, side burden, rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation, formation of dumping yard sites etc., During the first five years of Mining Plan period, such waste material are proposed to be dumped along the Southern part of the lease area where it comprises of country rock terrain. No wastewater will be generated by quarry operation except domestic sewage. Domestic sewage will be disposed to septic tank followed by soak pit. Septic tank will be cleaned periodically.
4	Capital cost of the project, estimated time of completion.	Cost of the project is Rs.99,97,000/-
5	The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts	Contour map is shown in Chapter 3, Section 3.5.5, Figure 3.10

	on the wells due to mining activity	
6	A detailed study of the lithology of the mining lease area shall be furnished	Lithology details are provided in Mining plan. Mining Plan is enclosed as Annexure-4 .
7	Detailed of village map” A” register and FMB sketch shall be furnished	 <p>Village map is shown in Chapter 2, Figure 2.9</p>
8	Detailed mining closure plan for the proposed projects approved by the Geology of Mining department shall be shall be submitted along with EIA report	Mine closure plan is discussed in Chapter 7, Section 7.2.4
9	Obtain a letter/certificate from the Assisstant Director of Geology and Mining standing that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report	Noted and is followed
10	EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010	EIA report is prepared as per Environemntal Impact Assesement Guidance Manual.
11	Details plan on rehabitation and reclamation carried out for the stabilization and restoration of the mined areas.	There will be no reclamation and restoration. It is proposed not to fill back the ultimate pit, in as much as good quantity of reserve is available below the workable depth.
12	The EIA study report shall include the surrounding mining activity, if any.	There is no mining activity around the Proposed project site.
13	Modelling study for Air, Water and Noise shall be carried out in this field and incremental increase in the above study shall be substantiated with mitigation measures	AERMOD Software Version 8.0.5 is used for the modeling study of air and noise. The details are dicussed in Chapter 4

S. No	Description	Quantity (m ³)	
14	A study on the geological resources available shall be carried out and reported	Geological Reserves:	
		1 Geological Reserves (ROM)	1,86,802
		2 Geological Reserves (at 10% Recovery)	18,680
		Mineable Reserves:	
		1 Mineable Reserves (ROM)	1,10,265
		2 Mineable Reserves (at 10 % Recovery)	11,027
		3 The peak/maximum annual production per year would be	2,406
15	A specific study on agriculture and livelihood shall be carried out and reported	The details of agriculture & Livelihood is discussed in Chapter 3, Section 3.12	
16	Impact of soil erosion, soil physical chemical and biological property changes may be assumed	The quality of soil is discussed in Chapter 3, Section 3.10	
17	Site selected for the project-Nature of land Agricultural (single/double crop), barren, Govt./private land, status of its acquisition, nearby (in 2-3km) water body, population, with in 10km other industries, forest, eco-sensitive zones, accessibility, (note-incase if industrial estate this information may not be necessary)	The details are discussed in Chapter 3, Section 3.2, Table 3.1	
18	Baseline environmental data-air quality, surface and ground water quality and soil characteristic, flora and fauna, socio economic conditions of the nearby population.	Baseline environmental data-air quality, surface and ground water quality and soil characteristic, flora and fauna, socio economic conditions of the nearby population are discussed in Chapter 3 .	
19	Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.	3.0 litres/year of waste oil is generated from the mining activity. The waste oil will be collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/ Recycling.	
20	Likely impact of the project on Air, Water, Land, flora and fauna and nearby population.	The impacts of the project on Air, Water, Land, flora and fauna are discussed in Chapter 4	
21	Emergency preparedness plan in case of natural or in case of plant emergencies.	The emergency preparedness plan is discussed in Chapter 7, Section 7.2.3	
22	Issues raised during public hearing (if applicable) and response giving.	The public hearing minutes and compliance discussed in Chapter 7, Section 7.1 and Table 7.1	
23	CER plan with proposed expenditure.	CER Activity will be implemented for an amount of Rs.1,99,940 (2% of Project Cost) as per MoEF&CC O.M dated 20th October, 2020 (F.No. 22-65/2017-IA.III). CER fund will be allotted for Public Hearing commitments.	
24	Occupational Health Measures.	Occupational Health impacts & preventive measures detail given in Chapter 4, Section 4.7.3 and Table 4.28	
25	Post project monitoring plan.	Post project monitoring plan is discussed in Chapter 3, Section 6.3	

26	The project proponent shall carry out detailed hydro geological study through institutions/NABET Accredited agencies.	The Proposed depth the quarry is 40m AGL of a hill of 126m and the ground water is in 15m. So there will be no impact on the Ground water. Also there are no major surface water bodies in the surrounding the project area.
27	A detailed report on the greenbelt development already undertaken is to be furnished and also submit the proposal for greenbelt activities	As proposed, 20 plants per year were planted during the mining Period along the eastern boundary of lease area and achieved survival rate of 50%. The project proponent will spend Rs.30,000/- for the afforestation.
28	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines	The control measures to control the fugitive emissions during the operations of the mines is discussed in Chapter 4, Section 4.2, Table 4.3
29	A specific study should include impact on flora and fauna, disturbance to migratory pattern of animals	Flora and Fauna study is discussed in Chapter , Section 3.11
30	Reserve funds should be earmarked for proper closure plan	Reserve Funds will be earmarked while mining activity.
31	A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government Order (Ms) No.84 Environment and Forests (EC.2) Department dated 25.06.2018 regarding ban on time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan.	A sustainable plastic waste management plan by installing bins for collection/Segregation of recycleable and non-recyclable plastic waste at the proposed project site will be implemented.

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

S. No	ToR Point	Compliance
a.	A note containing compliance of the ToR with cross referencing of the relevant sections/pages of the EIA report should be provided.	Compliance of the ToR with cross referencing of the relevant sections/pages of the EIA report is provided in Chapter 1, Section 1.10.5
b.	All documents may be properly referenced with index, page number and continuous page numbering.	All documents are properly referenced with index, page number.
c.	Where data are present in the report especially in table, the period in which the data were collected and the sources should be indicated.	The sources are mentioned in the table. The period and locations of water, air, noise and soil samples collected from the site are discussed in Chapter 3.
d.	While preparing the EIA report, the instructions for the proponents and instruction for the consultant issued by the MoEF vide OM no. J-11013/41/2006-IA.II (I) dated 4 th August 2009 which are available on the website of	Noted and is followed

	the ministry should also be followed.	
e.	<p>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 organizations/laboratories including the status of the approvals etc. in this regards 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 and 30th September 2011 posted on the Ministry's website http://www/moef.nic.in/ may be referred.</p>	<p>EIA Report is prepared by NABET accredited Consultant, The Consultancy Laboratory is certified by MoEF&CC and NABL accredited. The disclosure of Consultant is given in Chapter 12.</p>

2 PROJECT DESCRIPTION

2.1 Type of Project including interlinked and interdependent projects

The black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & 6 m width with vertical slopes. The area applied for quarry lease exhibits hilly terrain; the altitude of the area is above ($\approx 182 - 293\text{m}$) AMSL. Total estimated Geological reserves are $1,86,802 \text{ m}^3$. Total Mineable Reserves is estimated as $1,10,266\text{m}^3$. Maximum production will be $2,406 \text{ m}^3$ of ROM of Black Granite and $11,027\text{m}^3$ of recoverable production of granite per annum. Summary of quarry reserves are given in **Table 2-1**.

The extent of the Quarry lease area is 20.95.5 Ha. The Quarry is located at Kodakkal village, Sholinghur Taluk, Ranipet District, Tamil Nadu State. Quarry lease area falls in the survey of India Toposheet no 570/8 and the area lies in the Eastern Longitude from $79^\circ 24' 14.80812''\text{E}$ to $79^\circ 24' 58.45205''\text{E}$ and Northern latitude from $13^\circ 04' 37.36450''\text{N}$ to $13^\circ 04' 55.00967''\text{N}$.

Table 2-1 Summary of Project Reserves

S. No	Description	Quantity (m^3)
Geological Reserves:		
1	Geological Reserves (ROM)	1,86,802
2	Geological Reserves (at 10% Recovery)	18,680
Mineable Reserves:		
1	Mineable Reserves (ROM)	1,10,266
2	Mineable Reserves (at 10 % Recovery)	11,027
3	The peak/maximum annual production per year would be	2,406

2.2 Need of the Project

The granite dimensional stone material by virtue of its pleasing color and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks is produced and exported as raw blocks and some quantity is being processed at TAMIN's granite processing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up.

This project will provide direct employment for about 30 persons. This material is well known in the international supermarket of Granite which will fetch a good foreign exchange to the nation.

2.3 Location of the project

The quarry is located at SF.No.1193/1 (Part-5 and Part-16), Kodakkal village, Sholinghur taluk, Ranipet District, Tamil Nadu State. Quarry lease area falls in the survey of India Topo sheet 57 O/8 and the area lies in the eastern Longitude from 79°24'14.80812"E to 79°24'58.45205"E and Northern latitude from 13°04'37.36450"N to 13°04'55.00967"N. The topography of the area is hilly. The elevation of the lease area is ≈170m AMSL. The boundary coordinates of the site are shown in the **Table 2.2.**

Table 2-2 The Boundary Coordinates of the Site

S.No	Boundary Mark Point	Latitude	Longitude
1.	TM1	13° 4'48.70"N	79°24'58.45"E
2.	TM2	13° 4'41.83"N	79°24'51.09"E
3.	TM3	13° 4'37.87"N	79°24'42.49"E
4	TM4	13° 4'37.36"N	79°24'35.25"E
.5.	TM5	13° 4'37.67"N	79°24'28.28"E
6.	TM6	13° 4'39.50"N	79°24'28.24"E
7.	TM7	13° 4'39.59"N	79°24'24.64"E
8.	TM8	13° 4'39.06"N	79°24'14.81"E
9.	TM9	13° 4'40.06"N	79°24'20.09"E
10	TM10	13° 4'52.37"N	79°24'15.11"E
11.	TM11	13° 4'54.22"N	79°24'17.22"E
12.	TM12	13° 4'55.01"N	79°24'19.41"E
13	TM13	13° 4'41.01"N	79°24'24.13"E
14	TM14	13° 4'42.11"N	79°24'28.55"E
15	TM15	13° 4'43.07"N	79°24'32.68"E
16	TM16	13° 4'44.07"N	79°24'36.96"E
17.	TM17	13° 4'44.98"N	79°24'40.74"E
18.	TM18	13° 4'45.73"N	79°24'44.55"E
19	TM19	13° 4'46.41"N	79°24'48.24"E
20.	TM20	13° 4'47.35"N	79°24'51.96"E
21.	TM21	13° 4'48.26"N	79°24'56.18"E

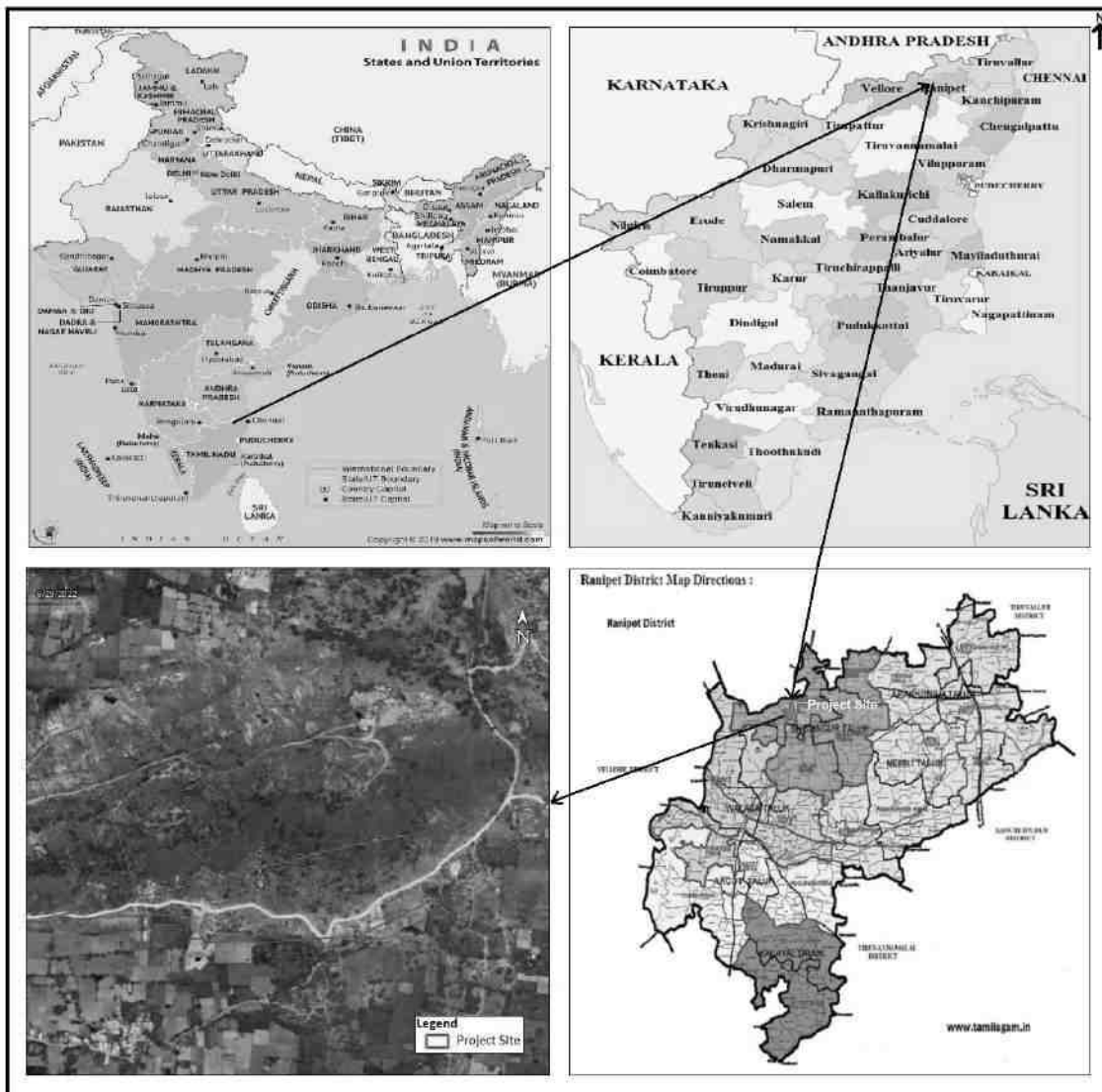


Figure 2-1 Project Location map



Figure 2-2 Google image of the lease area



Figure 2-3 500m radius Google imagery of the lease area



Figure 2-4 Google Imagery of 1 km radius of the lease area



Figure 2-55 km Google Imagery of the project site



Figure 2-6 10km Google Imagery of the project site

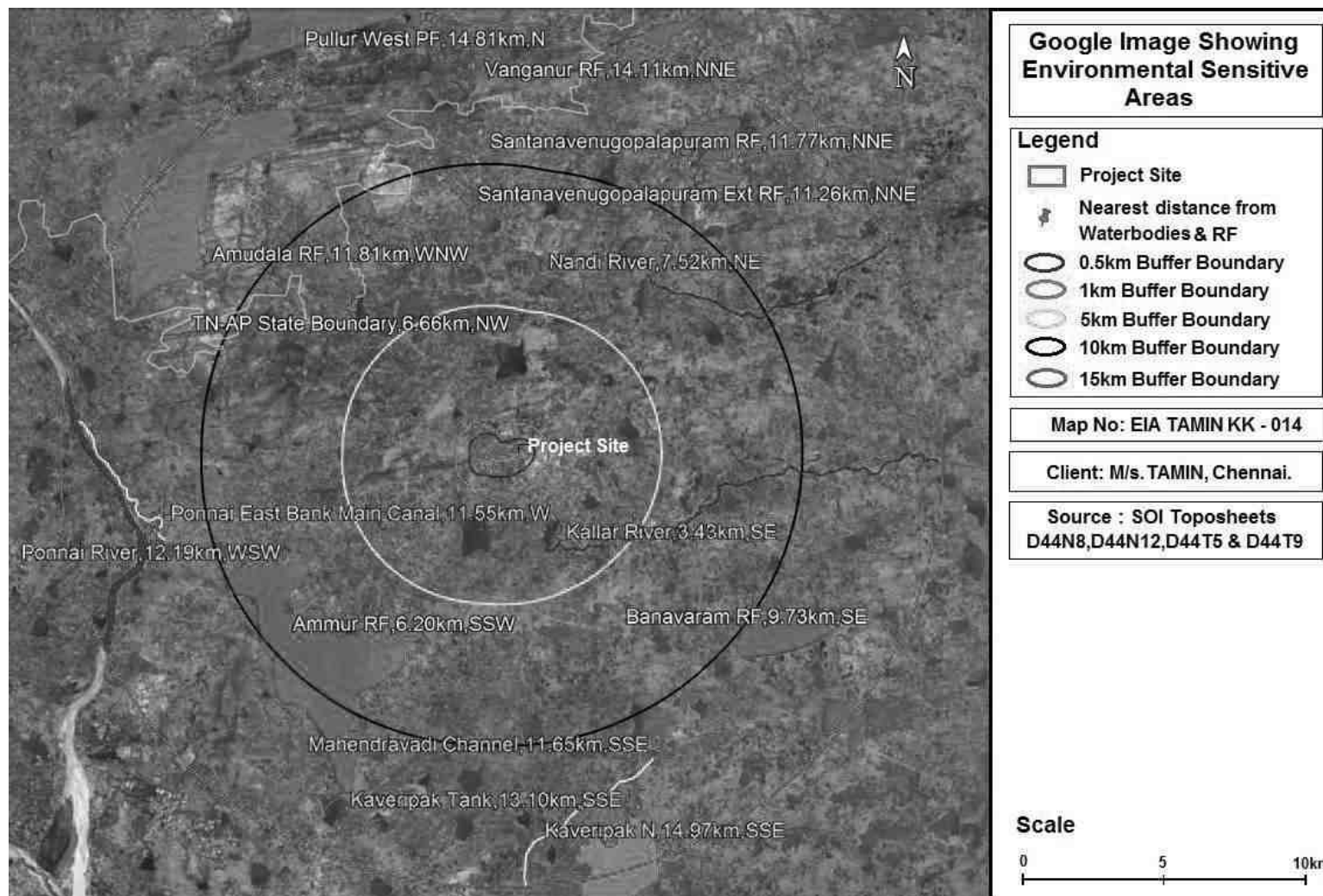


Figure 2-7 Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image

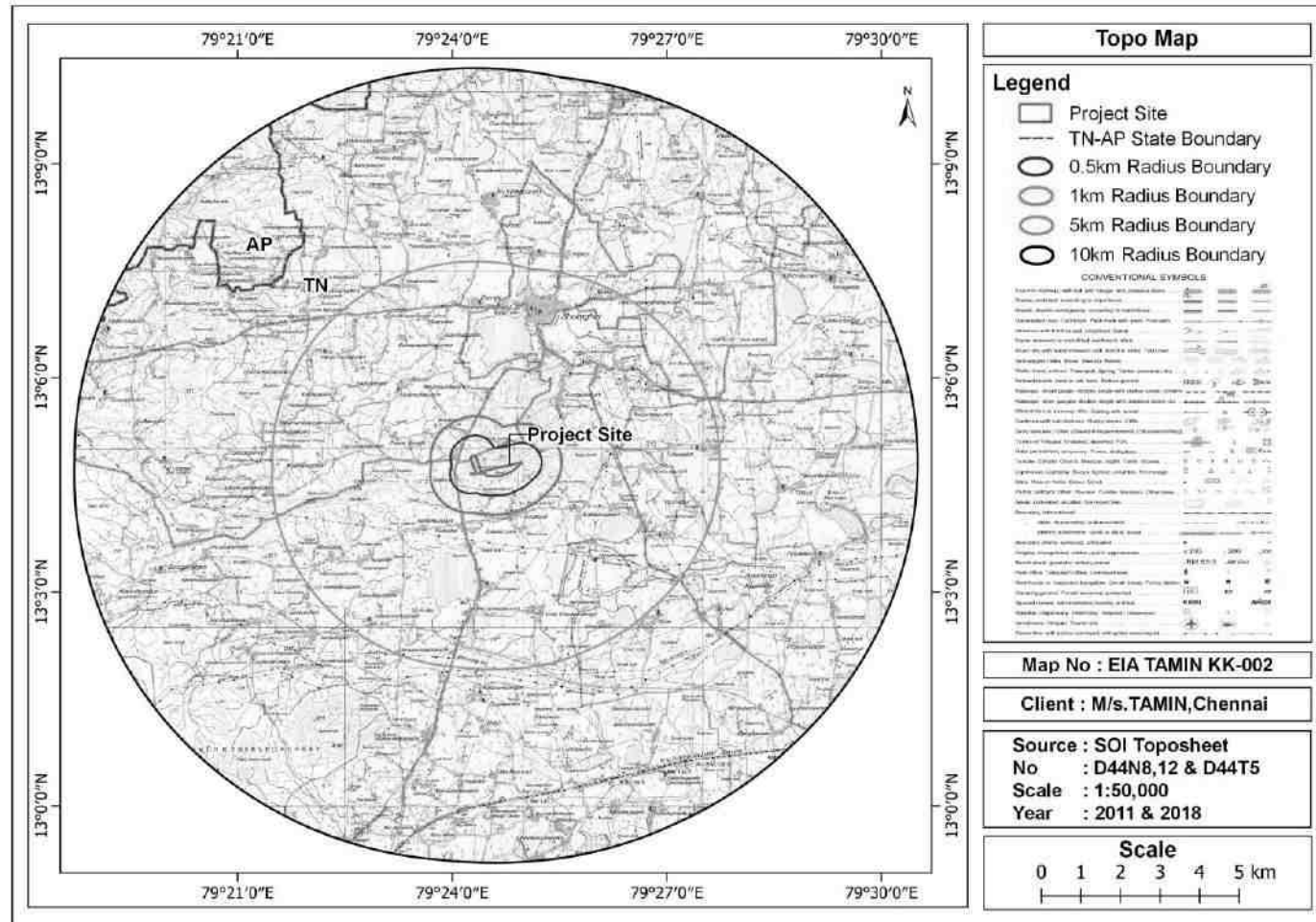


Figure 2-8 Topo map of the study area

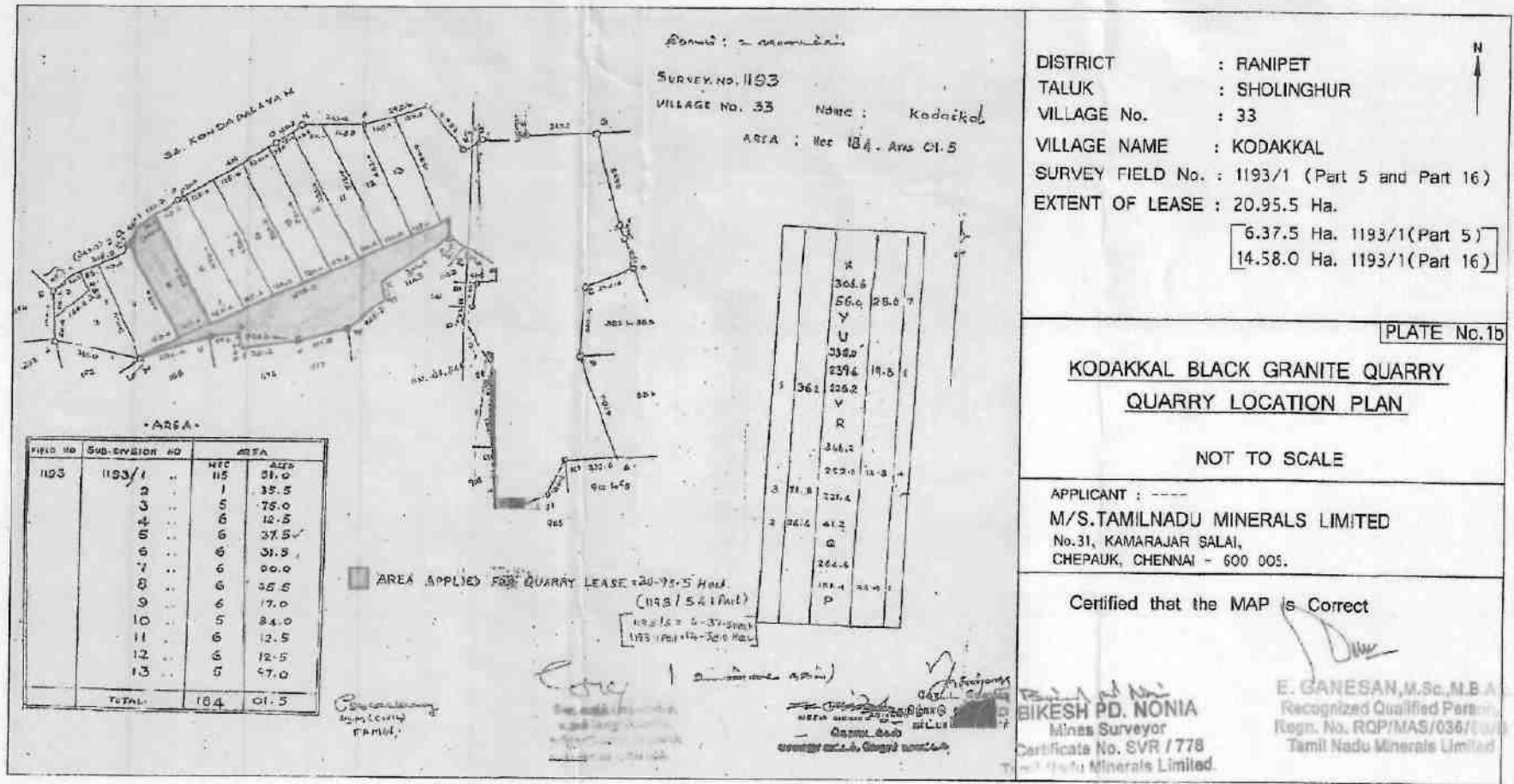


Figure 2-9 Village map Sketch of the lease area

Table 2-3 Salient Features and Environmental sensitivity details within 15km radius of the project site

S.No	Particulars	Details			
1.	Latitude	79°24'14.80812"E to 79°24'58.45205"E			
2.	Longitude	13°04'37.36450"N to 13° 04'55.00967"N			
3.	The lease area height	170m AMSL			
4.	Topo sheet no.	570/8			
5.	Topography	Hilly terrain			
6.	Land Type	Government Poramboke land			
7.	Extent of lease area(hectares)	20.95.5 Ha			
8.	Nearest National highway	NH 40 (Kurnool-Chittoor-Ranipet) ≈ 16.96km- SSW			
9.	Nearest State highway	SH 61(Walajh-Sholinghur-Arakonam) ≈0.29km-W			
10.	Nearest railway station	Thalangai Railway station ≈ 8.59km– SSE			
11.	Nearest airport	Tirupathi International Airport≈ 61.18km- N			
12.	Nearest town / city	Sholinghur≈2.34km-NNE			
13.	Hills / valleys	Nil in 15 km radius			
14.	Archaeologically important Places	S.No	Monuments	Distance (~km)	Direction
		1.	Rock inscriptions in the Right flank of the Sholinghur tank	2.93	N
		2.	Choleswara Temple Melpadi	13.05	W
		3.	Somanatha Temple Melpadi	13.06	W
15.	National parks / Wildlife Sanctuaries	Nil in 15 km radius from the project boundary			
16.	Seismicity	Seismic zone-III (moderate risk)			
17.	Defense Installations	Nil in 15 km radius			
18.	State Boundary	TN – AP State Boundary ≈ 6.66km – NW			
19.	Water bodies	S.No	Water Bodies	Distance (~km)	Direction
		1.	Pond near Project Site	0.16	S
		2.	Pond near Pudukkudiyapur	0.46	S
		3.	Perunganji Lake	1.74	S
		4.	Sholinghur Lake	2.35	N
		5.	Kallar River	3.43	SE
		6.	Nandi River	7.52	NE
		7.	Paranji Lake	10.32	ENE
		8.	Ponnai East Bank Main Canal	11.55	W
		9.	Mahendravadi Channel	11.65	SSE
		10.	Ponnai River	12.19	WSW
		11.	Kaveripak Tank	13.10	SSE
		12.	Mahendravadi Lake	13.47	SE
13.	Kaveripak N	14.97	SSE		
20.	Reserve Forests/ Protected Forests	S.No	Reserve Forests	Distance (~km)	Direction

		1.	Ammur RF	6.20	SSW	
		2.	Banavaram RF	9.73	SE	
		3.	Santanavenugopalapuram Ext RF	11.26	NNE	
		4.	Santanavenugopalapuram RF	11.77	NNE	
		5.	Amudala RF	11.81	WNW	
		6.	Vanganur RF	14.11	NNE	
		7.	Pullur West PF	14.81	N	
21.	Nearest Villages	S.No	Monuments	Distance (~km)	Direction	Population as per Census 2011
		1.	Pudukkudiyannur	0.20	S	300
		2.	Kodakkal	0.53	S	7,948
		3.	Nilotpalapuram	0.85	NW	850
		4.	Padmapuram	1.28	N	1,033
		5.	Kondapalaiyam	1.38	NE	1,200

Table 2-4 Project summary

S.No	Particulars	Details
1.	Project Location	S.F.No.1193/1(Part-5) & Part-16, Kodakkal village, Sholinghur taluk, Ranipet District, TamilNadu State.
2.	Land classification	Government Poramboke Land
3.	Extent of lease area (Ha.)	20.95.5
4.	Precise area communication	Precise area communication letter was granted vide Industries (MME.1) Department, letter No. 3040/MME.1/2022-1, dated: 02.06.2022.
5.	Lease Period	20 years
6.	Estimated Geological Reserves (ROM) m3	1,86,802
7.	Estimated Mineable Reserves (ROM) m3	1,10,266
8.	Black Granite production per annum m3	2,406
9.	Depth of Mining	40m from the top surface of the granite body
10.	Method of Mining	Open cast semi mechanized method (Reg. 106(20(b))
11.	Water Requirement (KLD)	1.5
12.	Source of Water	Road tankers
13.	Power requirement (kVA)	Negligible
14.	Power Backup (DG set)Kva	1* 125
15.	Fuel requirements (Lts/Day)	200
16.	Direct Manpower (Nos)	30
17.	Municipal Solid Waste Generation (kg/day)	13.5
18.	Waste Oil generation (Lts/Year)	3.0
19.	Project Cost in Lakhs	99.97
20.	EMP Cost in Lakhs	2.05

2.4 Nearest Human Settlement

The detail of nearest human settlement from the project site is provided below in **Table 2.5**.

Table 2-5 Nearest Human Settlement

S.No	Places	Distance (≈km)	Direction	Population as per Census 2011
1.	Kodakkal	0.81	S	7,948
2.	Pudukkudiyannur	0.22	S	310
3.	Padmapuram	0.16	N	1033
4.	Nilotpalapuram	0.85	NW	1190
5.	Kondapalayam	1.42	NE	Inside Sholinghur Town Panchayat(3,0856)

2.5 Details of alternate sites considered

The mineral deposits are site specific in nature; hence question of seeking alternate site does not arise. No R & R, no sensitive area etc., making the site suitable for the mining of Black Granite. The site meets the requirement of all critical factors that are important for success of mining in the state and could be a pre-eminent location. Thus, there are no alternative sites examined.

2.6 Size or Magnitude of operation

The black granite quarrying operations is carryout by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & 6m.

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 1,86,802 m³. By applying 10% recovery the effective geological reserves work out is 18,680 m³.

Mineable Reserves have been computed as 1,10,266 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406m³ of ROM of saleable and 11,027m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery.

Total waste (Granite waste + Side Burden to be generated during the five years of Mining Plan period will be around 2,00,367 m³. These wastes are proposed to be dumped on the North eastern side of lease area with dimensions of 674.4m x 68.3 x 4.35m. The Land Use break up summarized as **Table 2.6**.

Table 2-6 Land use details of the quarry area

S.No	Land Use	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Area under Quarry	0.43.5	0.92.5
2	Waste Dump	1.12.5	4.61.0
3	Infrastructure	Nil	0.04.0
4	Road	0.85.0	0.85.0
5	Green Belt	-	0.06.5
6	Un utilized Area	18.54.5	14.46.5
Total		20.95.5	20.95.5

2.7 Granite Reserves

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 1,86,802 m³. By applying 10% recovery the effective Geological reserves works out 18,680 m³.

Mineable Reserves have been computed as 1,10,266 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406m³ of ROM of sateable and 11,027m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery. Sectional plates are enclosed as **Annexure-IV**.

During extraction of blocks, each bench will be of 6m height with vertical slope for dimensional cutting. The quantum of excavation is estimated to be 2,11,394m³(ROM 1,10,265 m³ + Side Burden 1,01,129m³) up to an average depth of 40m during the entire lease period. The generation of total waste estimated about 2,00,367 m³(Granite Rejects 99,238m³ and side Burden 1, 01,129 m³) and marketable granite blocks as 11,027m³ during the entire life of Quarry.

The total waste (Granite waste + Side Burden) to be generated during the 5 years of Mining plan period will be around 2,00,367 m³. These wastes are proposed to be dumped on the Southest side of lease area with dimensions of 674.4m x 58.3m x 4.35m. Granite Quarry Reserves is given in **Table 2-7**. The yearwise production details are given in the **Table 2.8**. Surface Plan of the Quarry is given in **Figure 2.10** Geological plan and cross section of the quarry is shown in **Figure 2.11**. Conceptual Plan of the quarry area is shown as **Figure 2.12**. Land use and afforestation of the quarry is shown as **Figure 2.14**. Year wise production plan is shown as **Figure 2.13**.

Table 2-7 Granite Quarry Reserves

S. No	Description	Granite (m ³)	Recovery 10% (m ³)	Granite waste 90% (m ³)
1	Geological Resource	1,86,802	18,680	1,68,122
2	Mineable Reserves	1,10,266	11,027	99,238

Table 2-8 Yearwise Production details

S. No	Year	ROM (m ³)	Recovery @10% (m ³)	Granite Waste @ 90 % (m ³)	Side Burden (m ³)
1	1 st Year	23,616	2,361	21,254	15,552
2	2 nd Year	24,064	2,406	21,658	8,880
3	3 rd Year	24,000	2,400	21,600	15,408
4	4 th Year	18,105	1,810	16,294	18,779
5	5 th Year	20,480	2,048	18,432	42,510
Total		1,10,265	11,027	99,238	1,01,129

Estimated Life of the Quarry:

- Mineable ROM: 1,10,266 m³
- Mineable Recoverable Reserved @10%: 11,027 m³
- Average Production per Year@10%: 11,027/5 Years= 2,406 m³
- Estimated Life of the Quarry: 11,027/2,406 m³=5 years

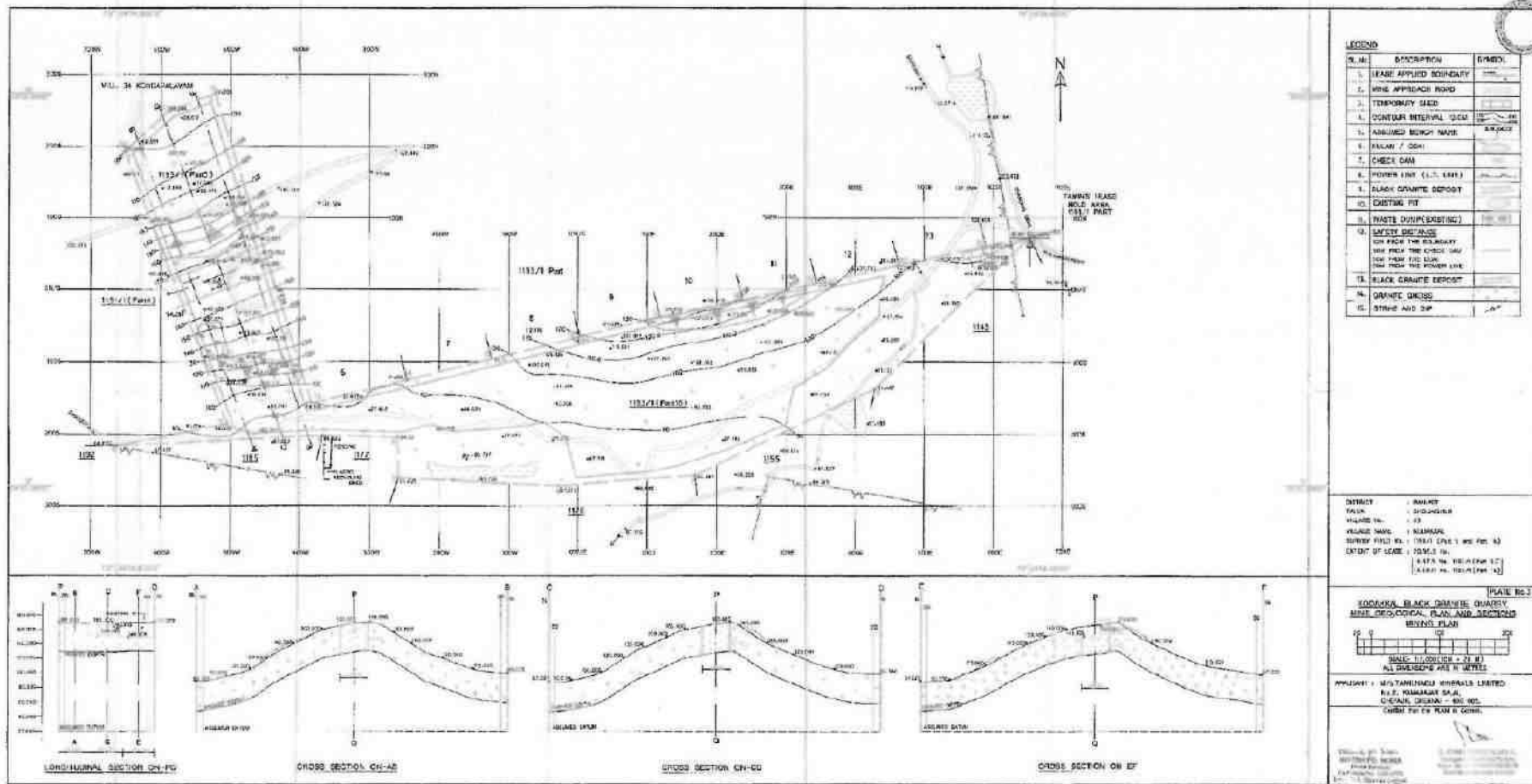


Figure 2-11 Geological plan of the quarry

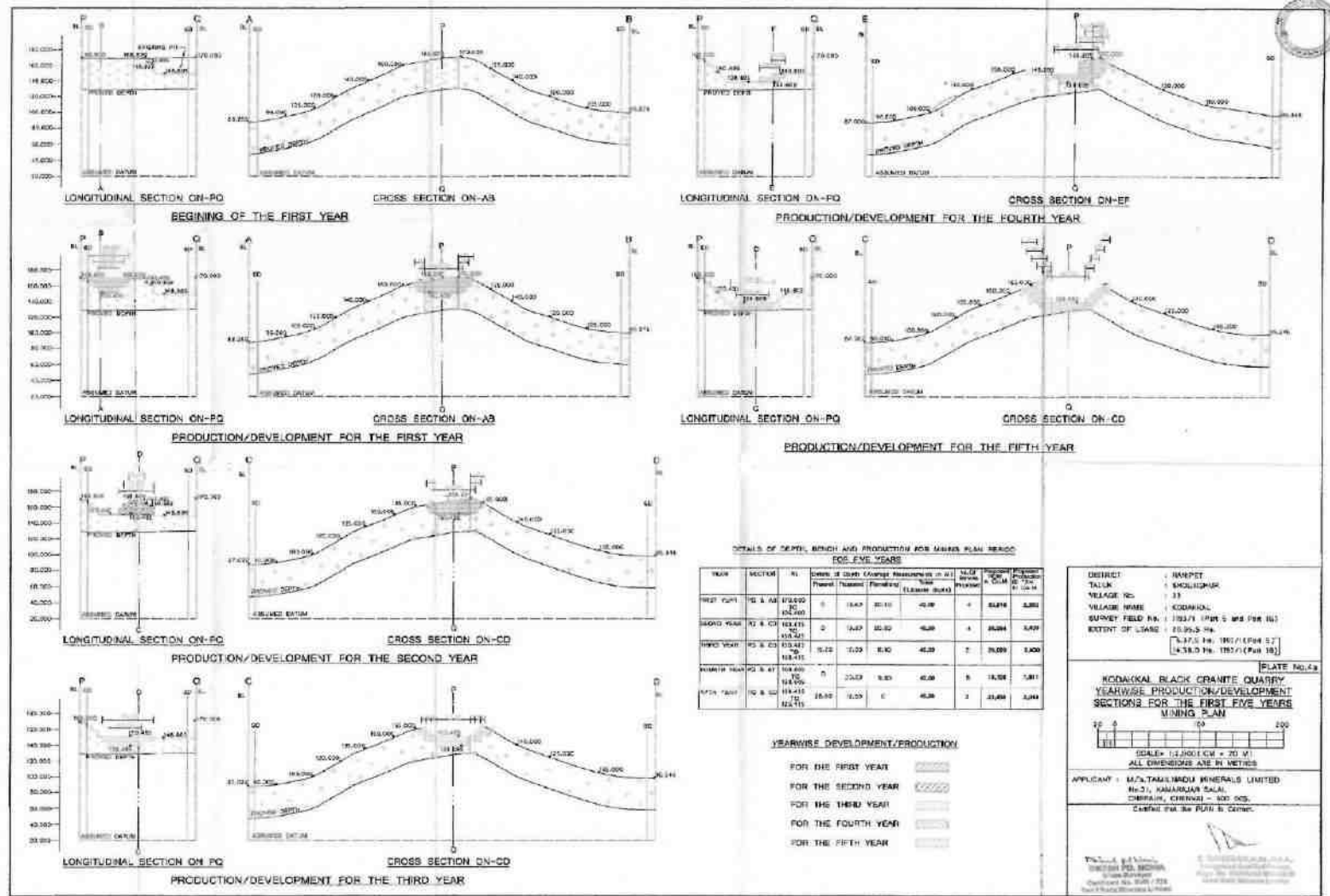


Figure 2-12 Mines Geological Sections of the lease area

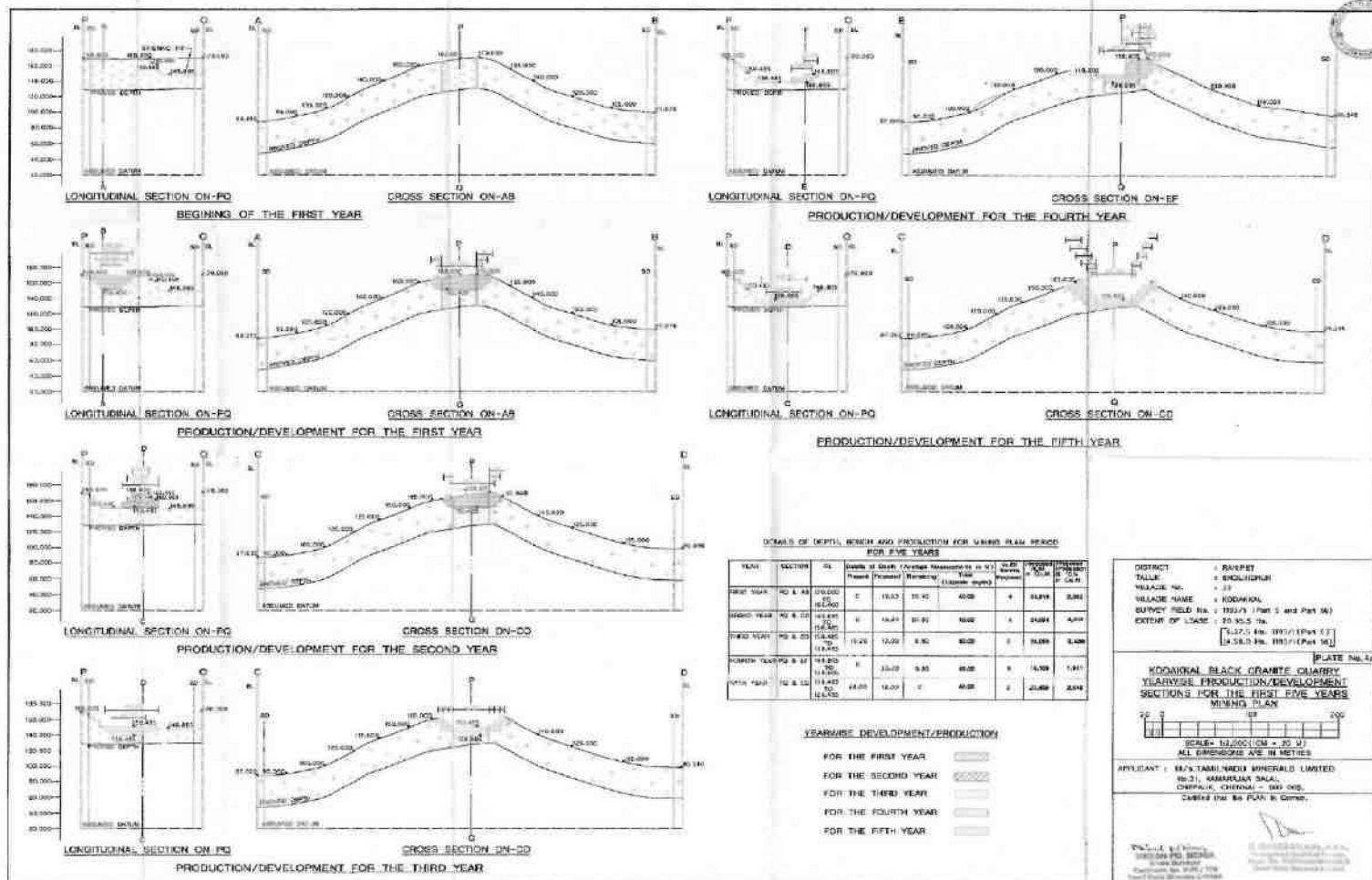


Figure 2-13 Year wise Production/Development Plan for 5 years

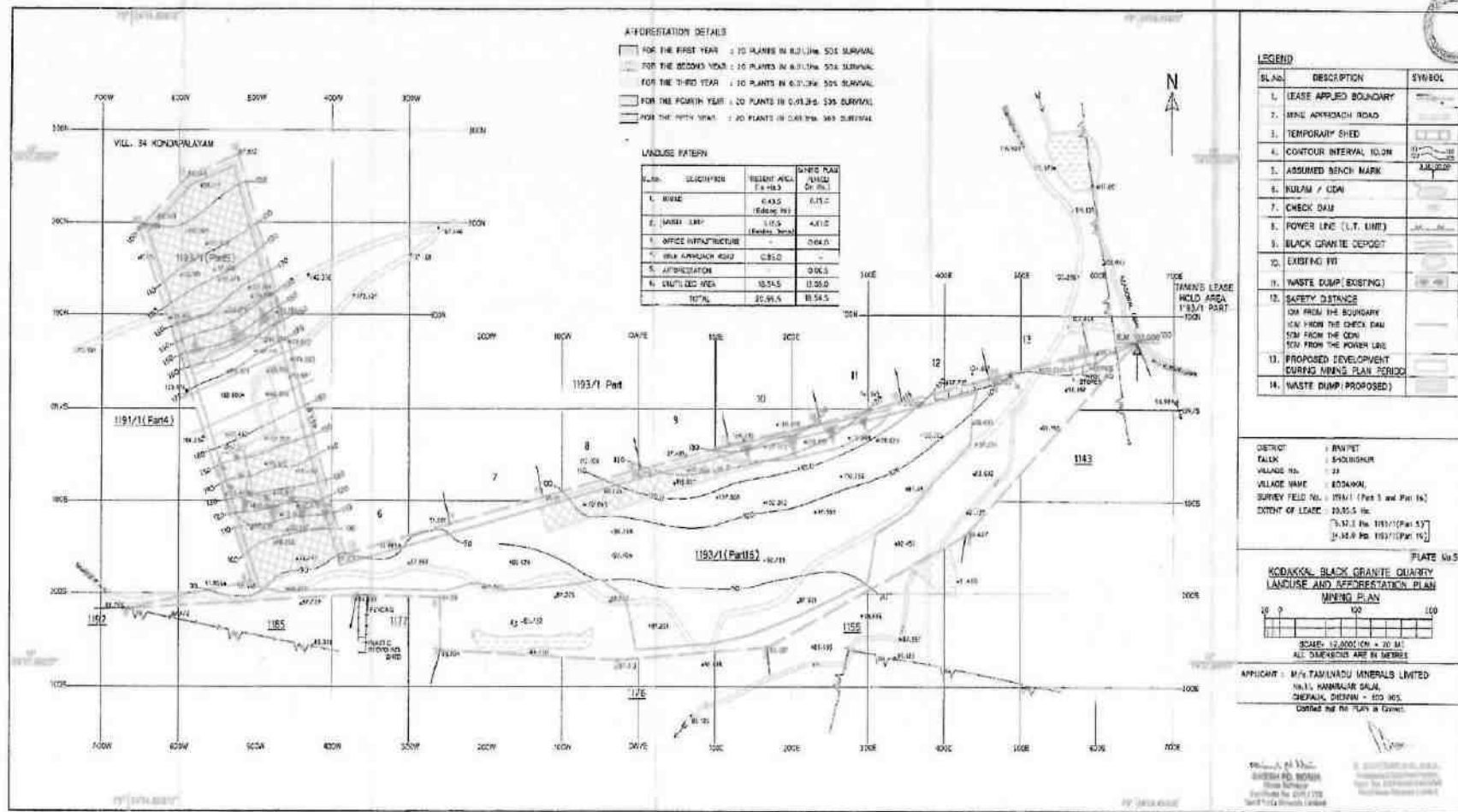


Figure 2-14 Land Use and Afforestation Plan

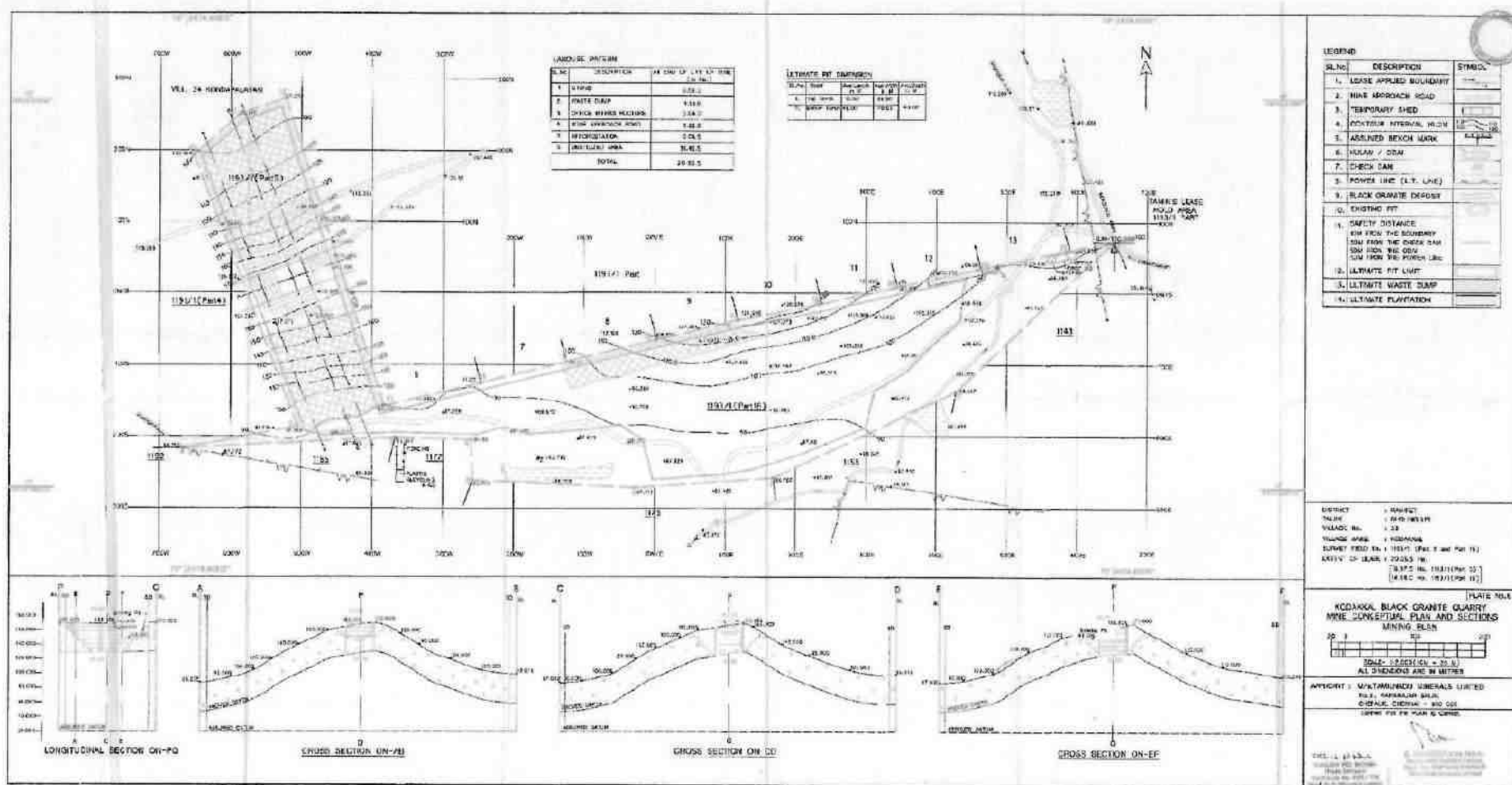


Figure 2-15 Conceptual Plan

2.7.1 Proposed schedule for approval and implementation

The time schedule for the completion of the proposed mining project is given in the below as,

Particulars	Time Schedule
ToR obtained on	16.02.2023
Baselines study started as per MoEF&CC OM F. No. IA3-22/10/2022-IA.III [E 177258] dt. 08.06.2022	Mid Jan 2023 to Mid April 2023
Submission of DRAFT EIA/EMP	May 2023
Conducting Public Hearing and submitting final EIA/EMP and PoD	June 2023
Presentation before SEAC and Obtaining EC	August 2023

The project will be implemented after Obtaining EC from SEIAA and CTO from PCB.

2.8 Project Cost

The project cost is summarized in Table 2.9.

Table 2-9 Project cost

S. No	Description of the Cost	Amount in Rs.
A. Fixed Cost		
1	Land Cost	Nil. Because Govt. land
2	Labour shed	50,000/-
3	Sanitary facilities	50,000/-
4	Fencing Cost	1,25,000/-
Total		2,25,000/-
B. Operational Cost		
1	Jack Hammers	1,98,000/-
2	Compressor	19,82,000/-
3	Diamond wire saw	4,87,000/-
4	Diesel General	4,00,000/-
5	Excavators	6,00,000/-
6	Tippers	58,00,000/-
7	Drinking water facilities for the labours	50,000/-
8	Safety kits	50,000/-
Total Operational Cost		95,67,000/-
C. EMP Cost		
1	Afforestation	30,000/-
2	Water Sprinkling	50,000/-
3	Water Quality test	25,000/-
4	Air Quality test	25,000/-
5	Noise/Vibration test	25,000/-
6	CSR activities	50,000/-
Total EMP Cost		2,05,000/-
Total Cost of the Project (A+B+C)		99,97,000/-

	(Say 1 Crore)
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2.9 Technology & Process Description

2.9.1 Technology

Primary step of mining of minerals is the removal of the deposits from the ground. Once the minerals / ore are removed, additional preparation process is required to isolate the valuable minerals from their waste gangue minerals. There are two basic method of mining of minerals opencast and underground mining. The choice of method depends on the geologic, hydrological, geo-technical, geographic, economic, technological, environmental, safety, Socio - political and financial considerations. Schematic Diagram of Mining Process is given in **Figure2.16**.



Figure 2-16 Schematic Diagram of Mining Process

2.9.2 Method of mining-Open Cast Working

In accordance with the Regulation 106 (2) (a) of the Metalliferous Mines Regulations 1961, in all open cast workings where the ore body forms hard rock, the working faces and sides should be adequately benched and sloped. A bench height not exceeding 6m and a bench width not less than the height has to be maintained. The slope angle of such benches and sides should not exceed 60° from the horizontal. However, observance of these statutory provisions into in granite dimensional stone mining is seldom possible due to the field difficulties and technical reasons as below:

- Recovery of the granite mineral is to be as undamaged rectangular dimensional blocks. In the attempt to the benches and sides with the above statutory parameters haphazard blasting may be involved.
- In which case the commercial granite body may get spoiled due to generation of blasting cracks. In the exercise of forming the benches with 60° slope within the granite deposit, the portion confined within the 60° as well as its complimentary part in the extricated block will become as mineral waste while shaping into rectangular blocks.
- The granite industry needs blocks as huge as few cubic meters volume with measurements up to 3m x 2m x 2m. Production of such huge blocks with a moving bench of 6m height is not

possible. Production of such huge blocks in turn increases the recovery and reduces the mineral waste during dressing. Blocks of smaller size of certain varieties of granite are not marketable now-a-days.

- Formation of too many benches with more height and the width equal to the height may lead to mineral lock up. Hence, in order to avoid granite waste and to facilitate economical and convenient mining operations, it is proposed to obtain relaxation to the provisions of Regulation 106 (2) (a) up to a bench parameter of 6m height and 3m width with vertical faces. Such a provision for relaxation of the Regulation has been provided within the regulation 106 (2) (a). Further, it is to be noteworthy that opencast granite mining operations with the above proposed bench parameters may not be detrimental to Mines Safety, since the entire terrain is made up of hard rock, compact sheet and possess high stability on slope even at higher vertical angles.

It is proposed not to backfill the pit in as much as good quantities of reserves are underlying the pits. The stock yard for the granite blocks produced and the dressing yard where the manual dressing and shaping of the blocks are carried out are located near the working pit in order to minimize the lead from the pit to the dressing yard and stock yard. A mine office, store room, first-aid room and workers rest shelter are provided within the lease hold area.

2.10 Process Description

2.10.1 Mining

The production of Black Granite dimensional stone in this mine involves the following methods typical for granite mining in contrast to any other major mineral mining.

Splitting of rock mass of considerable volume from the parent sheet rock carefully avoiding any kind of damage in the form of cracks in the deposit by adopting the following methods.

- a. Separation of two vertical ends along the width side by diamond wire cutting.
- b. Separation of the horizontal(bottom) and the vertical(length side) planes by serial blasting simultaneously along the above two plans by using 32mm dia blast holes charged with mild explosives like gunpowder or detonatincord.
- c. Diamond wire cutting along the horizontal as well as two sides parallel to strike and dip direction and the vertical face will be a free face is liberated by conventional serial blasting.

All the above process continued together aiming at the liberation of huge volume of the granite body from the parent sheet rock is called 'primary cutting'.

The secondary splitting in to required size involves long hole drilling up to the bottom of the separated block and mild blasting along the required plans. The blocks split as above are separated and removed from the pit to the dressing yard by using hydraulic excavators.

Now-a-days the secondary splitting is carried out by way of splitting and overturning cushion operational procedure. The procedure is by utilizing the compressed air available at the quarry at 7 to 8 bar pressure, initially (widening) splitting up to 15 to 18cms. Next by using super imposed cushion widening up to 80cms and overturning of the blocks.

Removing the defective portions and dressing into the dimensional blocks are done manually using feather and wedges and chiseling respectively by the laborers who are skilled in this work.

The defect free rectangular shaped dimensional stones as acceptable to consumers are produced by the method described as above which is constantly supervised by experienced mining geologist.

The waste material generated during mining activity include the rock fragments of different angularity formed during the works, during the removal of naturally defective and uneconomical portions of the deposits and the working waste formed during dressing of the extricated blocks. Such waste materials are proposed to be dumped along the northern side of the lease boundary / barren area where the commercial granite occurrences are not seen / the area covered with poor quality granite deposit identified to be uneconomical due to sheared and contacted nature or the presence of closely space natural joints, etc.

2.10.2 Blasting

The blasting parameters in the mining of granite dimensional stones are entirely different from that of industrial minerals, since the basic purpose for the use of explosives in both the cases are entirely different. In the industrial minerals, maximum fragmentation and crushing of the ore is essential, whereas in the granite mining, the granite stones are to be extricated intact, without any damage on both the extricated part and the parent rock body.

The portion to be extricated from the parent rock body is free in all planes by adopting different methods. Only mild explosives such as detonating cord, ordinary detonators etc will be used for the production of granite blocks. The blast holes of 32mm diameter are drilled up to the bottom of the horizontal plane all along the required planes without deviations.

Conventional 32 mm dia blast holes are drilled perfectly parallel to each other at 20 to 25cm intervals without any hole deviations, all along the required plane of splitting. The holes are drilled up to a depth of few cms above the required horizontal plane. Sub grade drilling is not necessary,

since the splitting will be affected up to a further distance of few cms from the drill hole on blasting. Sub grade drilling may affect the underlying granite deposit.

Explosives such as gelatin, delay detonators etc. may also be used occasionally at places further away from the granite deposit for certain development works such as forming approach roads to the working faces below ground level for forming flat surfaces to be used as dumping yard etc. The explosives required for this mine is obtained from the authorized, licensed dealer for which necessary permission will be obtained from the authority concerned. The blasting will be under the direct supervision of the statutory persons of TAMIN.

Blasting is carried out at appointed hours only with prior precaution to the local public. Now-a-days the splitting within the sheet rock is affected by diamond wire sawing, which largely reduces the use of explosives in granite mining. Many adverse effects of blasting are avoided and hence the recovery will be substantially increased by diamond wire cutting. Hence it is proposed to deploy one wire saw machine in this mine.

Now-a-days expansion mortar [$\text{Ca}(\text{OH})_2$] is used for splitting granite blocks from parent rocks and wire saw cutting is also used for that. Thus, kind of technique will minimize the blasting activities in granite mining.

2.10.3 Loading & Transportation

The mode of transport of the granite blocks produced and marketed is by road of various consumer destinations and granite processing units located at different parts of the country. The blocks approved for export market are shipped through Chennai / Tuticorin Harbours to various countries.

2.10.4 Exploration

A number of valuable data for economical mining of the granite stone in this area have been known.

1. Occurrence of the Black granite stone is economically viable quality and quantity has been established by geological mapping and visual examination by mining geologist experiences in granite mining which have been proved by actual mining practice.
2. The depth persistence of the granite stone is proved beyond the workable limits of depth of 40m from the surface level and the top surface of the granite body works.
3. The recovery of the saleable granite stones has been established as 5% from the visual exploration and from the data available by actual mining practices during the past mining in this area. As the sale of granite dimensional stone is in terms of volumes (cubic meter) only and not in terms of tonnage as in the case of the mining of Industrial minerals, the geological

reserves, mineable reserves and quantum of waste generation etc., are given in terms of cubic meter (volume) only.

2.10.5 Storage of Explosives

The applicant will engage an authorized explosive agency to carry out the small amount of blasting as such no storage of explosives is envisaged for this proposal. The blasting will be supervised by DGMS authorized. Mines Foreman /Mines Manager certificate of competency.

2.10.6 Mine Drainage

The lease applied area is hillock 40m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 15m depth. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the ground water are collected at one point called as sump and dewatered nearby agricultural field with the help of 10HP oil engines.

Odai is passes through the site. As per the mining plan, a safety distance of 50m shall be maintained for the odai.

2.10.7 Disposal of Waste

The Mine waste in the mine includes the over burden, side burden, rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation, formation of dumping yard sites etc., During the first five years of Mining Plan period, such waste material are proposed to be dumped along the Southern part of the lease area where it comprises of country rock terrain.

2.10.8 Top Soil Management

Topsoil will be properly stacked at earmarked dump site with adequate measures. It will be used for growing plants along the fringes of the site roads and reclamation of external dump and backfilled area. The topsoil stockpiles will be low height and will be grassed to retain fertility. Besides these topsoil stacks there will be temporary stacks near the excavation area and area to be reclaimed which will be made use of concurrent lying without bringing the topsoil to the soil stack near the OB dump.

2.10.9 Stabilization of Dump

As the waste generation in the mine includes hard rock fragments of considerable size and irregular shape with varying angularity, the waste dump will be stable on its own even at higher slopes of the sides. However, suitable variety of soil will be identified and brought from outside and used for

increasing the stability of the sides of the waste dumps and also for planting trees over the dumps in a phased manner.

2.11 Requirements

2.11.1 Land Requirement and Land Use Planning

Quarry Land details are shown in **Table 2-10** and Land use pattern is provided in **Table 2-11**.

Table 2-10 Quarry Land details

District and State	Taluk	Village	S.F. No	Area (Ha)	Land Classification
Ranipet, TamilNadu	Sholinghur	Kodakkal	1193/1, Part-5 & Part-16	20.95.5	Government land

Table 2-11 Land Use Pattern of the lease area

S. No	Land Use	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Area under Quarry	0.43.5	0.92.5
2	Waste Dump	1.12.5	4.61.0
3	Infrastructure	Nil	0.04.0
4	Road	0.85.0	0.85.0
5	Green Belt	-	0.06.5
6	Un utilized Area	18.54.5	14.46.5
Total		20.95.5	20.95.5

2.11.2 Water Requirement

The total water requirement is 1.5 KLD. The total water requirement will be met through private tankers. The granite quarry will not produce toxic effluent in the form of solid, liquid or gas. No wastewater will be generated by quarry operation except domestic sewage. Domestic sewage will be disposed to septic tank followed by soak pit. Septic tank will be cleaned periodically.

Table 2-12 Water requirement breakup

S. No	Description	Water Requirement(KLD)
1	Drinking & Domestic purpose	0.5
2	Wire Saw Cutting	0.3
3	Dust suppression	0.3
4	Green Belt	0.4
Total		1.5

2.11.3 Power & Fuel Requirement

The Power and Fuel requirement details are given in

Table 2-13.

Table 2-13 Power Requirements

S. No	Description	Power Required
1	Power requirement (kVA)	60
2	Power Backup (DG set)	1*125kVA
3	Fuel requirements (Lts/Day)	200

2.11.4 List of Equipments

1 No. of Excavator having 600LC capacity Tata Hitachi will be used for excavation and 2 nos of 25 tones capacity Ashok Leyland Dumpers will be used during loading. The list of Equipments is given in **Table 2-14.**

Table 2-14 Lists of Machineries

S. No	Machinery type	Numbers	Capacity	Motive power
1	Jack Hammar (32mm dia.)	6	1.2 to 6m	Compressed air
2	Compressor	2	400 psi	Diesel Drive
3	Tractor Mounted air Compressor	1	-	Diesel Drive
4	Diamond wire saw	1	30m ³ /day	Diesel Generator
5	Diesel Generator	1	125 kVA	Diesel

2.11.5 Man power Requirement

Manpower details are given in

Table 2-15.
Table 2-15 Manpower Details

S.No	Details	Numbers
A	Technical/Mining Personnel	
1	Geologist/Agent (M.sc Qualified)	1
2	Mine Manager (Holder of Manager Certificate of Competency under MMR, 1961)	1
3	Mining Mate cum Blaster	1
4	Machinery operator	6
5	Diesel Mechanic	1
B	Workers	
1	Skilled	1
2	Semi- Skilled	9
3	Un-skilled	10
	Total	30
	Indirect Manpower	20

2.11.6 Solid Waste Management

The municipal solid waste generation and management details are given in **Table 2-16**.

Table 2-16 Municipal Solid Waste generation & Management

S.No	Type	Quantity Kg/day	Disposal method
1	Organic	8.1	Municipal bin including food waste
2	Inorganic	5.4	TNPCB authorized recyclers
Total		13.5	

As per CPHEEO guidelines: MSW per capita/day =0.45

2.11.7 Hazardous waste Management

The type of hazardous waste and the quantity generated are detailed in **Table 2-17**.

Table 2-17 Hazardous Waste Management

Waste Category No	Description	Quantity (L/Year)	Mode of Disposal
5.1	Waste Oil	3.0	Will be Collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/Recycling

2.12 Infrastructure facilities

Sanitation facility, office room and rest room facilities will be provided.

2.13 Resource optimization/recycling and reuse envisaged in the project

No optimization/recycling and reuse envisaged in the black granite quarry.

2.14 Availability of water its source, Energy/power requirement and source

This quarry project does not require huge water and No electricity requirement is proposed for the project. The operations will be carried out in day time only.

2.15 Schematic Representations of the Feasibility Drawing which Give Information Important for EIA Purpose

A schematic representation of the overall feasibility and environmental assessment process is shown in **Figure 2-17**. The EIA process is composed of the following stages:

- Study of project information
- Screening & Scoping
- Environmental Pre-Feasibility study & application for approval of TOR
- Collection of detailed project management plan/report
- Baseline data collection
- Impact identification, Prediction & Evaluation

- Mitigation measures & delineation of EMP
- Risk Assessment and Safety & Disaster Management plan
- Review & finalization of EIA report based on the TOR requirements.
- Submission of EIA report for implementation of mitigation measures & EMP as well as necessary clearances from relevant Authority.

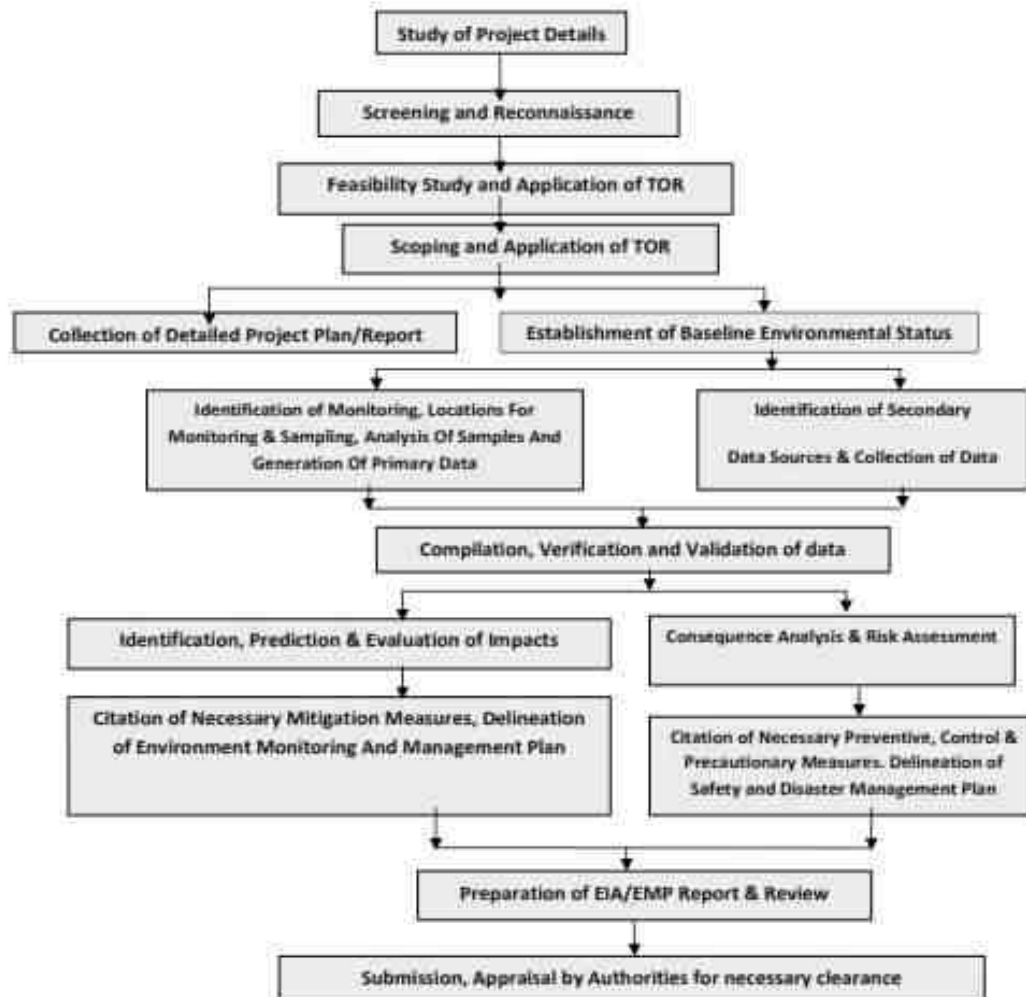


Figure 2-17 Feasibility & Environmental Assessment Process

2.16 Description of mitigation measures incorporated into the project to meet the environmental standards

From an environmental perspective, this phase is of paramount significance due to its potential to invoke long-term impacts. The adverse effects that are likely to occur during operational phase of the project are: Air Pollution (gaseous emissions), Effluent/Sewage generation, Noise generation, Solid waste generation etc.

2.16.1 Land Environment

The land use of the existing area is already for mining purpose. Hence there will be no change in land use pattern.

i. Discharges on Land-Impact

Domestic:

Domestic sewage will be disposed in to septic tank followed by soak pit.

Mitigation Measures

- The mine waste in the mine includes the topsoil/rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation or dumping yard/sites etc.
- The dumps may also be source of airpollution due to wind erosion incase they are not properly rehabilitated. Topsoil and overburden will be generated from the mining project which will be stacked separately at the designated areas.

ii. Impacts- Soil Contamination

Potential impacts on land environment are envisaged due to hazardous and non-hazardous wastes generated due to various operations in the project site like municipal waste from domestic use and waste diesel oil from quarry machineries. Poor management of such materials/wastes from the operations is a potential risk of soil contamination.

Soil – Mitigation Measures

Good housekeeping and best practices of waste handling shall be adopted to eliminate/minimize the risks of soil contamination. The wastes generated will be stored in temporary storage facility and transferred to nearby municipal disposal bins. Waste oil generated from quarry machineries and the same is disposed through TNPCB Authorized dealers.

2.16.2 Air Environment

Mining operations contribute towards air pollution in two ways: addition of gaseous pollutants to the atmosphere and the dust particles. The gaseous pollutants include NO_x, SO₂ and Hydrocarbons. The sources of pollutants from the mining activity include:

- Operation of Heavy Earth Moving Machinery (HEMM) which mostly run on diesel
- Loading /unloading operations
- Transportation of mineral/overburden in dumpers
- Drilling and Blasting operations.

2.16.3 Sources of Air Pollution

2.16.3.1 Point Source/Single Source

These are stationary sources, which emit air pollutants into the atmosphere from a certain fixed point. In the proposed quarry, the following sources or activities from the point sources, which emit Suspended Particulate Matter (SPM), SO₂ & NO_x.

2.16.3.2 Drilling

Drilling is an important activity of mining process. The secondary splitting in to required size involves drilling up to the bottom of the separated block. Air pollution in the form of SPM is envisaged from this activity.

2.16.3.3 Loading

In the proposed project, the loading of side burden and granite rejects is proposed by Hydraulic excavators. This activity is likely to contribute air pollution in the form of SPM (dust) during discharge of material from bucket and gaseous pollutants like SO₂, NO_x and Hydrocarbons due to combustion of fuel (diesel) in the loading machinery.

2.16.3.4 Unloading

The generated rejects and granite at mine face will be transported by dumpers and unloaded at the designated locations. During unloading operation of both the material, air pollution in the form of SPM (dust) is envisaged due to discharge of material from the dumper and gaseous pollutants like SO₂, NO_x and Hydrocarbons due to consumption of fuel (diesel) by dumper while unloading the material.

2.16.3.5 Line sources

These are normally mobile sources, which emit atmospheric pollutants in the area through which they pass.

2.16.3.6 Transportation

The generated rejects and granite from site will be transported by haul road. Transportation also includes movement of service vehicles also in the mine lease area. The traffic on the haul roads is likely to contribute towards increase in dust and gaseous pollutants concentration in the area. However, this is more of a localized phenomenon within the mining areas that have limited human exposure.

2.16.3.7 Area sources/multiple sources

These constitute pollution from various sources and activities situated in the mine lease area. The total mine area with all its mining activities constitutes the area source. These include all the mining

activities, operations of equipment/machinery (HEMM), wind erosion from active mine pit, and waste dump locations and haul road which contribute to the atmospheric pollution from the various units/activities.

2.16.3.8 Instantaneous Sources

The instantaneous sources consist of air pollution due to sudden/instantaneous activities like blasting in the mine area. Blasting process involves dislodgement of big blocks of hard strata/mineral from the mines. This operation generates maximum dust, which results in the increase of SPM concentration. It also contributes to emissions of certain gases (Oxides of Nitrogen and Ammonia) due to the use of explosives.

The size of the dust particles emitted into the atmosphere plays a major role in deciding the distance to which they may be transported. Particles of larger size fall fairly rapidly and closer to their source, because of gravitational settling. However, the aerosols because of their small size may be held in suspension for years in the atmosphere and may be transported on a global scale. Eventually, these smaller particles are collected in raindrops and fall on earth. The composition of these particles largely depends on the composition of the mineral being processed.

Mitigation Measures

- The increment in the fugitive emissions will be mainly due to transportation activity. Therefore emissions due to mineral handling during mining operation are not much and restricted to the lease area only.
- Proper mitigation measures are practiced during mining activities to control air pollution load below the prescribed limits are as follows:
 - Watering of haul roads and other roads at regular intervals
 - Spraying of water on permanent transport roads at required frequencies.
 - Provision of dust filter / mask to workers working at highly dust prone and affected areas.
 - Provision of green belt by vegetation for trapping dust.
 - Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
 - Utmost care will be taken to prevent spillage of sand and stone from the trucks.
 - Covered tarpaulin for transport of materials.

2.16.4 Noise & Vibration environment

The sound pressure level generated by noise sources decrease with increase in distance from the source due to wave divergence. The main sources of noise in the mine are as follows:

- Transportation vehicles

- Loading & unloading of minerals.
- Drilling and Blasting

2.16.4.1 Noise Levels

Heavy Earth Moving Machineries (HEMM) is deployed in mining operations. The noise levels of the major equipment are in the range of 88 to 90 dB (A). The noise levels are localized within the mining areas and have human exposure. Occupational hazard is envisaged if proper personal protective equipment is not provided to operator.

2.16.4.2 Vibration

The vibration due to blasting can cause damage to the nearby structures if appropriate technology and control measures are not adopted in the blasting operation. Fly rock is another possible damage causing outcome of blasting. There are many factors which influence fly rock during blasting. Most important of these factors are long explosive column with little stemming column, improper burden, loose material or pebbles near the holes and long water column in the hole.

By adopting controlled blasting, the problems will be greatly minimized and the impacts will also be minimized by choosing proper detonating system, optimizing total charge and charge/delay.

Ground vibration, fly rock, air blast, noise, dust and fumes are the deleterious effects of blasting on environment. The explosive energy sets up a seismic wave in the ground, which can cause significant damage to structures and disturbance to human occupants. The impact will be minimized by choosing proper detonating system and optimizing total charge and charge/delay and by regular monitoring of magnitude of ground vibrations and air blast.

Impact

A noise generation source during operation phase is classified into two categories:

- Stationary sources due to operation of heavy duty machineries at the project site like Compressors, DG sets, Quarry vehicles and drilling machineries etc.

Mitigation Measures

- The major noise generating equipments like Compressors, DG sets, Exacavator, &Tippers etc, will be enclosed in an acoustic enclosure designed for an insertion loss of 25 dB (A) and silencers to other equipment etc.
- Drilling will be carried out with the help of sharp drill bits which will help in reducing noise.
- Secondary blasting will be totally avoided.
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be

maintained.

- The blasting will be carried out during favorable atmospheric condition and less human activity timings i.e. during lunch interval.
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Greenbelt and plantation will be developed around the mining activity area and long haul roads. The plantation minimizes propagation of noise.
- Periodical monitoring of noise will be done.
- The occupational noise exposure to the workers in the form of eight hourly times weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits.
- Adequate PPE will be provided to the staff exposing to noise risks.
- Acoustic silencers will be provided in equipment wherever necessary.
- Use of personal protective equipments/devices such as ear-muffs, ear plugs etc. will be strictly enforced for the workers engaged in high noise areas.
- Periodic maintenance of the equipment to be used in the developmental works will be carried out. Worn out parts will be replaced and rotating parts will be lubricated to minimize noise emissions.
- Implementation of greenbelt for noise attenuation will be undertaken.
- Ambient noise levels will be monitored at regular intervals during operational phase of the project.
- Low vibration generating machines/equipment will be selected to meet international standards and foundations will be so designed to minimize vibrations and secured properly.
- Vibration generating sources and their platforms should be maintained properly to minimize vibrations and related impacts.
- Vibration dampers will be provided around the source of generation.
- Transportation Management Plan will be prepared and the transportation of materials will be planned in line with the same.

2.16.5 Water Environment

Impact on Existing Water Resources

The total water requirement for quarry is 1.5 KLD. The total water requirement is met from private tankers; Domestic sewage will be disposed into Septic tank & no toxic/other effluent generation. Hence the impact due to the project is very minimal.

2.16.5.1 Impacts on Surface Water Bodies

The surface water and groundwater are the life line of the villages. All the ponds in the area are working as recharge sites for the under lying groundwater and hence the surface water and ground water systems are acting like a single unit and therefore cannot be seen in Isolation.

Any contamination in surface drainage due to operation of project could collapse the system and will have serious impacts to the water resources especially the availability of potable water in the PIA area. The impacts will be high in the core area especially the 10 km radius area. Therefore, apparent to that there will is negligible impact of mining on the surface water regime.

2.16.5.2 Impact on Ground Water

There will not be any ground water withdrawal, as the total water requirement will be met by private water tankers. As, the mine lease area is a Hilly area, elevated at 170m AMSL height from the ground level. Hence, there will not be any groundwater level intersect as the planned depth of mining is 40m.

Mitigation Measures

The following measures are proposed as a part of development to improve the ground water scenario and also to ensure that ground water is not contaminated. Strategic plans such as implementing the following structures for rainwater harvesting and groundwater recharging purposes in project site will be adhered.

- Rainwater storage ponds/tanks
- Storage cum recharge ponds
- Monitoring of water quality and groundwater level variations in the project site.

2.16.6 Biological Environment

Impact on migratory paths for wildlife and forest blocks

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

Mitigation Measures

- Discharge of wastes into the water bodies during the quarry operation phase would not be allowed.
- Awareness will be given to workers about the importance and conservation of terrestrial ecology and biodiversity.

2.16.7 Solid Waste Management

2.16.7.1 Impact due to Solid Waste Generation

During quarry operations, Municipal solid waste and waste oil are likely to be generated which can be broadly categorized as Hazardous Waste and Non-hazardous Waste. Further, the generated solid waste generation may include Biodegradable, Recyclable and Inert compounds. The details of solid waste generation and its management proposed are discussed in **Chapter 2, Section 2.11.6 & 2.11.7**. If the solid waste generated is not properly managed and disposed in unauthorized manner, it will impact on soil quality, groundwater and air quality.

2.16.7.2 Solid Waste Management

Strict guidelines will be put in place in order to manage the solid waste generation during the operational phase of the development. The main goals of the guidelines will be to ensure adopting recycling techniques and encouraging sorting of solid waste at source into organic and inorganic wastes. Waste management is given in **Figure 2-18**.



Figure 2-18 Waste Management Concepts

2.16.8 Afforestation

The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain, wind erosion, improve the aesthetics and support the re-creation of bio-diversity as well as to prevent air pollution & noise pollution. Afforestation will be taken up along the lease area.

During Mining plan period 20 plants per year is proposed to be planted for complying Afforestation program with the arrived survival rate of 50% within the safety distance along the 650m² portion of the lease area in a phase manner. Native species will be planted in phased manner as given in table below **Table 2-18**.

Table 2-18 Afforestation Plan details

Year	No. of trees proposed to be planted	Name of the species	Area (m ³)	Survival rate expected	No. of trees expected to be grown

1 st Year	20	Neem/Pungam	130	50%	10
2 nd Year	20	Neem/Pungam	130	50%	10
3 rd Year	20	Neem/Pungam	130	50%	10
4 th Year	20	Neem/Pungam	130	50%	10
5 th Year	20	Neem/Pungam	130	50%	10

2.16.9 Assessment of New and untested technology for the risk of technological failure

The project is a fresh granite quarry. The technology used for mining is made by TAMIN in house there would not be any changes in the Mining. The mining technology is tried & tested method, and therefore there is no risk of technological failure. In addition to this the TAMIN is being processed to take care of any technological failures.

3 DESCRIPTION OF ENVIRONMENT

3.1 Preamble

This chapter depicts the establishment of baseline for valued environmental components, as identified in and around the proposed project of **Black granite quarry** over an extent of 20.95.5 Ha in S.F. 1193/1 (Part-5) & 1193/1 (Part-16) at Kodakkal Village, Sholinghur Taluk, Ranipet District, Tamil Nadu by M/s. Tamil Nadu Minerals Limited. The primary baseline data monitoring covered one season (three (3) months) i.e., from **Mid of Jan 2023 – Mid of April 2023**, and the secondary data was collected from government and semi-government organization's published data. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) Ltd, Chennai, a MoEF&CC approved and National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited environmental testing laboratory for the following terrestrial environmental components.

- **Meteorology:**

Temperature, Relative Humidity, Rainfall, Wind Speed & Direction- **Refer Section - 3.6**

- **Ambient Air Quality:**

Particulate matter <10 micron size (PM₁₀), Particulate matter <2.5 micron size (PM_{2.5}), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Lead (Pb), Ozone (O₃), Benzene (C₆H₆), Benzo (a) pyrene (C₂₀H₁₂), Arsenic (As), Nickel (Ni), Ammonia (NH₃)-**Refer Section - 3.7.**

- **Ambient Noise Levels:**

Day equivalent noise levels, Night equivalent noise levels -**Refer Section - 3.8.**

- **Inland Water Quality:**

Groundwater Quality, Surface Water Quality - **Refer Section - 3.9.**

- **Soil Quality - Refer Section - 3.10.**

- **Ecology - Refer Section - 3.11.**

- **Social Economic Status - Refer Section - 3.12.**

3.2 Study Area

A 10 km radial distance from the proposed project site boundary has been identified as the General study area for assessing the baseline environmental status. The core study area is the project area and its immediate surroundings to the tune of 1.0 km radius from the boundary. Further the Project

Impact/Influence Area (PIA) is 10 km from the boundary of the project site which covers parts of Ranipet District, Tamil Nadu State.

3.3 Description of the Study Area

The project site is located ≈ 0.29 km away from the state highway SH-61 in West direction and NH40 is 16.96 km in South South West direction from the site. An overall idea of the study area with reference to the physical conditions are presented for better understanding in the following sections before proceeding into the section on the prevailing environmental conditions of the study area. The map showing the satellite image of the study area is given in **Figure 3-1** and Topo Map of the study area is given in **Figure 3-2**.

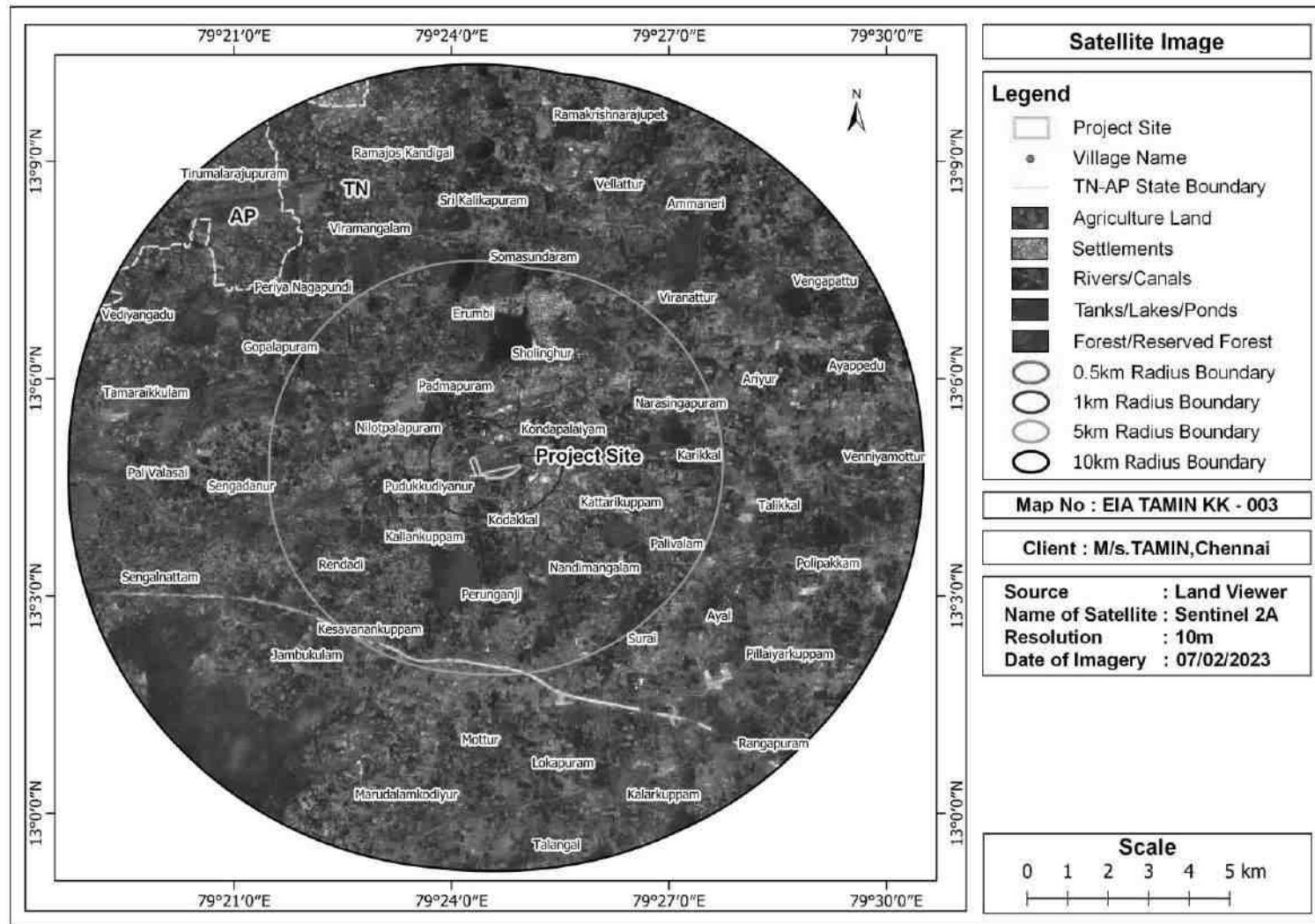


Figure 3-1 Map showing the Satellite Image of the study area of Project

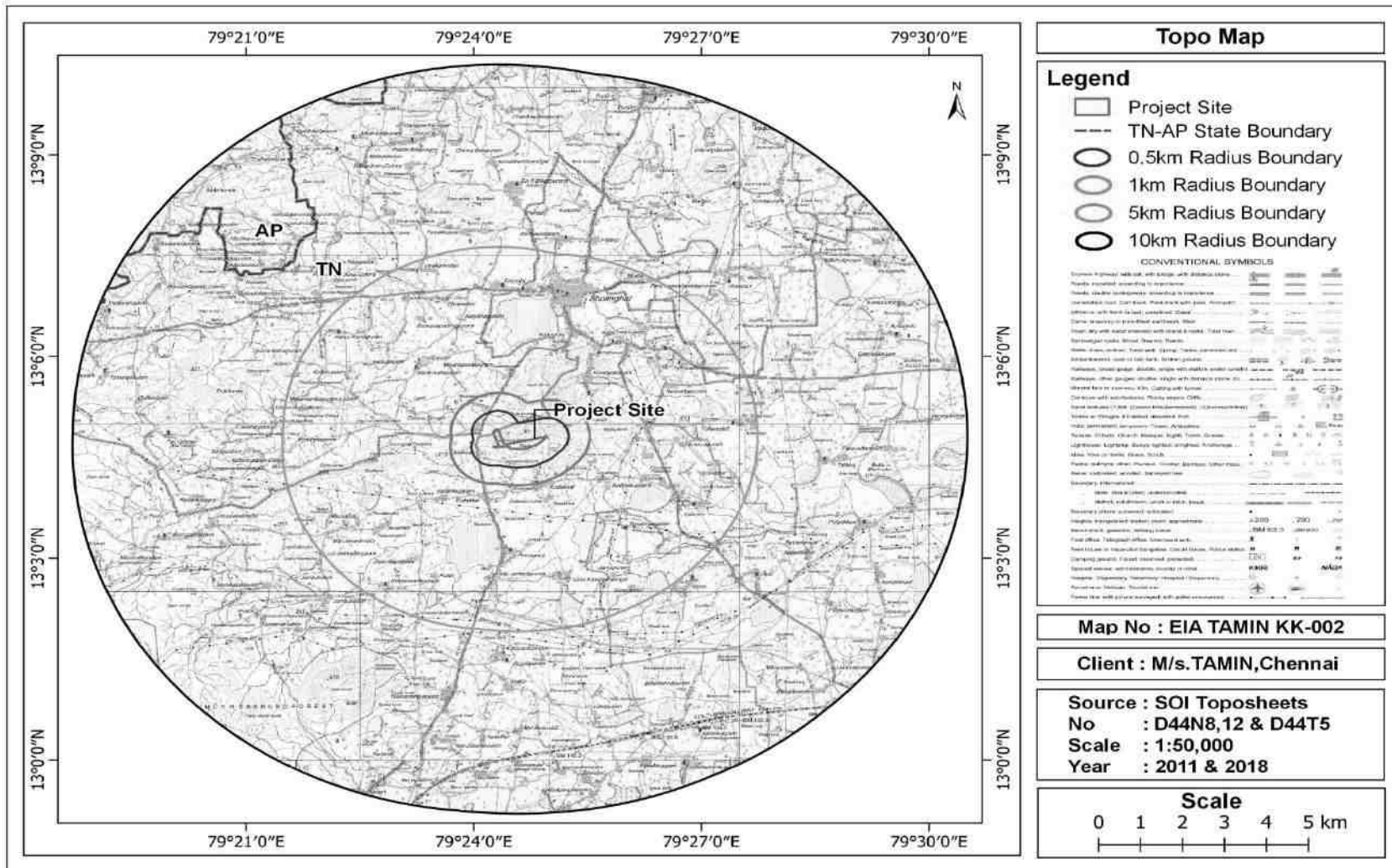


Figure 3-2 Topo Map of Study area

3.4 Environmentally Ecologically Sensitive areas

This section details with the environmental sensitive areas present within the project site and surrounding environs. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in **Table 3-1**.

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

S. No.	Areas	Distance & Direction from project boundary			
		S. No	Monuments	Distance (≈km)	Direction
1.	Monuments & Heritage	1.	Rock inscriptions in the Right flank of the Sholinghur tank	2.93	N
		2.	Choleswara Temple Melpadi	13.05	W
		3.	Somanatha Temple Melpadi	13.06	W
2.	Wetlands, Watercourses or other water bodies, coastal zone	S. No	Places	Distance (≈km)	Direction
		1.	Pond near Project Site	0.16	S
		2.	Pond near Pudukkudiyapur	0.46	S
		3.	Perunganji Lake	1.74	S
		4.	Sholinghur Lake	2.35	N
		5.	Kallar River	3.43	SE
		6.	Nandi River	7.52	NE
		7.	Paranji Lake	10.32	ENE
		8.	Ponnai East Bank Main Canal	11.55	W
		9.	Mahendravadi Channel	11.65	SSE
		10.	Ponnai River	12.19	WSW
		11.	Kaveripak Tank	13.10	SSE
		12.	Mahendravadi Lake	13.47	SE
		13.	Kaveripak N	14.97	SSE
3.	Reserved Forests & Wild Life Sanctuary	S.No	Places	Distance (≈km)	Direction
		1.	Ammur RF	6.20	SSW
		2.	Banavaram RF	9.73	SE
		3.	Santanavenugopalapuram Ext RF	11.26	NNE
		4.	Santanavenugopalapuram RF	11.77	NNE
		5.	Amudala RF	11.81	WNW
		6.	Vanganur RF	14.11	NNE
		7.	Pullur West PF	14.81	N
4.	Nearest Highway	➤ SH 61(Walajah – Sholinghur – Arakkonam) ≈ 0.29 km, W ➤ NH 40(Kurnool- Chittoor –Ranippettai) ≈ 16.96 km, SSW			
5.	Nearest City & Town	➤ Nearest Town – Sholinghur ≈1.42km, NE ➤ Nearest City – Ranipet ≈13.04km, SSW			
6.	Nearest Port and Airport	➤ Nearest Railway Station – Thalagai ≈8.25km, S ➤ Tirupati International Airport ≈61.50km, N ➤ Chennai Port ≈94.32km, E			
7.	State, National	➤ TN-AP State Boundary ≈ 6.66km, NW			

boundaries						
8.	Nearest Villages	S. No	Places	Distance (~km)	Direction	Population as per Census 2011
		1.	Pudukkudiyannur	0.20	S	300
		2.	Kodakkal	0.53	S	7,948
		3.	Nilotpalapuram	0.85	NW	850
		4.	Padmapuram	1.28	N	1,033
		5.	Kondapalayam	1.38	NE	1,200
9.	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	S. No	Places	Distance (~km)	Direction	
		SCHOOLS				
		1.	Shri Vijayalakshmi School	0.23	NNW	
		2.	Kodaikkal Govt High School	0.83	S	
		3.	Chanurmallavaram Govt High School	2.39	NW	
		4.	Rendadi Govt High School	3.95	SW	
		5.	Sholinghur Govt Boy's High School	4.21	N	
		COLLEGES				
		1.	Kalai Bharathi B.Ed College	1.81	N	
		2.	Sholinghur Govt Arts and Science College	4.33	NNE	
		3.	Sri Bharathi Velu Polytechnic College	5.41	SSW	
		4.	Saraswathi Velu College of Engineering	5.65	SSW	
		5.	C.M.Annamalai Arts And Science College For Women	7.04	N	
		GOVERNMENT BUILDINGS				
		1.	Kodaikkal Village Pachayat Office	0.72	S	
		2.	Kondapalayam Police Station	1.75	NNE	
		3.	Sholinghur Fire Station	3.47	NE	
		4.	Sholinghur Judicial Magistrate Court	3.60	N	
		5.	Sholingur Municipality Office	3.88	N	
		HOSPITALS				
		1.	Kodaikkal Govt PHC	1.16	S	
		2.	Chanurmallavaram Govt Sub Health Centre	2.48	NW	
		3.	Sholinghur Govt Hospital	3.54	N	
		4.	Vengupattu Health Sub Centre	9.28	ENE	
		5.	Banavaram Govt Upgraded PHC	10.37	SE	
		RELIGIOUS PLACES				
		1.	Thurabhathi Amma Temple	0.79	S	
		2.	Arulmigu Sri Yoga Narasimha Swamy Temple	0.89	NNE	
		3.	Lakshmi Narasimha Temple	3.79km	N	
		4.	Jamia Mosque	3.89	N	
		5.	CSI Church	4.70	W	
		6.	Sri Gnanamalai Subramaniaswamy Temple	9.61	SSE	
		INDUSTRIES				
		1.	Turbo Energy Pvt Ltd	2.05	E	
		2.	Brakes India Ltd Unit-2	2.10	E	
		3.	Brakes India Warehouse	2.18	E	
		4.	Guardian Engineering Integrated Warehouse	3.06	E	



		5.	Brakes India Private Ltd	3.18	NE
		6.	Sholingur Textiles Ltd	3.71	NE
		7.	Midrange Components (Unit of Brakes India Private Limited)	4.20	S
		8.	ABI Soorai Green	5.81	SSE
10.	Areas already subjected to pollution or environmental damage.	CEPI: Ranipet District boundary which is located at 15.31km from the project Site in the SW direction.			
11.	Areas susceptible to natural hazard which could cause the project to present environmental problems, (earthquakes, subsidence, landslides, erosion or extreme or adverse climatic conditions)	Project site located at seismic zone-III (Moderate Risk Zone)			

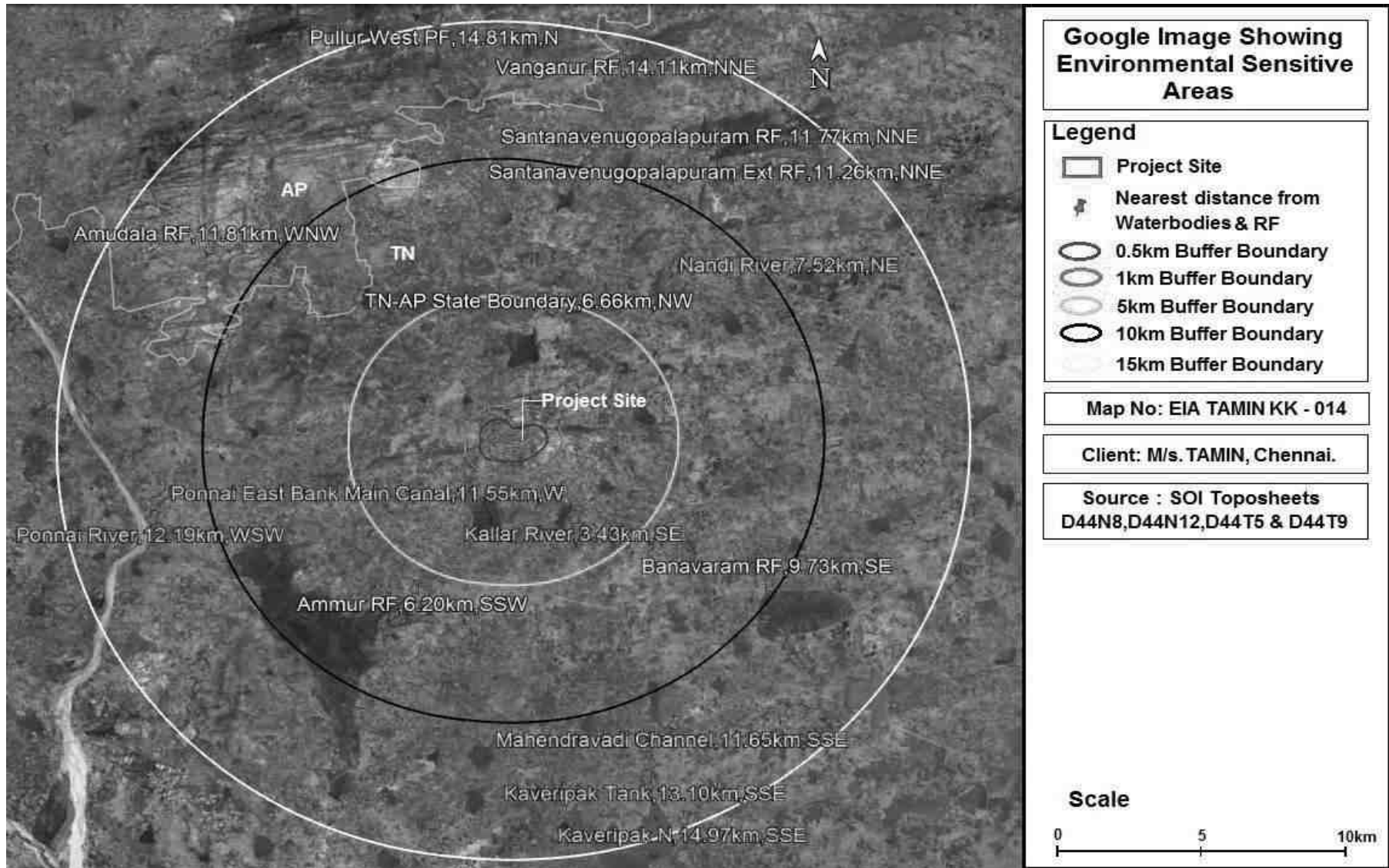


Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary

3.5 Physical Conditions

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

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

3.5.1 PIA District Profile

The district is spread over between 12° 15' and 13° 15' of North latitude and 78° 20' and 79° 50' of East longitude. Vellore district is situated in the northern part of Tamil Nadu bordering Andhra Pradesh. The district bounded by Andhra Pradesh on the north, Thiruvallur district on the northeast, Kancheepuram district on the east, Tiruvannamalai district on the south and Krishnagiri district on the West. The total geographical area of the district is 6075 sq.kms. In terms of size, Vellore district ranked 4th in comparison to other district in the State.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

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

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.2 Climatic Conditions

Moderate climate is recorded in the district. Better climate has been recorded in the areas where more forest cover and hilly region. The maximum temperature of Vellore in 2009- 10 was 40.4°C in April and minimum temperature was 18.5°C in January. In 2009-10, Vellore district received 814.8mm of rainfall as compared to a normal of 917mm. This district gets maximum rainfall (251.7mm) in September (South West Monsoon) and minimum rainfall (0.0mm) in February and March (winter and Hot Weather).

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

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

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.3 Natural Resources of Vellore District

3.5.3.1 Flora & Fauna

Ordinary plants such as tamarind, teakwood, sandal wood, ven-teak, casuarina, bamboo etc are common in the forests. Bison, tiger, Black bears, hyenas, sambar, spotted deer, jungle sheep, barking deer, antelope, king cobras, Monkeys exist in several places in the district. The most common birds of South Indian species are seen in the district.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

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

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.3.2 Forest Resources

Dense forest is found in many mountain ranges of Jawadhu region. Many forest areas have been classified as Reserve Forest in Gudiyatham, Katpadi, Wallajah, Arakonam, Arcot, Vellore, Vaniyambadi, Ambur and Tirupathur taluks.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

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

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.3.3 Irrigation

Irrigation sources in the district are poor and the agriculture depends on seasonal rainfall. Tube wells and dug wells are chief sources of irrigation. The rivers Palar, Ponnai and the Pennai River meet a good part of the irrigational needs and "anaicuts" have been constructed across them. The three important anaicuts are built across Palar, Ponnai and Pennaiyar. The Palar anaicut irrigates land in Wallajah and Arakonam taluks. The anaicut across Ponnai River also irrigates smaller area in these taluks. For irrigation of agricultural lands, there were 604 canals and 110,220 wells (for irrigation only) besides 57,055 wells used for domestic purposes in 2009-10. There were 1355 tanks in the district; out of this 420 have ayacuts of 40 hectares or more while remaining tanks have ayacuts of less than 40 hectares. Kaveripakkam Lake,

covering an area of 6 sq. kms, is a major tank in the district which irrigates large area of land. The water from the lake, when ever it is filled, irrigates land in 33 villages. Depending on water availability, the cultivation is done in 2-3 times a year.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

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

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.3.4 Agricultural Resources

Paddy, Millets Cholam, Cumbu, Ragi, Maize, Pulses like Redgram, Blackgram, Greengram, and Oilseeds like Groundnut, other crops Sugarcane and cotton are cultivated predominantly in Ranipet District. Paddy, which is the staple food crop of Tamil Nadu is extensively cultivated in Ranipet District in a normal area of 42, 900 Ha. And it is cultivated in three major seasons viz., Sornavari (Apr – July), Samba (Aug – Nov) and Navarai (Dec – Mar). Pulses are a remunerative crop that enables the farmers to fetch higher income. In Ranipet, pulses is raised in a normal area of 30,000 Hectares of which redgram occupies major area followed by horse gram, black gram, green gram. Strategies such as promotion of pulses as pure crop, intercrop, bund crop besides encouraging the farmers to practice rice fallow pulses coupled with micro-irrigation units such as sprinklers and rainguns are adopted.

Source: <https://ranipet.nic.in/agriculture/>

(Ref: Profile of Ranipet District-Government of Tamil Nadu)

3.5.3.5 Mineral Resources

Vellore District in Tamil Nadu accounts for 79% of country's resources of vermiculite (source: IBM - Indian Minerals year book 2016) with a single operating mine producing 989 tonnes in 2015-16 valued for 2218 million rupees. In addition to Granites (Dimension stones) and River Sand with minor occurrence of other minerals such as Fireclay, Graphite, Limestone, Quartz/Silica sand, Apatite, Barytes, Molybdenum, etc., excluding Atomic and Rare Earth Minerals. The details of the production of minerals are given in **Table 3.2**. Geology and Minerals Maps of Tamilnadu and Pondicherry is shown in **Figure 3.4**.

Source:

<https://cdn.s3waas.gov.in/s31651cf0d2f737d7adeab84d339dbabd3/uploads/2019/04/2019040961.pdf>

(Ref: District Survey Report-Vellore District-Department of Geology and Mining-Government of Tamil Nadu)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

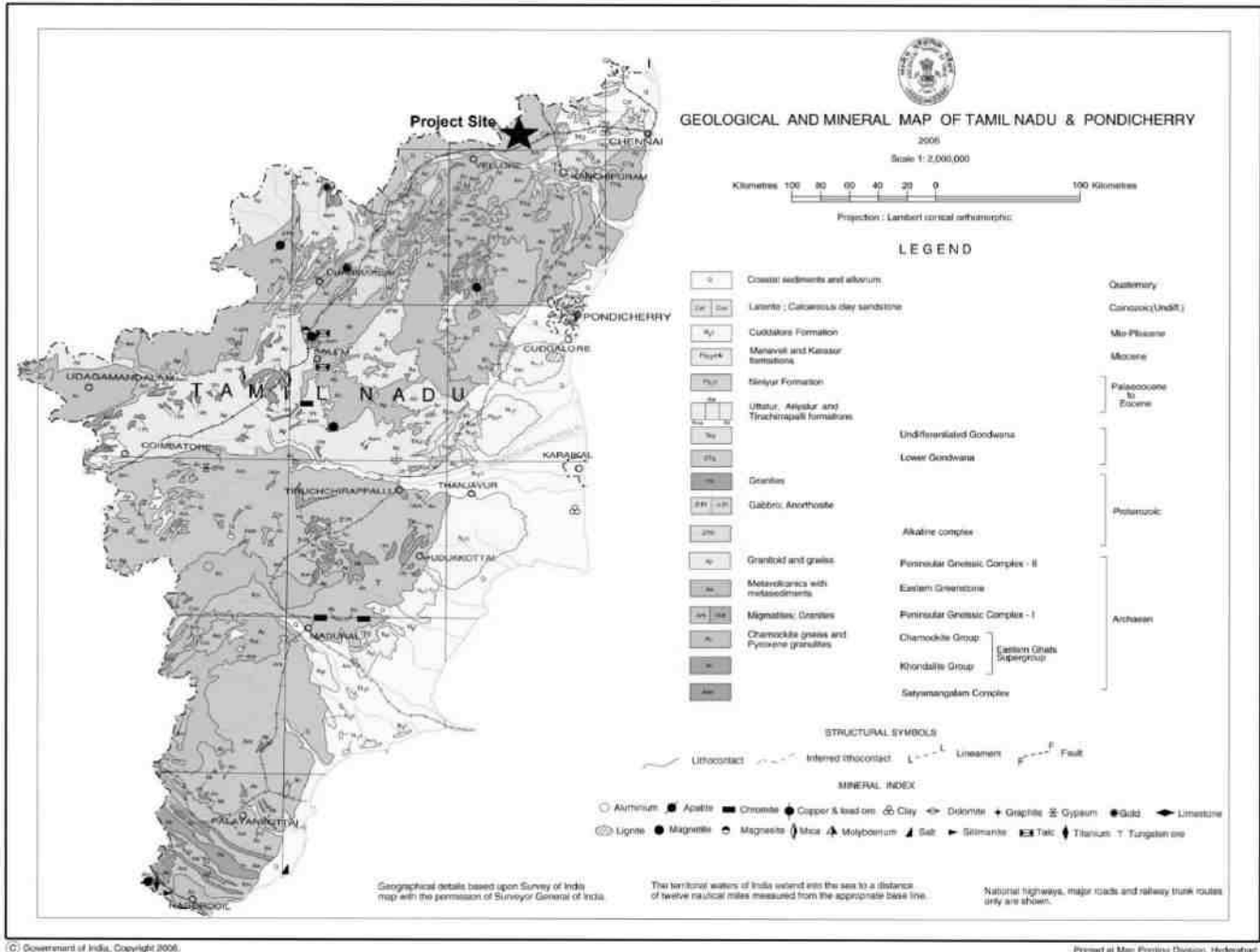


Figure 3-4 Geology and Minerals Maps of Tamil Nadu and Pondicherry

3.5.4 Land Use & Land Cover

Total geographical area of Vellore district is 6077 sq.km. Details of land use/land cover statistics for Vellore district is given in **Table 3.2**. Land use/Land cover map of the Vellore district is shown in **Figure 3.5**. Land Use Pattern of Vellore district **Figure 3.6**.

Table 3-2 District land use/land cover statistics (2011-12) for Vellore district

S. No	Particulars	Area (sq.km)	Area (Hectares)	Area (Acres)	Percent age
1.	Built up, Urban	118.47	29274.53	11847	1.95
2.	Buildup , Rural	260.08	64267.07	26008	4.28
3.	Buildup , mining	16.48	4072.29	1648	0.27
4.	Agriculture crop land	2149.38	531122.54	214938	35.37
5.	Agriculture plantation	807.24	199473.04	80724	13.28
6.	Agriculture Fallow	717.31	177250.89	71731	11.80
7.	Forest ,Evergreen /semi evergreen	234.13	57854.69	23413	3.85
8.	Forest deciduous	1126.36	278329.19	112636	18.53
9.	Forest, Forest plantation	12.79	3160.47	1279	0.21
10.	Forest scrub forest	0.37	91.43	37	0.01
11.	Barren/unculturable/wastelands/ Salt Affected land	2.99	738.84	299	0.05
12.	Barren/unculturable/wastelands/ Gullied /Ravinous Land	0.08	19.77	8	0.00
13.	Bareen/unculturable/wastelands, scrub Land	207.91	51375.60	20791	3.42
14.	Barren /unculturable /wastelands , sandy lands	0.68	168.03	68	0.01
15.	Barren/unculturable/wastelands,Barren rocky	11.97	2957.85	1197	0.20
16.	Wetlands/water Bodies, Rivers / Stream/canals	112.34	27759.78	11234	1.85
17.	Wetland/Water Bodies/Reservoir/Lakes/ponds	298.44	73746.02	29844	4.91
Total		6077.0	1501662.03	607702	100.00

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

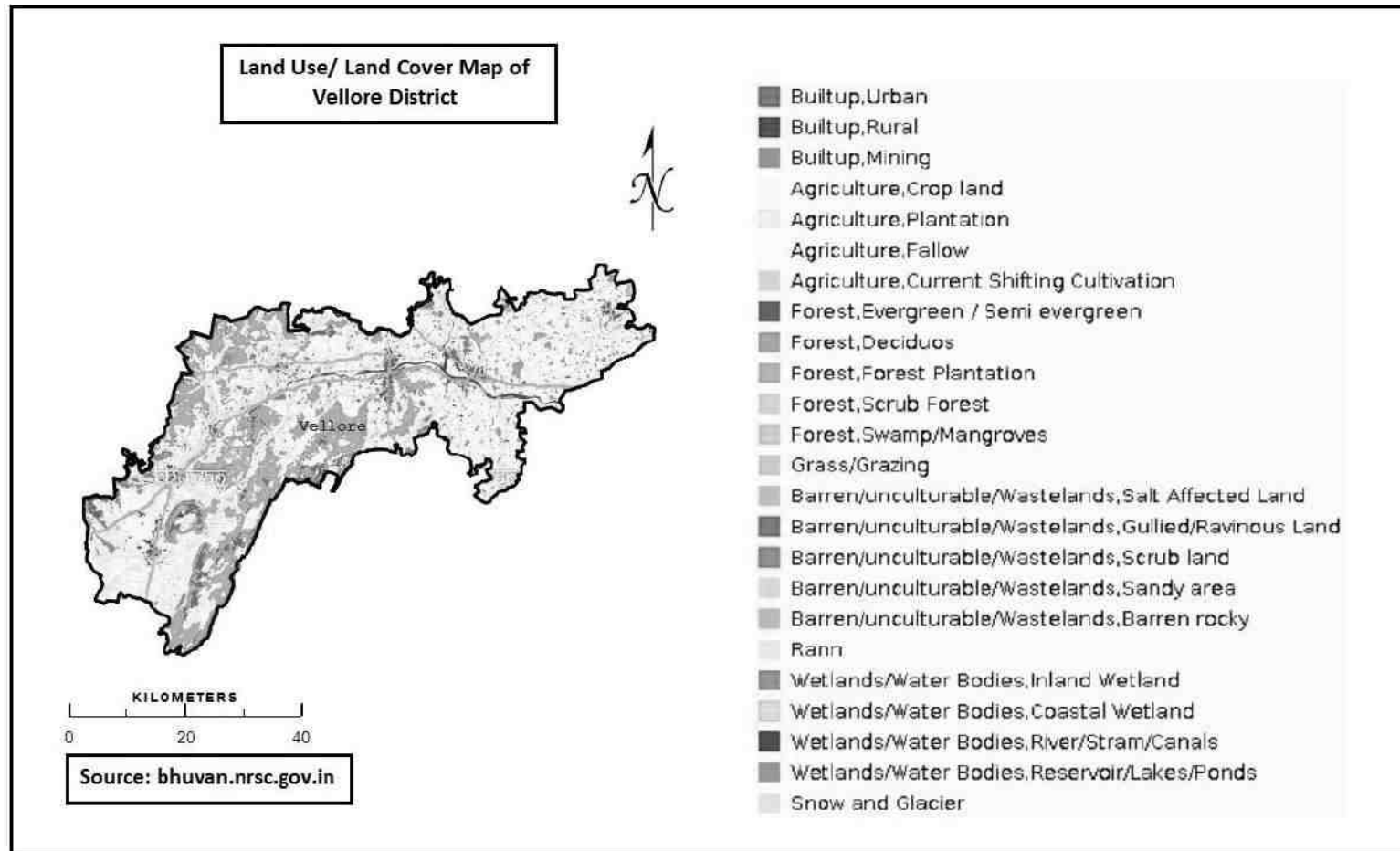


Figure 3-5 Land use/Land Cover map of the Vellore district

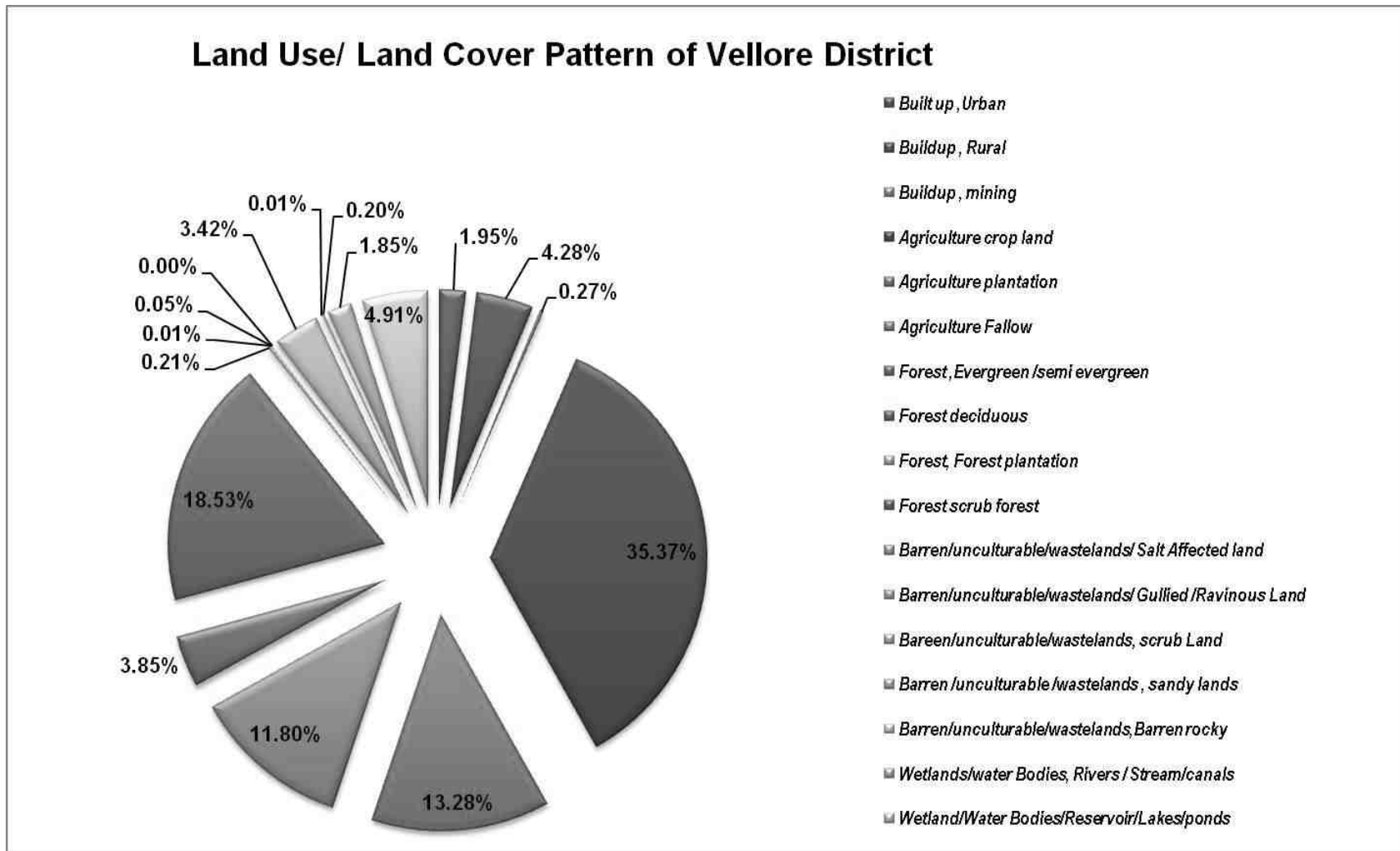


Figure 3-6 Land Use/ Land Cover Pattern of Vellore district

3.5.4.1 Land use land cover for the study area

Total Project Study Area is **347.81**sq.km. Land Use /Land Cover pattern of the Study Area is given in **Figure 3.7**. The land use/land cover pattern of the study area is given in **Table 3-3**.

Table 3-3 Land use/Land Cover pattern of the Study Area

S.No	Description	Area (sq.km)	Area (Acres)	Area (Hectares)	Area (%)
1.	Crop land	220.68	54531.13	22068	63.45
2.	Scrub land	33.30	8228.60	3330	9.57
3.	Rural	26.82	6627.36	2682	7.71
4.	Waterbodies	22.09	5458.55	2209	6.35
5.	Fallow	19.34	4779.01	1934	5.56
6.	Deciduous	11.89	2938.08	1189	3.42
7.	Urban	3.3	815.45	330	0.95
8.	Barren rocky	3.18	785.79	318	0.91
9.	Mining	2.37	585.64	237	0.68
10.	Plantation	2.21	546.10	221	0.64
11.	Evergreen / Semi Evergreen	1.57	387.95	157	0.45
12.	River / Stream / Canals	0.67	165.56	67	0.19
13.	Salt affected land	0.39	96.37	39	0.11
Total		347.81	85945.59	34781	100.00

Landuse/ Landcover Pattern of Study Area

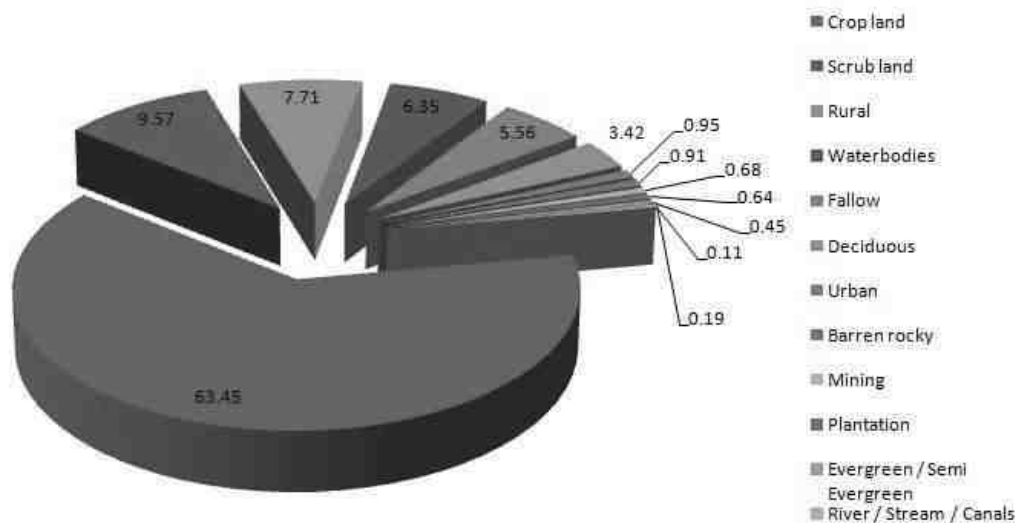


Figure 3-7 Land use/Land Cover pattern of the Study Area

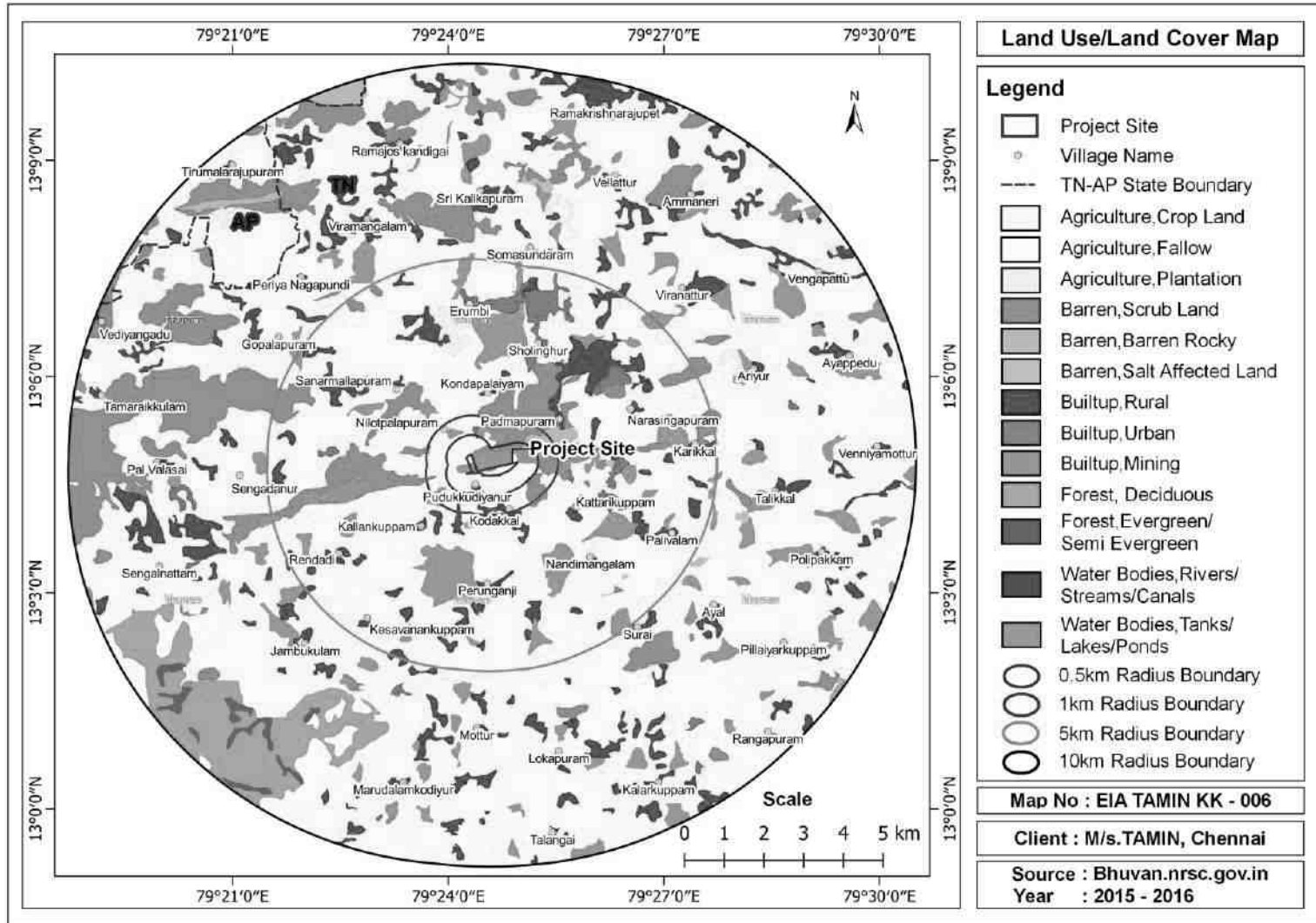


Figure 3-8 Land use/Land Cover map of the Study Area

3.5.5 Topography

Vellore district can be classified into two major physiographic divisions i) Hilly terrain in the eastern and southwestern parts ii) Plain regions in the eastern part. The western part of the district is occupied by the Javadi and Elagiri hills. In the Elagiri hills, a few peaks 1121m, 942m, 841m raise above, are prominent. In Javadi hills, the peaks 1076m, 975m and 99m are prominent. The eastern areas of Vellore are undulating rugged plains with isolated hillocks of 120m and 140m above msl. The area is drained by Palar, Cheyyar and smaller tributary streams. The drainage is subdendritic and most of the streams are ephemeral. The Palar Flood Plain becomes broader on entering into the Kancheepuram district whereas in the west, it is restricted to the river bed only. The south western part of the district viz., Elagiri hills ranging upto 1330 m above mean sea level. The lowest of 21m at the eastern margin of the district in the alluvial plains of Palar River.

Source:

<https://cdn.s3waas.gov.in/s31651cf0d2f737d7adeab84d339dbabd3/uploads/2019/04/2019040961.pdf>

(**Ref:** District Survey Report-Vellore District-Department of Geology and Mining-Government of Tamil Nadu)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.



Figure 3-9 Physical map of Tamil Nadu State

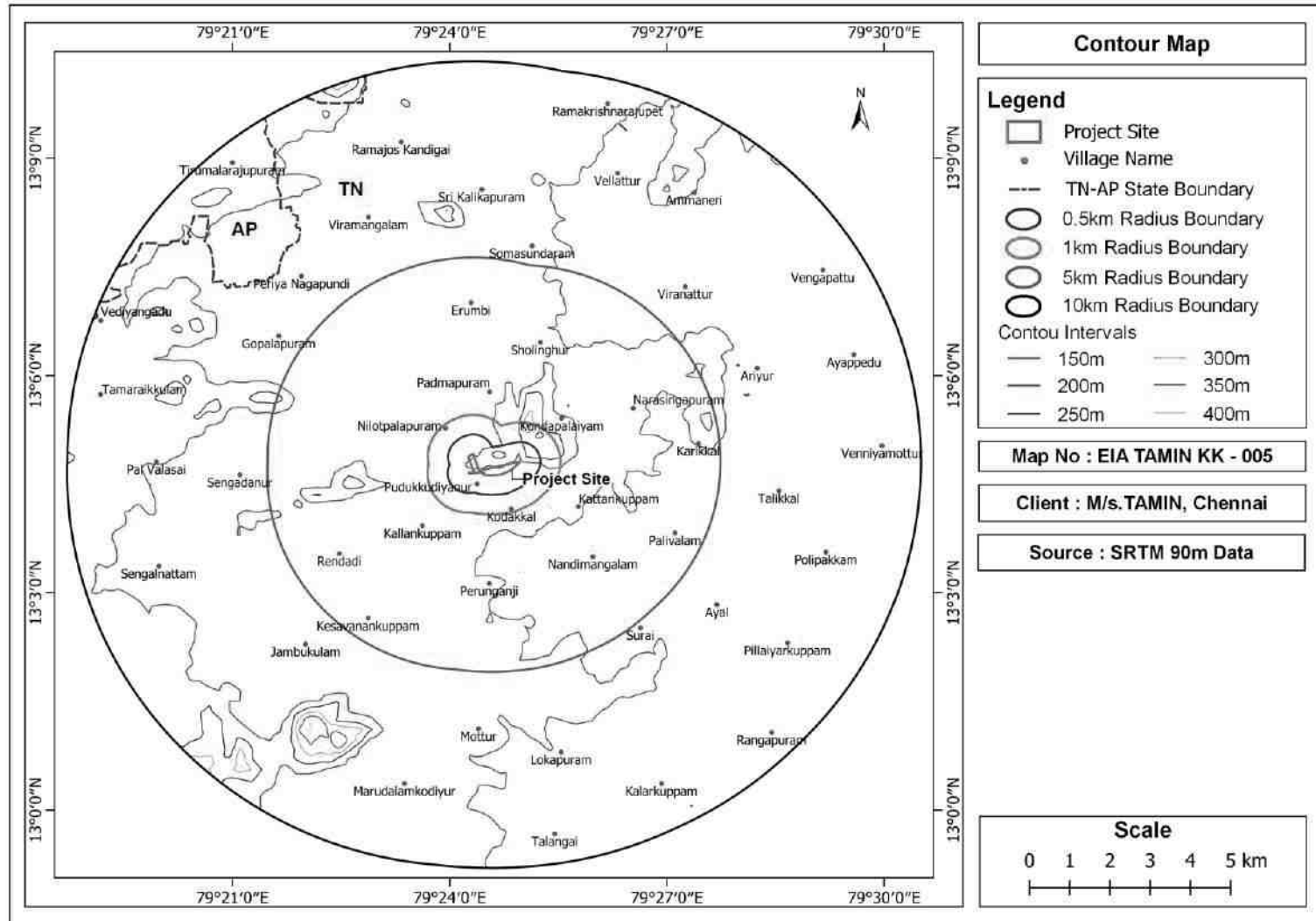


Figure 3-10 Contour map of Study Area

3.5.6 Geomorphology of PIA District

Vellore district can be classified into two major physiographic divisions viz., i) Hilly terrain in the eastern and southwestern parts and ii) Plain regions in the eastern part. The landscape in the hilly terrain is undulating to rugged, flanked by hill ranges belonging to Eastern Ghats. The major hill ranges in the district are those belonging to Jawadu, Elagiri and Kalrayan hills. The eastern part of the district is a gently undulating plain dotted with isolated hillocks with sharply rising peaks, sloping towards east.

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

(Ref: District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.6.1 Geomorphology of the Study Area

Geomorphology of the study area consists of Denudational origin - pediment – pedi plain Complex- 83.84%, Denudational Origin-Moderately Dissected Hills and Valleys –6.78% and Water bodies- 6.47%. The total Geographical area of the study area is **347.81sq.km**. The Geomorphology of the study area is given in **Table 3-4**. Geomorphology pattern of the study area is given in **Figure 3.11**. Geomorphology map of study area is given in **Figure 3.12**.

Table 3-4 Geomorphology of the study area

S. No.	Geomorphology	Area in sq.km	Area in Acre	Area in Hectare	Total Area %
1.	Denudational Origin Pediment - Peditain Complex	291.62	72059.88	29162	83.84
2.	Waterbodies	22.50	5559.99	2250	6.47
3.	Denudational Origin - Moderately Dissected Hills and Valleys	23.58	5827.66	2358	6.78
4.	Structural Origin - Low Dissected Hills and Valleys	6.96	1718.70	696	2.00
5.	Denudational Origin - Low Dissected Hills and Valleys	1.78	439.76	178	0.51
6.	Anthropogenic Origin - Anthropogenic Terrain	1.37	339.60	137	0.40
Total		347.81	85945.59	34781	100.00

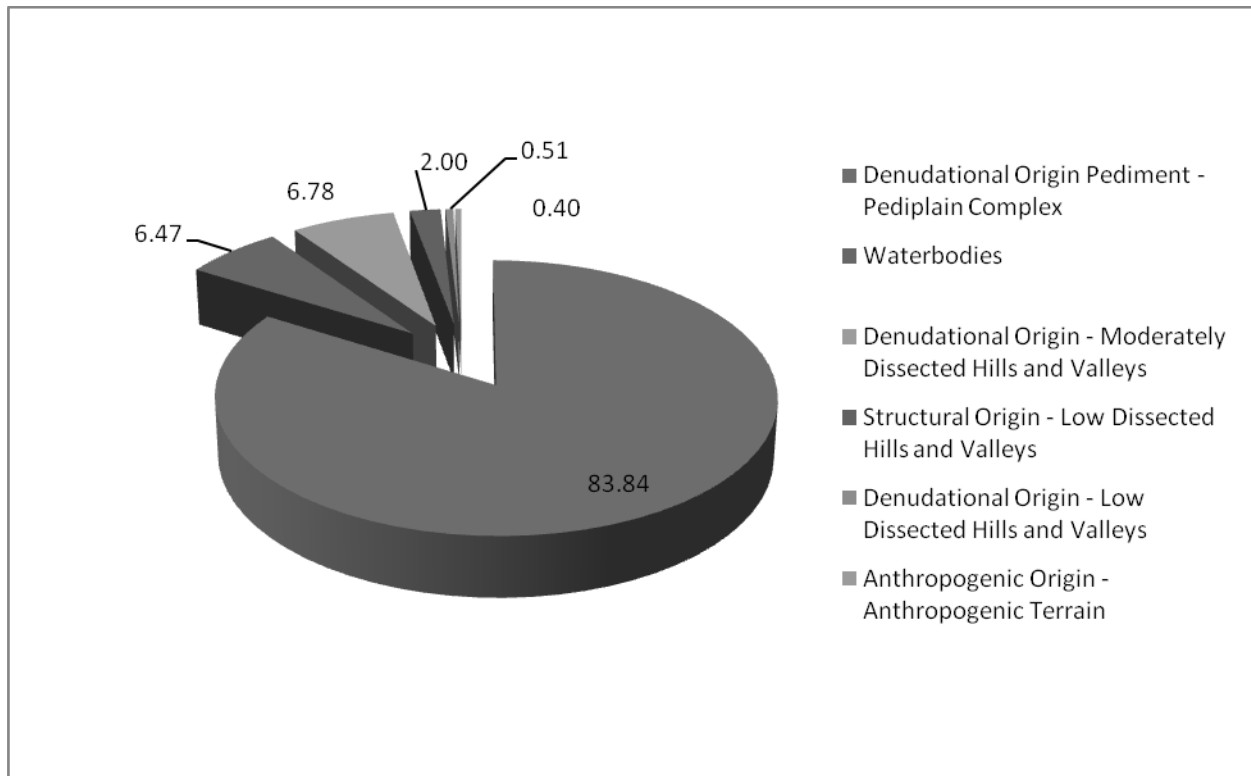


Figure 3-11 Geomorphology Pattern of the Study Area

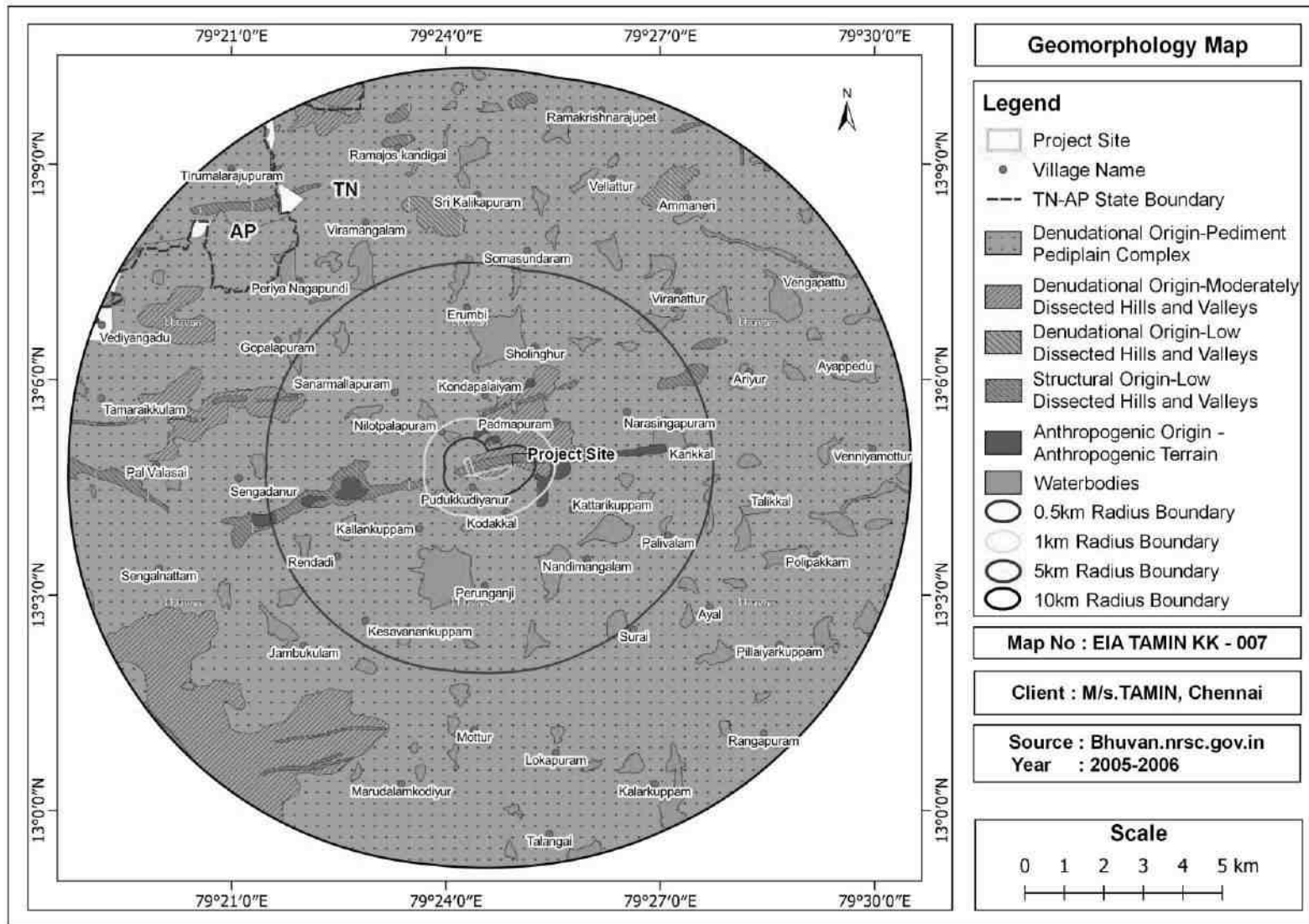


Figure 3-12 Geomorphology Map of Study Area

3.5.7 Hydrogeology of PIA District

Vellore district is underlain by geological formations ranging in age from Archaean to Recent. In the crystalline formations comprising charnockites, gneisses and granites. The yield of dug wells is less than <1 lps in massive crystalline rocks whereas it is up to 2.3 lps in highly weathered gneisses. The specific capacity of wells tested in the district ranged from 18.82 to 80.58 lpm/m/dd. The yield of exploratory wells drilled in crystalline rock areas of the district ranged from 0.27 to 10.55 lps. The specific capacity of bore wells ranged from 0.738 to 23.41 lps/m/dd. While the exploratory wells in alluvium have yields in the range of 3 – 7 lps. During May 2006, the depth to water levels in observation wells tapping shallow aquifer ranged from 1.15 – 18.60 m bgl. Shallow ground water levels i.e. less than 5 m bgl were prominently observed in observation wells at Arcot, Girisamudram, Rangavaram, Ranipet and Vishram, and comparatively deeper ground water levels (10 – 20 m bgl) at Asanampatti, Kandhili, K.V.Kuppam, Madhanur, Paradarami, Thirupathur and Thimiri. Depth to ground water levels during January 2007 ranged from 1 to 18.45 m bgl. Water levels were within 2 m bgl in isolated pockets in Echipudur and Ranipet and resulted in localised seasonal water logging conditions. Deeper ground water levels (10 – 20 m bgl) still persisted in the pockets of Asanampattu, Kandhili, K.V.Kuppam, Madhanur, Paradarami-I, Pernampattu, Thirupathur and Thimiri. The depth to piezometric surface of the deeper fractured aquifers ranged from 3.78 – 21.70 m bgl during pre monsoon and 2.08 to 8.02 m bgl during post monsoon period. Hydrogeology map of the PIA district is given in **Figure 3.13**.

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

(Ref: District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.



Figure 3-13 Hydrogeology map of the PIA district

3.5.8 Drainage Pattern in PIA District

Rivers such as Palar, Ponnai, Pamban, Malattar, Kavundinyanadi, Agaram Aru, Kallar, Naganadi and Goddar are important but not useful for irrigation as they mostly dry and sand wastes except heavy rain seasons. Originating near Nandidurg in Karnataka, Palar river enters the district in the western part through Vaniyambadi taluk. It is an important river in the district. Running towards east crossing Gudiyatham taluk, the river forms the boundary between Vaniyambadi, Gudiyatham and Vellore taluks. Making boundary between Wallajah and Arcot taluks, and separating Arcot and Ranipet towns Palar River enters into Cheyyar taluk in Tiruvannamalai district to the east. Ponnai River rising in Chittoor district of Andhra Pradesh flows on the western part of Walajapet taluk and joins Palar near Ranipet. Other rivers such as Goddar and Kavundinyanadi originating from north to south in Gudiyatham flow into Palar river. Drainage map of the study area is given in **Figure 3.14**.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

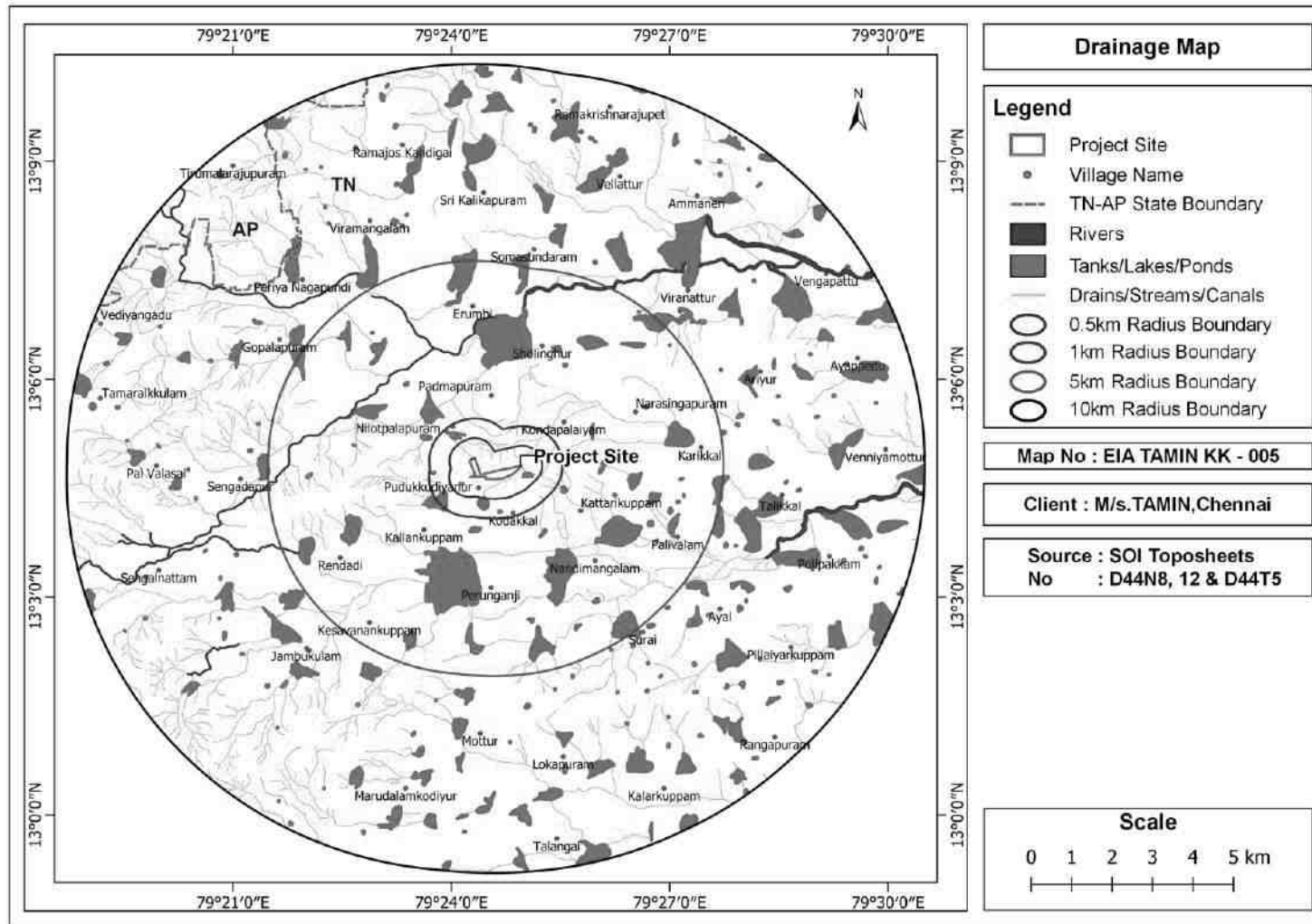


Figure 3-14 Drainage map of the study area

3.5.9 Soils in PIA District

Containing complex mineral compounds, the soil is thin layer of earth's crust made up of disintegrated and decomposed rocks. It constituted with the natural resources which supports to the growth of plants on earth. The central and southern parts of the district are mostly hilly and the eastern portion is almost a stretch of unbroken plain. In the western part, the land rises gradually towards the Mysore plateau along the Chittoor district. The soil is mostly of the red ferruginous variety both sandy and loamy, with black area accounting for about 16%. The black soil is found mostly in the neighbourhood of the rivers of Palar, Ponnai and in the ayacuts of a few big tanks. The black soil occurs in Arakonam, Wallajah, Arcot and Tirupathur Taluks. The black type loam soil is found mostly in Arakonam and Gudiyatham taluks in larger areas than in other taluks while red loam soil is found in all the taluks.

Source:

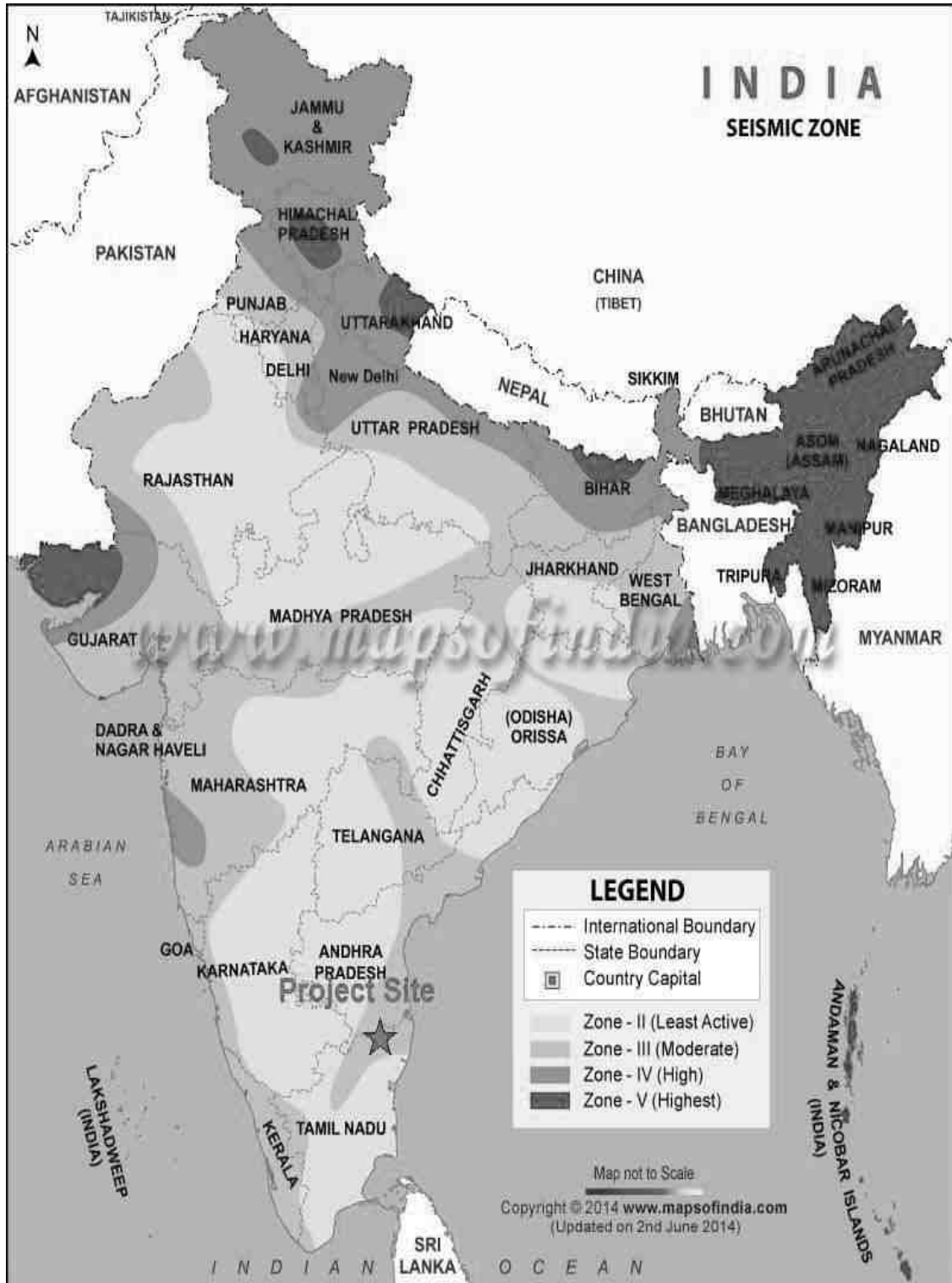
https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

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

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.5.10 Seismicity

As per the IS:1893 (Part-1) 2002 of Bureau of Indian Standards (BIS), the project location/study area falls in semi-arid region and the climate of the area is generally hot. The project location/study area falls in Zone III, which is categorized as a Moderate Risk Zone. The seismicity map of India is shown in **Figure 3.15**.



(Source: Mapsof India)

Figure 3-15 Seismicity Map of India

3.6 Air Environment

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

3.6.1 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed, wind direction and temperature. The meteorological data is useful for proper interpretation of the baseline data. It is used as input for air quality dispersion models for predicting the post project environmental scenario i.e. ground level concentrations due to mining activities, Quarry machineries, DG set & vehicles etc.

3.6.2 Meteorological Data Collection

Available secondary data pertaining to the meteorological parameters was obtained from the IMD Climatological tables. In addition, baseline meteorological data (primary data) was generated during the Pre-monsoon Season (**Mid of Jan 2023 – Mid of April 2023**). The methodology adopted for monitoring surface observations is as per the standard norms laid down by Bureau of Indian Standards (BIS) i.e. IS:8829 and Indian Meteorological Department (IMD).

3.6.3 General Meteorological Scenario based on IMD Data

The nearest Indian Meteorological Department (IMD) station located to project site is Vellore. The Climatological data for Vellore (12°55' N and 79°09' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30-year period, is presented in the following sections on the meteorological conditions of the region. The monthly variations of the relevant meteorological parameters are reproduced in **Table 3.5**.

Table 3-5 Climatological Summary – Vellore (1991-2020)

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	29.9	18	6.8	0.6	88	56	22.1	21.4	3.1	NE	NE
Feb	32.8	19.1	5.5	0.4	84	49	23	21.9	3.6	NE	NE

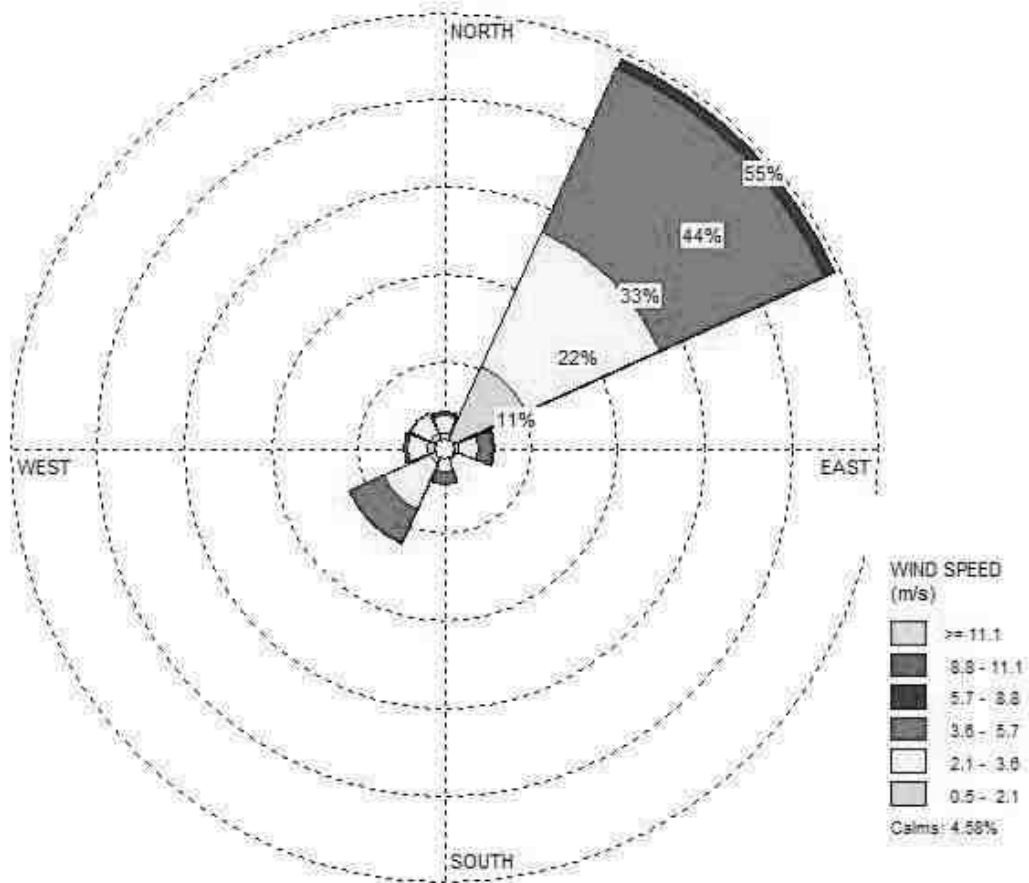
Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Mar	36.2	21.8	11.4	0.6	80	43	25.8	22.7	3.3	SW,W	E
Apr	38.3	24.8	30.5	1.7	74	43	29.3	24.8	4	SW	SE
May	39.2	26	63.8	4.4	67	48	28.7	26.6	3.9	SW	SW
Jun	36.7	25.5	89.9	5	67	51	27.2	26.7	4.9	SW	SW
Jul	35.2	24.9	104.9	5.9	70	55	26.8	27.1	4.8	SW	SW
Aug	34.4	24.3	144.9	8	75	60	27.4	28.3	4.1	W	SW
Sep	33.9	23.8	183.8	8.7	78	65	28	28.9	3.2	SW	SW
Oct	32.3	22.8	167.4	9.2	83	71	28.1	28.3	2.2	SW	NE
Nov	29.9	20.9	165.4	7.9	87	73	26.1	26.3	2.2	NE	NE
Dec	28.8	18.6	75.8	3.6	88	67	23.2	23.3	2.6	NE	NE
Max.	39.2	26	183.8	9.2	88	73	28.7	28.9	4.9	Annual Wind Predominant direction is & North East	
Min.	28.8	18	5.5	0.4	67	43	22.1	21.4	2.2		
Avg./Total.	33.9	22.5	1050.1	56.0	79	57	26.3	25.5	3.5		

As per the above IMD Climatological Table 3.6, the observations drawn are the following.

- Daily maximum temperature is **39.2°C** and the daily minimum temperature is **18°C** were recorded in the months of **May** and **January** respectively.
- Maximum and minimum relative humidity of **88%** and **43%** were recorded in the months of **January, December** and **March, April** respectively.
- Maximum and minimum rainfall of **183.8 mm** and **5.5 mm** was recorded in the months of **September** and **February** respectively. Annual total rainfall recorded in the region was **1050.1 mm**.
- Maximum and minimum mean wind is **4.9 kmph** and **2.2 kmph** was recorded in the months of **June** and **October, November** respectively. Annual Wind predominant pattern is from **North East**.

3.6.4 Meteorological data during Study Period

The meteorological data of study period was used for interpretation of baseline status and to simulate the meteorological conditions for prediction of impacts in modeling studies. Meteorology Data for the Study Period (**Mid of Jan 2023 – Mid of April 2023**) is presented in **Table 3.6**.



**Figure 3-16 Wind rose diagram considered for Dispersion Modelling
(Mid of Jan 2023 – Mid of April 2023)**

Table 3-6 Meteorology Data for the Study Period (Mid of Jan 2023 – Mid of April 2023)

S. No	Parameter	Observation
1.	Temperature	Max Temperature: 37.0°C Min Temperature: 17.0°C Avg Temperature: 27.75°C
2.	Average Relative Humidity	64.33%
3.	Average Wind Speed	2.86 m/s
4.	Predominant Wind Direction	North East

3.6.5 Atmospheric Inversion

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

- Average atmospheric temperature: 27.75°C
- Average Relative humidity: 64.33 %
- Average Wind speed: 2.86 m/s

The daily inversion level calculated based on the average temperature and average wind speed at the project site and the maximum inversion height is derived by the graph plotted based on the average temperature and average wind speed. The daily inversion level at the project site varies from 50 to 3674m during 6 AM to 5 PM, the maximum recorded at 4 PM, April 2023. This is shown in the following **Figure 3.17**.

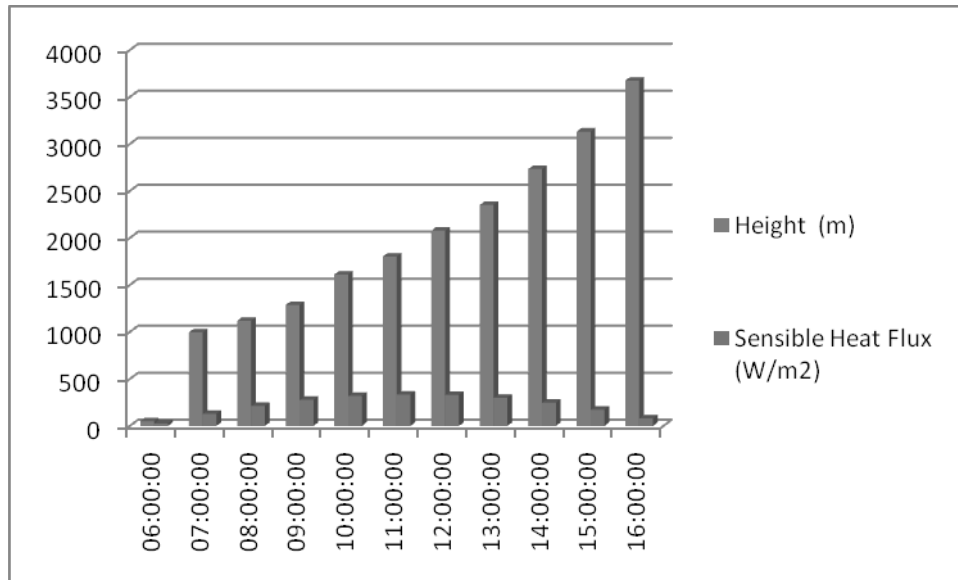


Figure 3-17 Atmospheric inversion level at the project site

3.7 Ambient Air Quality

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

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

3.7.1 Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, Eight (08) monitoring locations have been identified as per Study period wind predominance. The Study period wind predominance is North East. Map showing the AAQ monitoring locations is given in **Figure 3.18**.and the details of the locations are given in **Table 3.7**.

Table 3-7 Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Azimuth Directions
AAQ1	Project Site	-	Within Site	
AAQ2	Erumbi	c/w	3.92	N
AAQ3	Kondapalayam	u/w	1.49	NE
AAQ4	Karikkal	c/w	4.46	E
AAQ5	Kattarikuppam	c/w	1.78	SE
AAQ6	Perunganji	c/w	2.84	S
AAQ7	Kallankuppam	d/w	1.74	SW
AAQ8	Rendadi	d/w	3.86	SW

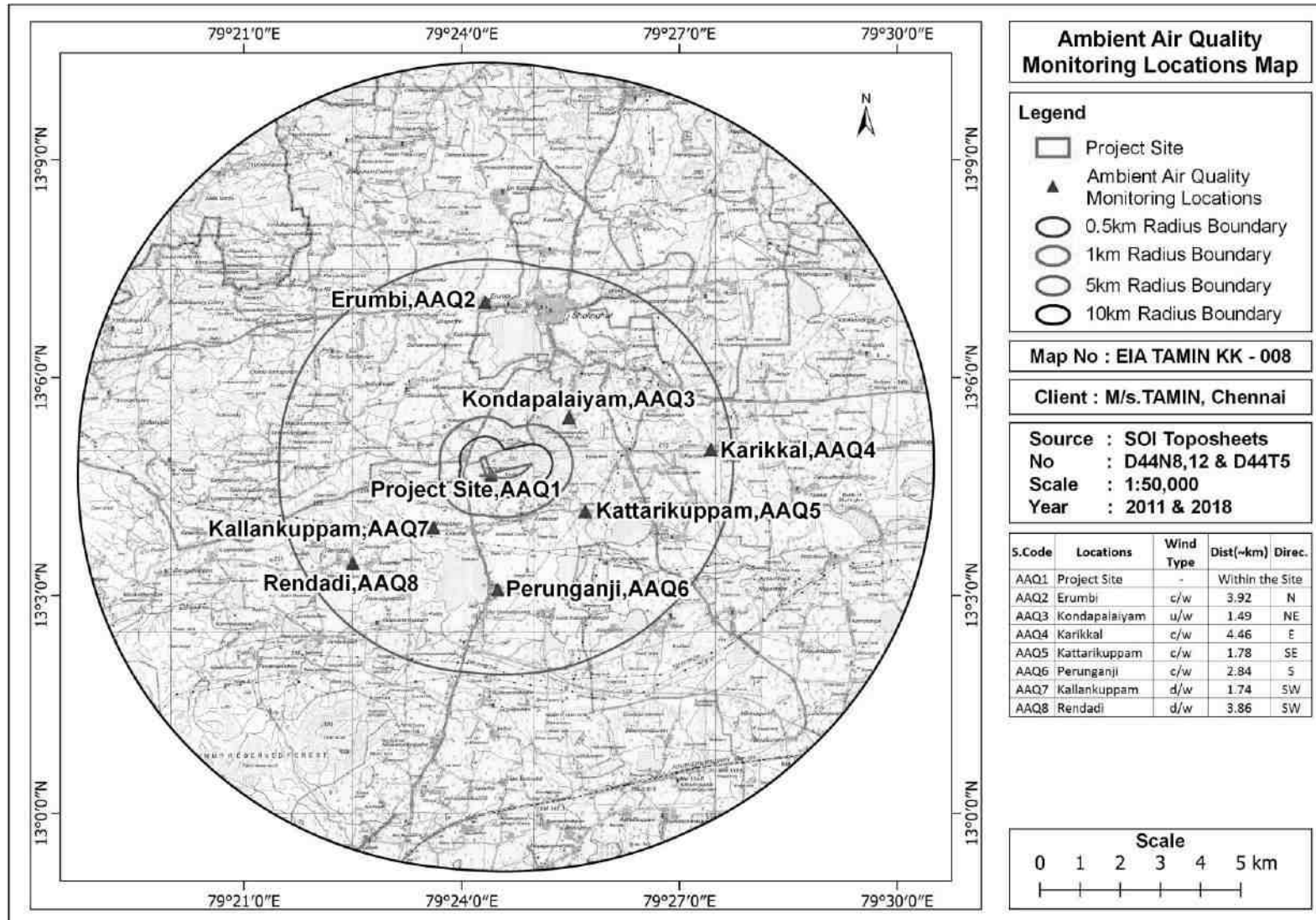


Figure 3-18 Map showing the Ambient Air Quality monitoring locations

3.7.2 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during Pre-Monsoon season (**Mid of Jan 2023 – Mid of April 2023**). PM₁₀, PM_{2.5}, SO₂, NO_x, Pb, NH₃, O₃, CO, C₆H₆, C₂₀H₁₂, As, Ni and Free Silica was monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in **Table 3.8**.

Table 3-8 Analytical Methods for Analysis of Ambient Air Quality Parameters (NAAQ)

S.No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
1.	Sulphur Dioxide (SO ₂), µg/m ³	IS:5182(Part-2):2001 (Reaff:2006)	50 (Annual)	80(24 Hours)	24 Hours
2.	Nitrogen Dioxide (NO ₂), µg/m ³	IS: 5182 (Part - 6): 2006	40 (Annual)	80 (24 Hours)	24 Hours
3.	Particulate Matter (PM _{2.5}), µg/m ³	IS: 5182 (Part - 23): 2006	40 (Annual)	60 (24 hours)	24 Hours
4.	Particulate Matter (PM ₁₀), µg/m ³	IS:5182 (Part– 23): 2006	60 (Annual)	100 (24 hours)	24 Hours
5.	CO mg/m ³	IS:5182(Part–10):1999 (Reaff:2006)	2 (8 hours)	4 (1hour)	8 Hours
6.	Pbµg/m ³	IS:5182(Part–22):2004 (Reaff:2006)	0.5(Annual)	1(24 hours)	24 Hours
7.	O ₃ , µg/m ³	IS: 5182 (Part – 9): 1974	100(8hours)	180 (1hour)	8 Hours
8.	NH ₃ , µg/m ³	APHA (air) 2nd edition (Indophenol-blue method)	100(Annual)	400(24 hours)	8 Hours
9.	Benzene, µg/m ³	IS:5182(Part–11):1999 (RA:2009)	5 (Annual)	5 (Annual)	24 Hours
10.	Benzo (a) pyrene, ng/m ³	IS:5182(Part–12):2004 (RA:2009)	1 (Annual)	1 (Annual)	24 Hours
11.	Arsenic, ng/ m ³	APHA (air) 2nd edition	6 (Annual)	6 (Annual)	24 Hours
12.	Nickel ng/ m ³	In house method (AAS method) based on CPCB guidelines volume 1	20(Annual)	20(Annual)	24 Hours
13.	Free Silica	NIOSH Manual- Method 7601	--	--	8 hours

3.7.2.1 Results and Discussions

The variations of the pollutants PM₁₀, PM_{2.5}, SO₂, NO₂, CO, Pb, O₃, NH₃, C₆H₆, C₂₀ H₁₂, As and Ni are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November, 2009. Ambient Air Quality Monitoring Data (**Mid of Jan 2023 – Mid of April 2023**) for the study area is given in **Table 3.9** and trends of measured ambient concentration in the study area were graphically represented in **Figure 3-19**.

Table 3-9 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Erumbi	Kondapalaiyam	Karikkal	Kattarikuppam	Perunganji	Kallankuppam	Rendadi
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
PM ₁₀ Conc. (µg/m ³)	Min.	100 (24 Hours)	33.62	49.27	36.99	46.15	41.38	46.98	35.28	43.04
	Max.		47.91	70.21	52.72	65.77	58.98	66.95	50.28	61.34
	Avg.		40.32	59.08	44.36	55.34	49.63	56.34	42.31	51.62
	98 th 'tile		47.63	69.80	52.41	65.39	58.63	66.56	49.99	60.99
PM _{2.5} Conc. (µg/m ³)	Min.	60 (24 Hours)	12.64	31.92	16.87	25.13	15.88	31.79	18.47	28.72
	Max.		18.02	45.49	24.04	35.82	22.63	45.30	26.32	40.94
	Avg.		15.16	38.28	20.23	30.14	19.05	38.12	22.15	34.45
	98 th 'tile		17.91	45.23	23.90	35.61	22.50	45.04	26.17	40.70
SO ₂ Conc. (µg/m ³)	Min.	80 (24 Hours)	9.66	13.07	10.23	11.14	9.52	12.12	9.15	14.41
	Max.		13.77	18.62	14.58	15.87	13.57	17.27	13.04	20.54
	Avg.		11.59	15.68	12.27	13.36	11.42	14.53	10.98	17.29
	98 th 'tile		13.69	22.02	14.49	15.78	13.49	23.05	12.97	20.42
NO ₂ Conc. (µg/m ³)	Min.	80 (24 Hours)	21.13	18.70	22.80	22.46	19.80	20.62	22.04	25.13
	Max.		30.11	26.66	32.49	32.01	28.21	29.39	31.42	35.82
	Avg.,		25.34	22.43	27.34	26.94	23.75	24.74	26.44	30.14
	98 th 'tile		29.93	26.50	32.30	31.83	28.05	29.22	31.23	35.61
Pb (µg/m ³)	Avg.	1 (24 hour)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)
CO (mg/m ³)	Avg.	4 (1hour)	0.67	0.52	0.46	0.77	0.65	0.58	0.41	0.39
O ₃ (µg/m ³)	Avg.	180 (1hour)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)
Benzene C ₆ H ₆ (µg/m ³)	Avg.	5 (Annual)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Benzo(a) Pyrene C ₂₀ H ₁₂ (a), (ng/m ³)	Avg.	1 (Annual)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Erumbi	Kondapalaiyam	Karikkal	Kattarikuppam	Perunganji	Kallankuppam	Rendadi
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
As (ng/ m ³)	Avg.	6 (Annual)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)
Ni (ng/m ³)	Avg.	20 (Annual)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)
NH ₃ (µg/m ³)	Avg.	400 (24 hour)	BLQ (LOQ 5)	BLQ (LOQ 5)	BLQ (LOQ 5)	BLQ (LOQ 5)	BLQ (LOQ 5)	BLQ (LOQ 5)	BLQ (LOQ 5)	BLQ (LOQ 5)
Free Silica	Avg.	--	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)

Note: BLQ (Below the Limit of Quantifications), LOQ (Limit of Quantifications)

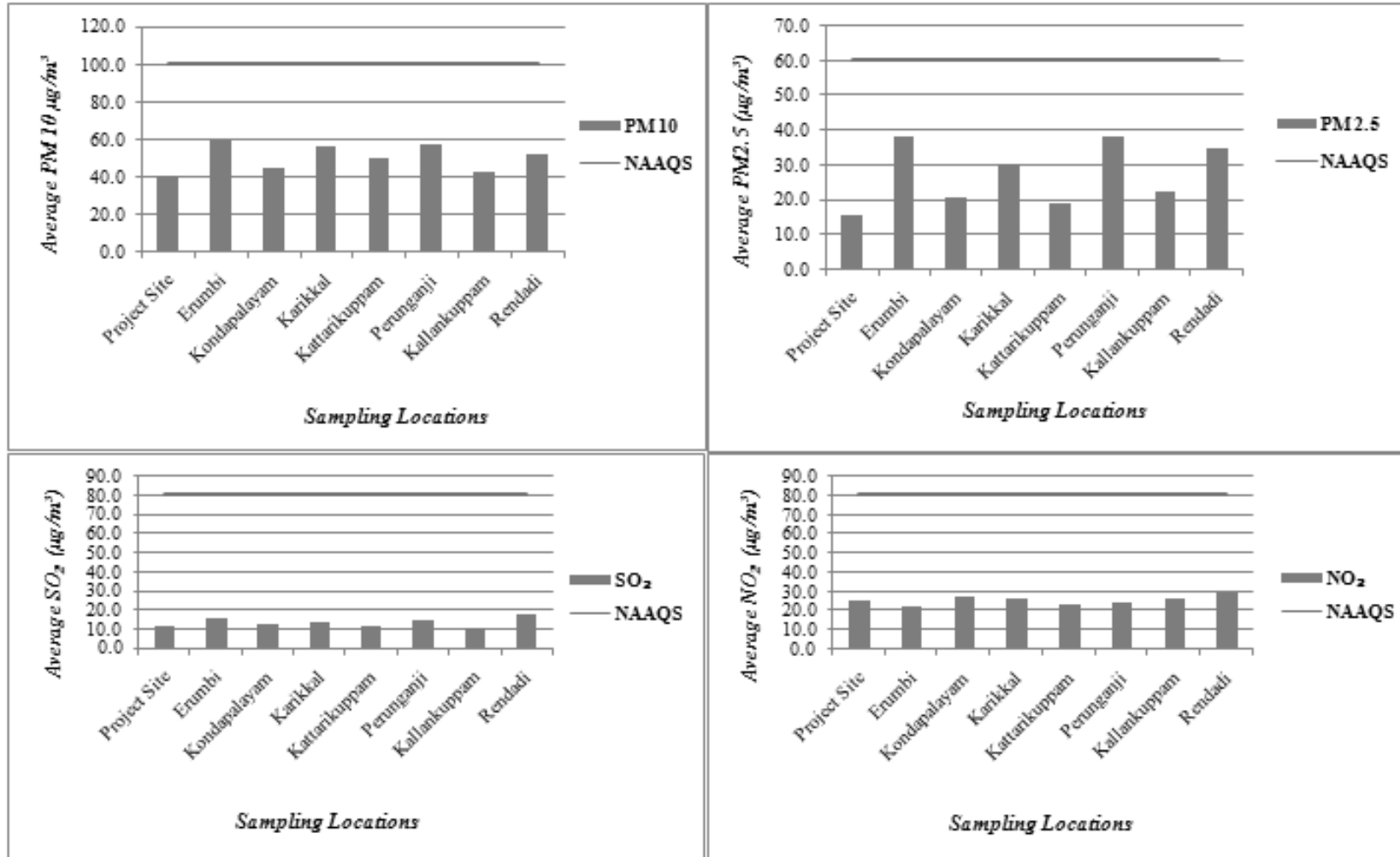


Figure 3-19 Trends of Measured Ambient Concentrations in the Study Area

3.7.2.2 Observations

The ambient air quality has been monitored at 8 locations for 12 parameters as per NAAQS, 2009 within the study area. The average baseline levels of PM₁₀ (40.32µg/m³- 59.08 µg/m³), PM_{2.5} (15.16µg/m³ -38.28 µg/m³), SO₂ (10.98µg/m³ – 19.51 µg/m³), NO₂ (22.43µg/m³ – 30.14µg/m³), CO (0.39 mg/m³– 0.77 mg/m³), all the parameters are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period.

3.8 Noise Environment

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

Ambient noise levels have been established by monitoring noise levels at Eight (08) locations in and around 10 km distance from project area during the study period using precision noise level meter. The noise monitoring locations in the study area were selected after giving due consideration to the various land use categories. The land use categories include commercial, residential, rural and sensitive areas. Noise levels were recorded on an hourly basis for one complete day at each location using pre- calibrated noise levels. Sampling images and map noise showing the noise monitoring locations are given in **Figure 3.20**.

3.8.1 Results and Discussions:

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

Ld: Average noise levels between 6:00 hours to 22.00 hours.

Ln: Average noise levels between 22:00 hours to 6.00 hours.

The comparison of day equivalent noise levels (Ld) and night equivalent noise levels (Ln) with the respective CPCB stipulated noise standards for various land use categories are shown in the **Table 3.10**.

Table 3-10 Day and Night Equivalent Noise Levels

Location Code	Location	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
				Day	Night	Lday (Ld)	LNight (Ln)	
N1	Project Site	Within Site		46.9	40.6	75	70	Industrial
N2	Erumbi	3.92	N	54.2	43.1	55	45	Residential
N3	Kondapalaiyam	1.49	NE	52.5	41.2	55	45	Residential
N4	Karikkal	4.46	E	54.8	43.4	55	45	Residential
N5	Kattarikuppam	1.78	SE	51.4	42.2	55	45	Residential
N6	Perunganji	2.84	S	50.5	41.5	55	45	Residential
N7	Kallankuppam	1.74	SW	52.4	41.7	55	45	Residential
N8	Rendadi	3.86	SW	53.6	43.5	55	45	Residential

1.8.1 Observations

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

- In industrial area, day time noise level was about 46.9 dB(A) and 40.6 dB(A) during night time, which is within prescribed limit by MoEF&CC (75 dB(A) Day time & 70 dB(A) Night time).
- In residential area day time noise levels varied from 50.5 dB(A) to 54.8 dB(A) and night time noise levels varied from 41.2 dB(A) to 43.5dB(A) across the sampling stations. The field observations during the study period indicates that the ambient noise levels are within the prescribed limit noise by CPCB (55 dB(A) Day time & 45 dB(A) Night time).

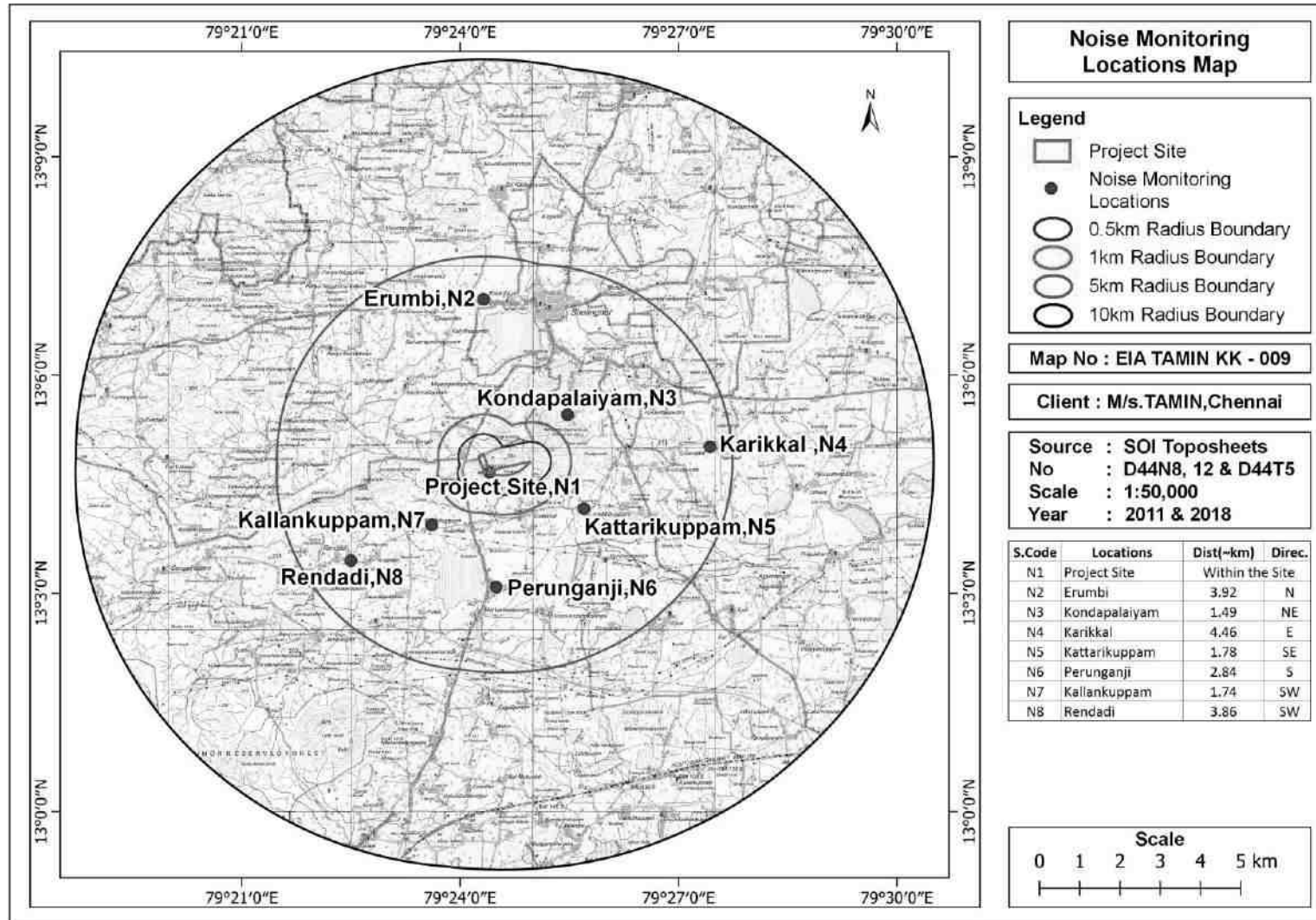


Figure 3-20 Map showing the noise monitoring location

3.9 Water Environment

3.9.1 Surface Water Resources

Rivers such as Palar, Ponnai, Pamban, Malattar, Kavundinyanadi, Agaram Aru, Kallar, Naganadi and Goddar are important but not useful for irrigation as they mostly dry and sand wastes except heavy rain seasons. Other rivers such as Goddar and Kavundinyanadi originating from north to south in Gudiyatham flow into the Palar River.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.9.2 Surface Water Quality Assessment

Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem, or to measure the effectiveness of best management practices will be implemented in water system. Monitoring helps to determine the trends in the quality of the aquatic environment and the impact due to the release of contaminants, other anthropogenic activities, and/or by waste treatment operations (impact monitoring). To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10 Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in **Table 3.11**. Water sampling and map of sampling location are given in **Table 3.12** and **Figure 3.21**.

Table 3-11 Test methods used for the analysis of water quality parameters

S.No	Parameter Measured	Test Method
1.	Colour	IS:3025 (Part- 4) 1983
2.	Turbidity	IS 3025(Part - 10):1984
3.	pH	IS:3025 (Part - 11): 1983
4.	Conductivity	IS:3025 (Part - 14): 1983
5.	Total Dissolve Solids	IS:3025:1(Part - 16) 1984
6.	Total Suspended Solids	IS 3025 (Part - 17) 1984
7.	Alkalinity as CaCO ₃	IS:3025,1 (Part - 23) 1986
8.	Total Hardness as CaCO ₃	IS:3025 (Part - 21) 1983
9.	Sodium	IS:3025,5(Part - 45) 1993
10.	Potassium	IS:3025,5(Part - 45) 1993
11.	Calcium as Ca	IS 3025 (Part - 40):1991

S.No	Parameter Measured	Test Method
12.	Magnesium as Mg	IS 3025 (Part - 46) 1994
13.	Chloride	IS 3025 (Part - 32):1988
14.	Sulphate SO ₄	IS 3025(Part - 24):1986
15.	Nitrate as NO ₃	ASTM(Part - 31)1978
16.	Phosphate	IS 3025 (Pt 45) 1993
17.	Fluorides as F	IS 3025 (Part - 60):2008
18.	Cyanide	IS 3025 (Part-27):1986
19.	Arsenic	IS 3025:(Part-37):1988
20.	Boron	IS:3025 (Part - 57):2003
21.	Cadmium	IS 3025 (Part - 41)1991
22.	Chromium, Total	IS:3025 (Part - 52) 2003
23.	Copper	IS:3025 (Part - 42)1992
24.	Iron	IS 3025 (Part - 53):2003
25.	Lead	IS:3025 (Part - 47) 1994
26.	Manganese	IS 3025:(Part - 59):2006
27.	Mercury	IS 3025 (Part48):1994 RA 1999
28.	Nickel	IS 3025:(Part-54):2003
29.	Selenium	IS 3025 Part (56)2003
30.	Zinc	IS:3025 (Part - 49) 1994
31.	Dissolved Oxygen	IS:3025 (Part - 38)1989
32.	BOD	5210B APHA22nd Edn 2012
33.	COD	IS:3025 (Part-58)-2006
34.	Total Coliform	IS 1622: 1981

Table 3-12 Details of Surface water sampling locations

Location Code	Locations	Distance from Project Boundary(~km)	Direction from project boundary
SW1	Erumbi Lake	4.85	N
SW2	Sholinghur Lake	3.56	N
SW3	Lake near Viranattur	7.05	NE
SW4	Nandi R	8.60	NE
SW5	Lake near Talikkal	6.46	E
SW6	Lake near Nandimangalam	2.62	SSE
SW7	Perunganji Lake	2.40	S
SW8	Periya Nagapundi Lake	6.31	NW

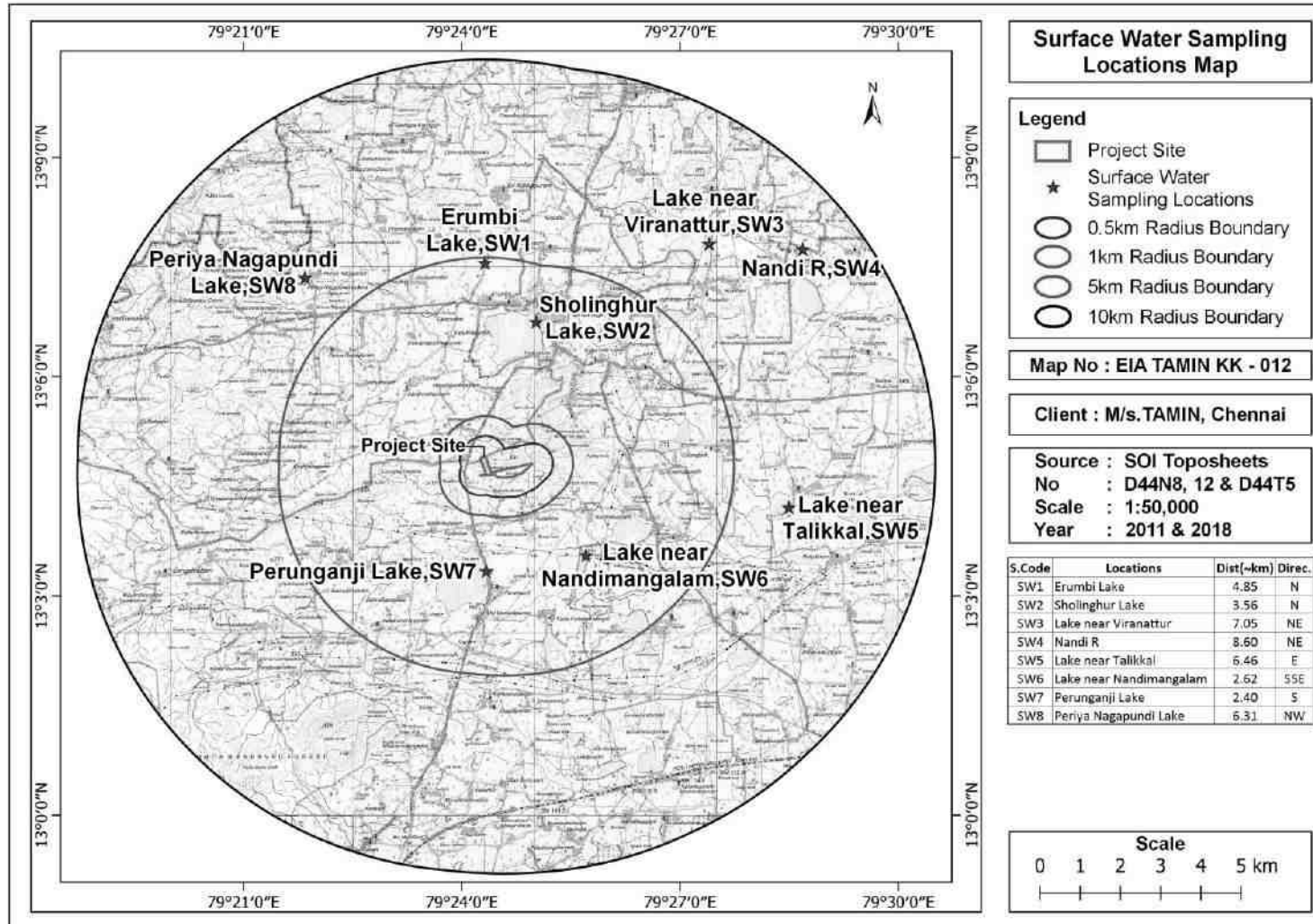


Figure 3-21 Map showing the surface water monitoring locations

Table 3-13 Physicochemical Parameters of Surface water samples from study area

S. No	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Erumbi Lake	Sholingur Lake	Lake near Viranattur	Nandi R	Lake near Talikkal	Lake near Nandimangalam	Perunganji Lake	Periya Nagapundi Lake
				SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
1.	pH (at 25°C)	--	6.5-8.5	6.85	7.32	7.65	7.11	7.23	7.44	7.56	6.33
2.	Electrical Conductivity	µS/cm	-	761.05	699.1	642.5	533	711.2	663.5	712.3	749.3
3.	Total Dissolved Solids	mg/l	500	711.2	567.2	443.2	298	350.2	572.3	512	498.3
4.	Total Suspended Solids	mg/l	-	25	31	18	58	13	16.3	22.1	14
5.	Total Alkalinity as CaCO ₃	mg/l	-	248.5	210	196.3	160.1	212.7	185	189.2	153.1
6.	Total Hardness as CaCO ₃	mg/l	200	523.12	254.73	260.82	202.71	237.28	283.35	261.21	391.96
7.	Sodium as Na	mg/l	-	2.6	117.3	83.1	73.6	102.4	95.6	74.3	99.6
8.	Potassium as K	mg/l	-	21.0	17.3	11.3	5.3	7.89	9.13	11.5	9.6
9.	Calcium as Ca	mg/l	-	115	53	48.1	45.23	39.12	67.3	44.25	75.8
10.	Magnesium as Mg	mg/l	-	57.3	29.72	34.17	21.8	33.9	28.0	36.6	49.22
11.	Chloride as Cl	mg/l	250	212.3	171.0	152.9	81.3	124.5	183	96.8	203.5
12.	Sulphate as SO ₄	mg/l	400	49.1	30.7	39.2	13.15	28.6	32.6	24.6	25.1
13.	Nitrate as NO ₃	mg/l	20	15.8	14.6	9.3	5.4	14.9	9.7	16.3	13.7
14.	Fluorides as F	mg/l	1.5	1.25	1.09	0.91	0.52	1.46	1.23	1.1	1.3
15.	Cyanide	mg/l	0.05	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
16.	Arsenic	mg/l	0.05	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
17.	Cadmium as Cd	mg/l	0.01	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)
18.	Chromium, Total	mg/l	0.05	0.03	0.01	0.03	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	0.02	0.04
19.	Copper as Cu	mg/l	1.5	0.15	0.07	0.05	BLQ(LOQ 0.01)	0.03	0.04	0.12	0.09

S. No	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Erumbi Lake	Sholingur Lake	Lake near Viranattur	Nandi R	Lake near Talikkal	Lake near Nandimangalam	Perunganji Lake	Periya Nagapundi Lake
				SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
20.	Lead as Pb	mg/l	0.1	0.01	0.01	0.09	BLQ(LOQ 0.005)	0.02	0.06	0.03	BLQ(LOQ 0.005)
21.	Manganese as Mn	mg/l	0.5	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
22.	Mercury	mg/l	0.001	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
23.	Nickel as Ni	mg/l	-	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
24.	Selenium as Se	mg/l	0.01	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
25.	Zinc as Zn	mg/l	15	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
26.	Dissolved Oxygen	mg/l	6	6	5.8	6.1	5.9	5.7	5.6	5.9	5.8
27.	Chemical Oxygen Demand as O₂	mg/l	-	23	43	17	28	32	52	36	42
28.	BOD, 3 days @ 27°C as O₂	mg/l	2	13.8	24.1	10.2	16.8	19.2	29.2	20.9	23.5
29.	Total Coliform	MPN/100mL	50	20	35	14	19	30	40	31	11

Note: BLQ (Below the Limit of Quantification), LOQ (Limit of Quantification),

3.9.2.1 Results and Discussions

- Water sampling results are compared with Surface water standards IS 2296:1992.
- pH in the collected surface water samples varies between 6.33 to 7.65.
- The Total Dissolved Solids range from 298 mg/l to 711.2 mg/l.
- The Total hardness ranges between 202.71 mg/l – 523.12 mg/l.
- BOD values varying from 10.2 to 29.2 mg/l. COD varies from 17 to 52 mg/l.
- The concentration of heavy metals like As, Cd, Cr, Pb, Mn, Hg, Ni and Se are within the limits of IS 2296:1992.

3.9.3 Groundwater resources

Ground water occurs under phreatic conditions in the weathered zone and under semiconfined conditions in the fractures. The thickness of weathered zone varies from less than a metre to about 15 m in the area depending on the topography. Potential aquifer zones are also developed in these rocks by fractures persisting to depths, particularly along lineaments and their inter sections. The depth of dug wells in crystalline formations varies from 8 – 19.5 m bgl. Fracture zones have been encountered in the well down to a depth of 116 m bgl in the borehole drilled by CGWB. The thickness of alluvium along the course of Palar River ranges from 8 – 12 m.

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

(Ref: District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.9.3.1 Groundwater Quality

Groundwater is the principal source for domestic and drinking purposes in almost all villages near the study area. The quality of the groundwater received is influenced by pollution of soil and air, industrial and domestic waste disposal, application of fertilizers and pesticides in agriculture, etc. Total Eight (08) ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the acceptable and permissible limit of water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3.14** and **Table 3.15** and Map showing the ground water monitoring locations is given in **Figure 3.22**.

Table 3-14 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance (km) from Project boundary	Azimuth Directions
GW1	Near Project Site (Pudukkudiyannur)	0.27	S
GW2	Erumbi	3.92	N
GW3	Kondapalayam	1.49	NE
GW4	Karikkal	4.46	E
GW5	Kattarikuppam	1.78	SE
GW6	Perunganji	2.84	S
GW7	Kallankuppam	1.74	SW
GW8	Rendadi	3.86	SW

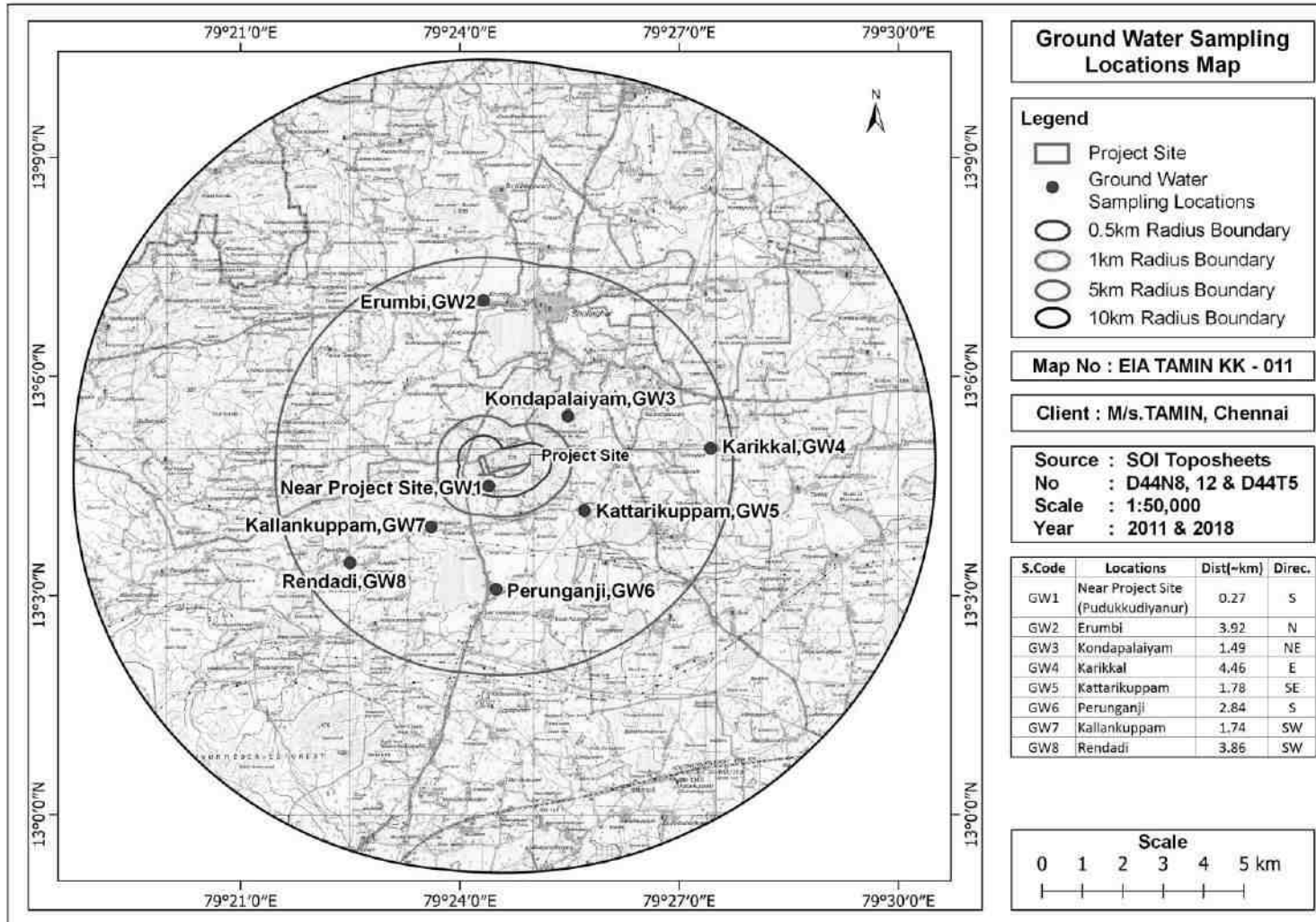


Figure 3-22 Map showing the groundwater monitoring locations

Table 3-15 Physico chemical analysis of Ground water samples from study area

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Project Site	Erumbi	Kondap alaiyam	Karikkal	Kattarik uppam	Perunganj i	Kallanku ppam	Rendad i
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1.	Colour	Haze n	5	15	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LO Q 1.0)	BLQ(LOQ 1.0)	BLQ(LO Q 1.0)	BLQ(LOQ 1.0)	BLQ(LO Q 1.0)	BLQ(L OQ 1.0)
2.	Turbidity	NTU	1	5	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LO Q 0.1)	BLQ(LOQ 0.1)	BLQ(LO Q 0.1)	BLQ(LOQ 0.1)	BLQ(LO Q 0.1)	BLQ(L OQ 0.1)
3.	pH	--	6.5-8.5	NR	7.96	7.22	8.2	7.19	7.99	7.31	8.26	7.02
4.	Conductivity	µS/cm	-	-	1073	1086	987	853	964	1246	956	965
5.	Total Dissolved Solids	mg/l	500	2000	702.9	896.8	688.1	602.7	692.9	967.1	630.9	609.5
6.	Total Suspended Solids	mg/l	-	-	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LO Q 1.0)	BLQ(LOQ 1.0)	BLQ(LO Q 1.0)	BLQ(LOQ 1.0)	BLQ(LO Q 1.0)	BLQ(L OQ 1.0)
7.	Alkalinity as CaCO ₃	mg/l	200	600	86	127	135	146	165	114	173	153
8.	Total Hardness as CaCO ₃	mg/l	200	600	279.8	364.7	374.9	202.6	273.2	305.3	390.4	307.5
9.	Sodium as Na	mg/l	-	-	83.4	110.7	80.5	89.7	85.7	149.3	76.2	95.1
10.	Potassium as K	mg/l	-	-	7.2	6.7	5.8	5.3	6.4	4.6	5.3	4.3
11.	Calcium as Ca	mg/l	75	200	73.9	68.9	61.9	56.3	57.3	77.8	83.5	81.7
12.	Magnesium as Mg	mg/l	30	100	39.3	42.1	33.4	23.30	26.4	31.5	36.2	44.2
13.	Chloride as Cl	mg/l	250	1000	237.8	249.1	197.3	163.4	177.8	275.6	129.1	191.7
14.	Sulphate SO ₄	mg/l	200	400	85.7	92.8	72.2	56.4	62.9	92.1	52.5	51.9
15.	Nitrate as NO ₃	mg/l	45	NR	3.8	4.5	3.4	4.9	4.1	3.9	5.8	4.1
16.	Fluorides as F		1	1.5	0.45	0.37	0.59	0.76	0.49	0.39	0.46	0.50
17.	Cyanide	mg/l	0.05	NR	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LO Q 0.01)	BLQ(LOQ 0.01)	BLQ(LO Q 0.01)	BLQ(LOQ 0.01)	BLQ(LO Q 0.01)	BLQ(L OQ 0.01)

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Project Site	Erumbi	Kondapalaiyam	Karikkal	Kattarikuppam	Perunganji	Kallankuppam	Rendadi
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
18.	Arsenic as As	mg/l	0.01	0.05	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
19.	Boron as B	mg/l	0.5	1.0	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
20.	Cadmium as Cd	mg/l	0.003	NR	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)
21.	Chromium as Cr	mg/l	0.05	NR	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
22.	Copper as Cu	mg/l	0.05	1.5	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
23.	Iron as Fe	mg/l	0.3	NR	0.164	0.154	0.138	0.165	0.172	0.124	0.132	0.16
24.	Lead as Pb	mg/l	0.01	NR	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
25.	Manganese as Mn	mg/l	0.1	0.3	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
26.	Mercury	mg/l	0.001	NR	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
27.	Nickel as Ni	mg/l	0.02	NR	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
28.	Selenium as Se	mg/l	0.01	NR	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Project Site	Erumbi	Kondap alaiyam	Karikkal	Kattarik uppam	Perunganji	Kallankuppam	Rendadi
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
												0.005)
29.	Zinc as Zn	mg/l	5	15	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)

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

3.9.3.2 Results and Discussions

A summary of analytical results are presented below:

- The average pH ranges from 7.02 - 8.26.
- In the present findings the TDS value varied from 602.7 mg/l to 967.1 mg/l for the ground water and for all samples it exceeds the acceptable limits but within permissible limits of IS 10500: 2012. The acceptable and permissible limit of TDS for drinking water is 500 mg/l and 2000 mg/l.
- The Total hardness ranges between 202.46mg/l – 390.4 mg/l for ground water and for all samples it exceeds the acceptable limit but is within permissible limits of IS 10500: 2012.
- The Total alkalinity as calcium carbonate, Magnesium and Chloride are well within the permissible limits.
- Most of the heavy metals concentrations in the study area samples are below detection limits and all are well within the limits.

3.10 Soil as a resource and its Quality

Soils have been classified into

- a) Sandy soil
- b) Sandy loam
- c) Red loam
- d) Clay
- e) Clayey loam
- f) Black cotton soils

The red loamy soils are generally observed at the highest elevations whereas the black cotton soils invariably occupy the valley areas. Other types of soils are found at Intermediate elevations. The pollution from tanneries has caused deterioration of quality of ground water and soil in vast areas. Soil quality monitoring locations & results are given in **Table 3.16 & Table 3.17**. Map showing the soil monitoring locations are given in **Figure 3.23**.

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

(Ref: District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

Table 3-16 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (km) from Project boundary	Directions
S1	Project Site	Within the Site	
S2	Erumbi	3.92	N



S3	Kondapalaiyam	1.49	NE
S4	Karikkal	4.46	E
S5	Kattarikuppam	1.78	SE
S6	Perunganji	2.84	S
S7	Kallankuppam	1.74	SW
S8	Rendadi	3.86	SW

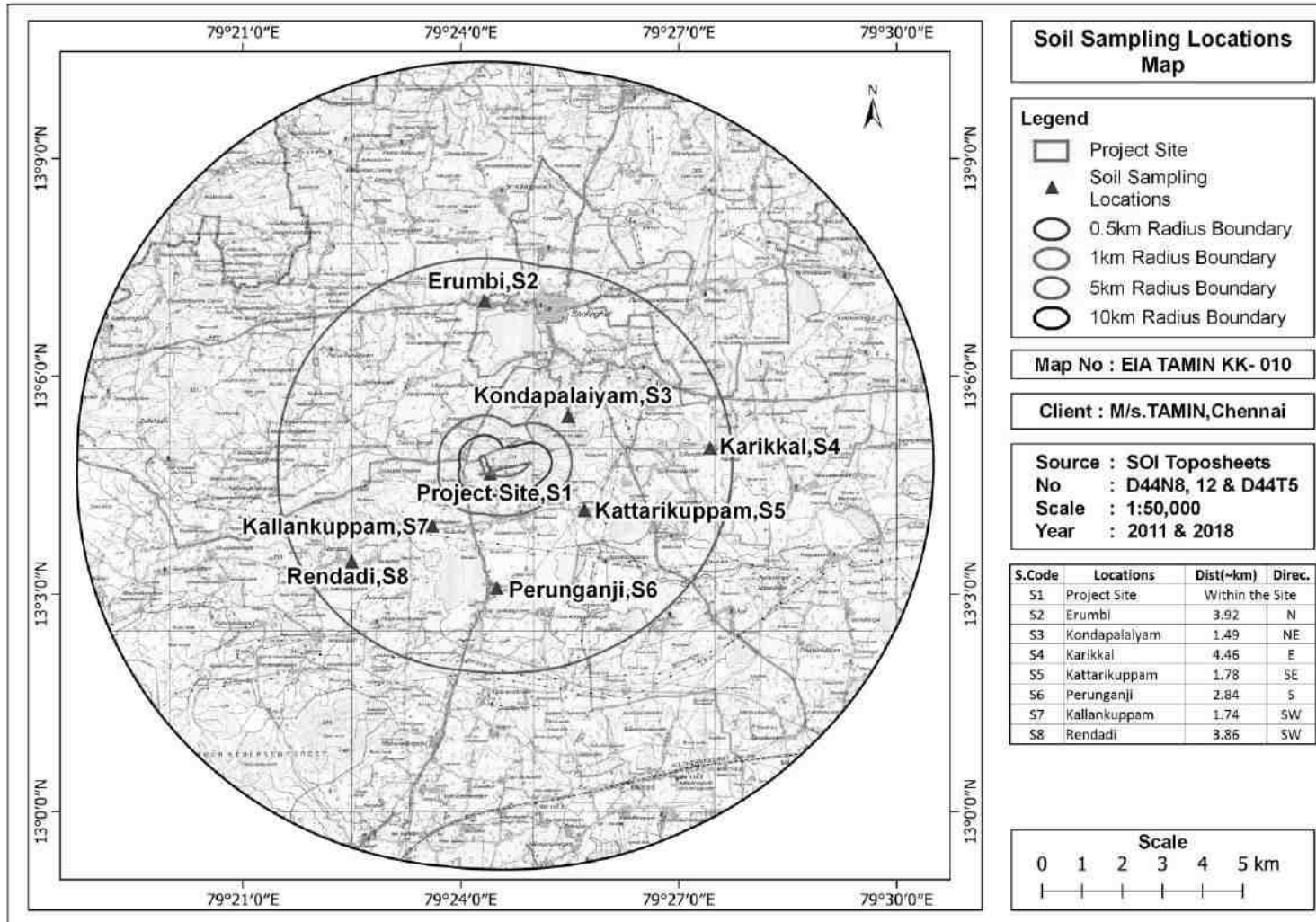


Figure 3-23 Map showing the soil monitoring location

Table 3-17 Soil Quality Monitoring Results

S. No	Parameters	Units	Project Site	Sholinghur	Karikkal	Kattarikupam	Perunganji	Pudukkudiy anur	Rendadi	Erumbi
			S1	S2	S3	S4	S5	S6	S7	S8
1.	Soil Texture	-	Loam	Sandy Loam	loam	sandy Clay loam	Sandy clay loam	Sandy loam	Loam	sandy loam
2.	Sand	%	45	55	48	54	47	58	42	58
3.	Silt	%	34	26	29	20	25	23	35	26
4.	Clay	%	21	19	23	26	28	19	23	16
5.	pH	-	8.49	7.79	8.47	8.31	8.24	7.18	7.96	7.53
6.	Electrical conductivity	Umhos/cm	253	246	295	183	248	236	227	218
7.	Organic Carbon	%	0.59	0.45	0.63	0.31	0.67	0.53	0.49	0.56
8.	Organic matter	%	0.94	0.61	0.89	0.63	0.91	0.83	0.77	0.89
9.	Nitrogen as N	mg/kg	168.7	159.8	147.6	143.8	179.3	184.7	163.2	176.7
10.	Phosphorus as P	mg/kg	17.3	28.4	26.2	17.4	26.9	24.5	26.1	16.7
11.	Potassium as K	mg/kg	369.7	373.5	236.9	253.4	383.9	268.4	387.2	425.8
12.	Cadmium	mg/kg	BLQ (LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
13.	Chromium	mg/kg	BLQ (LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
14.	Iron as Fe	mg/kg	3.91	5.71	4.75	4.67	3.94	5.12	4.34	4.13
15.	Porosity	-	0.34	0.49	0.36	0.45	0.41	0.35	0.23	0.38
16.	Water Holding Capacity	Inches of water per foot of soil	1.98	1.56	1.84	1.79	1.82	1.62	1.99	1.58

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

3.10.1 Results and Discussions

Summary of analytical results

- The pH of the soil samples ranged from 7.18 -8.49.
- Conductivity of the soil samples ranged from 183 – 295 umhos/cm. As the EC value is less than 2000 μ S/cm, the soil is found to be non-saline in nature
- Nitrogen content ranged from 143.8 mg/kg to 184.7 mg/kg
- Phosphorous ranged from 16.7 mg/kg – 28.4 mg/kg
- Potassium content ranges from 236.9 mg/kg – 425.8 mg/kg.

3.11 Biological Environment

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

During survey, following aspects were considered for ecological studies:

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

3.11.1 Methodology

Terrestrial investigations for flora and fauna records were collected by random field survey and a checklist was prepared. During field survey, discussions with the local people were carried-out to collect information related to local biodiversity in and around the area.

3.11.1.1 Floral Study

- ❖ The assessment of the flora of the study area is done by an extensive field survey of the area of 10 km radius.

- ❖ Plant species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature.
- ❖ Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.

3.11.1.2 Faunal Study

Ground surveys are carried out by trekking the study area for identification of important animal groups such as birds, mammals and reptiles for sampling of animals through the following methods.

- ❖ For sampling birds/ avifauna ‘point sampling’ along the fixed transects (foot trails) were done to record all the species of birds with the help of binoculars; field guides and photography for more than 1 hour on each transect (n=4).
- ❖ For sampling mammals, ‘direct count on open width (20 m) transect’ were used on the same transects. Besides, information on recent sightings/records of mammals by the locals are also collected from the study areas.
- ❖ Reptiles mainly lizards were sampled by ‘direct count on open width transects’.
- ❖ Secondary information collected from local villagers, published government data etc.
- ❖ List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.
- ❖ Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN.

3.11.2 Floristic composition within the study area

The ecology and diversity survey were conducted in the core area and buffer area extend 10 km radius in the study area. It is observed that human settlements present in and surround the project site and within the study area of 10 km radius vegetation area is in agricultural, horticultural land and private plantation and some natural vegetation observed near the Kallar river and Ammur reserve forest. Total 263 species and 191 genera under 68 families were found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3.18**.

3.11.2.1 Economically important Flora of the study area

Agricultural crops: Paddy, Maize is the main crop grown. Different fruits like Banana, papaya, mangoes, guava and vegetables like brinjal, drumsticks, onion, Coriander also grown by the local people.

Medicinal plant species: The near by area is not collected and cultivated medicinal plants but several medicinal plants which are commonly available in the shrub forest and waste lands. The common medicinal plants of the region are including flora table.

Rare and endangered floral species: During the vegetation survey in the study area did not recorded any such species which are endangered or threatened under IUCN (International Union for Conservation of Nature and Natural resources) guidelines.

Table 3-18 Cumulative List of Floral Species

S.No	Botanical Name	Family	Common Name	Habit	IUCN
1.	<i>Abrusprecatorius.</i>	Papilionaceae	Kunrinmani	Climber	NA
2.	<i>Abutilon hirtum</i>	Malvaceae	Thuthi	Shrub	NA
3.	<i>Abutilon indicum</i>	Malvaceae	Thuthi	Shrub	NA
4.	<i>Acacia auriculiformis</i>	Mimosaceae	--	Tree	LC
5.	<i>Acacia horrid</i>	Mimosaceae	Karuvellai	Tree	NA
6.	<i>Acacia melanoxyton</i>	Mimosaceae	Chemaivel	Tree	NA
7.	<i>Acacia nilotica</i>	Mimosaceae	Karovelam	Tree	LC
8.	<i>Acalypha indica</i>	Euphorbiaceae	Kuppaimeni	Herb	NA
9.	<i>Acanthospermumhispidum</i>	Compositae	--	Herb	NA
10.	<i>Acanthus ilicifolius</i>	Acanthaceae	--	Herb	LC
11.	<i>Achyranthes aspera</i>	Amaranthaceae	--	Herb	NA
12.	<i>Aegle marmelos</i>	Rutaceae	Villvamaram	Tree	NA
13.	<i>Aervalanata</i>	Amaranthaceae	Kannupulai	Herb	NA
14.	<i>Aeschynomene aspera</i>	Papilionaceae	--	Herb	LC
15.	<i>Agave cantula</i>	Agavaceae	Katchalai	Shrub	NA
16.	<i>Ailanthus excelsa</i>	Simaroubaceae	--	Tree	NA
17.	<i>Albizia lebbeck</i>	Mimosaceae	Vagai	Tree	NA
18.	<i>Alloteropsiscimicina</i>	Poaceae	--	Grass	NA
19.	<i>Alocasia macrorrhizos</i>	Araceae	Semphu	Herb	NA
20.	<i>Alternanthera pungens</i>	Amaranthaceae	--	Herb	NA
21.	<i>Alternanthera sessilis</i>	Amaranthaceae	--	Herb	LC
22.	<i>Alysicarpusmonilifer</i>	Papilionaceae	--	Herb	NA
23.	<i>Amaranthus roxburghianus</i>	Amaranthaceae	--	Herb	NA
24.	<i>Amaranthus spinosus</i>	Amaranthaceae	Mullukeerai	Herb	NA
25.	<i>Amaranthus viridis</i>	Amaranthaceae	--	Herb	NA
26.	<i>Ammaniabaccifera</i>	Lythraceae	--	Herb	NA
27.	<i>Anacardium occidentale</i>	Anacardiaceae	--	Tree	NA
28.	<i>Anisomelesmalabarica</i>	Labiatae	--	Shrub	NA
29.	<i>Apludamutica</i>	Poaceae	--	Herb	NA
30.	<i>Argemone mexicana</i>	Papaveraceae	--	Herb	NA
31.	<i>Aristida setacea</i>	Poaceae	Variyapul	Herb	NA
32.	<i>Asparagus racemosus</i>	Liliaceae	Thaneervitan	Climber	NA
33.	<i>Asystasiagangetica</i>	Acanthaceae	--	Herb	NA
34.	<i>Axonopuscompressus</i>	Poaceae	--	Grass	NA
35.	<i>Azadirachta indica</i>	Meliaceae	Veppamaram	Tree	LC
36.	<i>Bacopa monnieri</i>	Scrophulariaceae	--	Herb	LC
37.	<i>Barlerialongiflora</i>	Acanthaceae	--	Herb	NA
38.	<i>Barringtonia acutangula</i>	Barringtoniaceae	Neermaruthu	Tree	LC
39.	<i>Bauhinia racemosa</i>	Caesalpiniaceae	--	Tree	NA
40.	<i>Bidens pilosa</i>	Compositae	--	Herb	NA
41.	<i>Biophytumsensitivum</i>	Oxalidaceae	--	Herb	NA
42.	<i>Blepharismaderaspatensis</i>	Acanthaceae	--	Herb	NA
43.	<i>Blumeaobliqua</i>	Compositae	--	Herb	NA
44.	<i>Boerhaviadiffusa</i>	Nyctaginaceae	--	Herb	NA
45.	<i>Boerhaviaerecta</i>	Nyctaginaceae	--	Herb	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
46.	<i>Borassus flabellifer</i>	Arecaceae	Panaimaram	Tree	LC
47.	<i>Brachiariamutica</i>	Poaceae	--	Grass	LC
48.	<i>Calotropis gigantea</i>	Asclepiadaceae	Erukku	Shrub	NA
49.	<i>Canavalia rosea</i>	Papilionaceae	Kattuavarai	Climber	NA
50.	<i>Cardiospermum halicacabum</i>	Sapindaceae	--	Climber	LC
51.	<i>Cascabelathevetia</i>	Apocynaceae	--	Shrub	LC
52.	<i>Cassia absus</i>	Caesalpiniaceae	--	Herb	LC
53.	<i>Cassia alata</i>	Caesalpiniaceae	--	Shrub	LC
54.	<i>Cassia auriculata</i>	Caesalpiniaceae	Avarrai	Shrub	NA
55.	<i>Cassia fistula</i>	Caesalpiniaceae	--	Tree	LC
56.	<i>Cassia nigricans</i>	Caesalpiniaceae	--	Herb	NA
57.	<i>Cassia occidentalis</i>	Caesalpiniaceae	--	Herb	NA
58.	<i>Cassia senna</i>	Caesalpiniaceae	--	Herb	NA
59.	<i>Cassia tora</i>	Caesalpiniaceae	--	Herb	NA
60.	<i>Catharanthus roseus</i>	Apocynaceae	Nithiyakalyani	Herb	NA
61.	<i>Catunaregam spinosa</i>	Rubiaceae	--	Shrub	NA
62.	<i>Celosia argentea</i>	Amaranthaceae	--	Herb	LC
63.	<i>Cenchrus ciliaris</i>	Poaceae	--	Herb	LC
64.	<i>Centella asiatica</i>	Apiaceae	Vallarai	Herb	LC
65.	<i>Centipeda minima</i>	Asteraceae	--	Herb	LC
66.	<i>Chloris barbata</i>	Poaceae	--	Grass	NA
67.	<i>Chromolaena odorata</i>	Compositae	--	Shrub	NA
68.	<i>Cissus quadrangularis</i>	Vitaceae	Pirandai	Climber	NA
69.	<i>Citrullus colocynthis</i>	Cucurbitaceae	--	Herb	NA
70.	<i>Cleome aspera</i>	Cleomaceae	Naikadugu	Herb	NA
71.	<i>Cleome viscosa</i>	Cleomaceae	Naikaduku	Herb	NA
72.	<i>Clerodendrum inermis</i>	Verbenaceae	--	Herb	NA
73.	<i>Clerodendrum phlomidis</i>	Verbenaceae	--	Shrub	NA
74.	<i>Clitoria ternatea</i>	Papilionaceae	Sangupoo	Climber	NA
75.	<i>Coccinia grandis</i>	Cucurbitaceae	Kovaikai	Climber	NA
76.	<i>Cocculus hirsutus</i>	Menispermaceae	Kattukodi	Climber	NA
77.	<i>Coldenia procumbens</i>	Boraginaceae	--	Herb	LC
78.	<i>Commelinabenghalensis</i>	Commelinaceae	--	Herb	LC
79.	<i>Commelinadiffusa</i>	Commelinaceae	--	Herb	LC
80.	<i>Commelina erecta</i>	Commelinaceae	--	Herb	LC
81.	<i>Commelinahasskarlli</i>	Commelinaceae	--	Herb	NA
82.	<i>Commiphora berryi</i>	Burseraceae	--	Shrub	NA
83.	<i>Corchorus aestuans</i>	Tiliaceae	--	Herb	NA
84.	<i>Corchorus tridens</i>	Tiliaceae	--	Herb	NA
85.	<i>Corchorus urticifolius</i>	Tiliaceae	--	Herb	NA
86.	<i>Cordia oblique</i>	Boraginaceae	--	Tree	NA
87.	<i>Crinum asiaticum</i>	Amarayllidaceae	--	Herb	NA
88.	<i>Crotalaria juncea</i>	Papilionaceae	--	Shrub	NA
89.	<i>Crotalaria retusa</i>	Papilionaceae	--	Shrub	NA
90.	<i>Crotalaria verrucosa</i>	Papilionaceae	--	Shrub	NA
91.	<i>Croton bonplandianum</i>	Euphorbiaceae	--	Herb	NA
92.	<i>Ctenolepis garcinii</i>	Cucurbitaceae	--	Climber	NA
93.	<i>Cynodondactylon</i>	Poaceae	Arugampul	Grass	NA
94.	<i>Cyperus arenarius</i>	Cyperaceae	Korai	Sedge	LC
95.	<i>Cyperus brevifolius</i>	Cyperaceae	--	Sedge	LC
96.	<i>Cyperus cephalotes</i>	Cyperaceae	--	Sedge	LC

S.No	Botanical Name	Family	Common Name	Habit	IUCN
97.	<i>Cyperus compressus</i>	Cyperaceae	--	Sedge	LC
98.	<i>Cyperus corymbosus</i>	Cyperaceae	--	Sedge	LC
99.	<i>Cyperus difformis</i>	Cyperaceae	--	Sedge	LC
100.	<i>Cyperus digitatus</i>	Cyperaceae	--	Sedge	LC
101.	<i>Cyperus exaltatus</i>	Cyperaceae	--	Sedge	LC
102.	<i>Cyperus halpan</i>	Cyperaceae	--	Sedge	LC
103.	<i>Cyperus hyalinus</i>	Cyperaceae	--	Sedge	NA
104.	<i>Cyperus iria</i>	Cyperaceae	--	Sedge	LC
105.	<i>Cyperus nutans</i>	Cyperaceae	--	Sedge	LC
106.	<i>Cyperus paniceus</i>	Cyperaceae	--	Sedge	LC
107.	<i>Cyperus polystachyos</i>	Cyperaceae	--	Sedge	LC
108.	<i>Cyperus rotundus</i>	Cyperaceae	--	Sedge	LC
109.	<i>Cyrtococcum longipes</i>	Poaceae	--	Grass	NA
110.	<i>Dactyloctenium aegyptium</i>	Poaceae	--	Grass	NA
111.	<i>Datura metal</i>	Solanaceae	Umathai	Herb	NA
112.	<i>Dichrostachys cinerea</i>	Mimosaceae	--	Tree	LC
113.	<i>Digitaria abludens</i>	Poaceae	--	Grass	NA
114.	<i>Digitaria ciliaris</i>	Poaceae	--	Grass	NA
115.	<i>Eclipta prostrata</i>	Asteraceae	--	Herb	LC
116.	<i>Eichhornia crassipes</i>	Pontederiaceae	--	Herb	NA
117.	<i>Eleocharis spiralis</i>	Cyperaceae	--	Sedge	LC
118.	<i>Eleusine indica</i>	Poaceae	--	Grass	LC
119.	<i>Elytraria acaulis</i>	Acanthaceae	--	Herb	NA
120.	<i>Eragrostis aspera</i>	Poaceae	--	Grass	NA
121.	<i>Eragrostis japonica</i>	Poaceae	--	Grass	LC
122.	<i>Eragrostis tenella</i>	Poaceae	--	Grass	NA
123.	<i>Eragrostis unioides</i>	Poaceae	--	Grass	LC
124.	<i>Eriocaulon thwaitesii</i>	Eriocaulaceae	--	Herb	LC
125.	<i>Eriochloa procera</i>	Poaceae	--	Grass	LC
126.	<i>Eriochrysis rangacharii</i>	Poaceae	--	Grass	NA
127.	<i>Euphorbia hirta</i>	Euphorbiaceae	Ammanpacharici	Herb	NA
128.	<i>Evolvulus sinoides</i>	Convolvulaceae	--	Herb	NA
129.	<i>Ficus benghalensis</i>	Moraceae	Allamaram	Tree	NA
130.	<i>Ficus religiosa</i>	Moraceae	Arasamaram	Tree	NA
131.	<i>Fimbristylis aestivalis</i>	Cyperaceae	--	Sedge	NA
132.	<i>Fimbristylis argentea</i>	Cyperaceae	--	Sedge	LC
133.	<i>Fimbristylis dichotoma</i>	Cyperaceae	--	Sedge	LC
134.	<i>Fimbristylis ferruginea</i>	Cyperaceae	--	Sedge	LC
135.	<i>Fimbristylis miliacea</i>	Cyperaceae	--	Sedge	NA
136.	<i>Gomphrena serrata</i>	Amaranthaceae	Kattuvadamalli	Herb	NA
137.	<i>Hedyotis corymbosa</i>	Rubiaceae	--	Herb	NA
138.	<i>Hedyotis puberula</i>	Rubiaceae	--	Herb	NA
139.	<i>Heliotropium indicum</i>	Boraginaceae	Thelkodukku	Herb	NA
140.	<i>Hemidesmus indicus</i>	Periplocaceae	Nannari	Herb	NA
141.	<i>Heteropogon contortus</i>	Poaceae	--	Herb	NA
142.	<i>Hibiscus micranthus</i>	Malvaceae	--	Herb	NA
143.	<i>Hybanthus enneaspermus</i>	Violaceae	--	Herb	NA
144.	<i>Hydrilla verticillata</i>	Hydrocharitaceae	--	Herb	LC
145.	<i>Hygrophila auriculata</i>	Acanthaceae	Neermul	Herb	LC
146.	<i>Hygrophysa aristata</i>	Poaceae	--	Grass	NA
147.	<i>Hyptis suaveolens</i>	Labiatae	--	Shrub	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
148.	<i>Indigofera linnaei</i>	Papilionaceae	--	Herb	NA
149.	<i>Indigofera tinctoria</i>	Papilionaceae	--	Shrub	NA
150.	<i>Indotristicharamosissima</i>	Podostemaceae	--	Herb	LC
151.	<i>Ipomoea aquatica</i>	Convolvulaceae	--	Climber	LC
152.	<i>Ipomoea carnea</i>	Convolvulaceae	--	Shrub	NA
153.	<i>Ipomoea obscura</i>	Convolvulaceae	--	Climber	NA
154.	<i>Ipomoea pes-tigridis</i>	Convolvulaceae	--	Climber	NA
155.	<i>Isachnemiliacea</i>	Poaceae	--	Grass	NA
156.	<i>Ischaemumtimorense</i>	Poaceae	--	Grass	NA
157.	<i>Ischaemum indicum</i>	Poaceae	--	Grass	NA
158.	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Kattumanaku	Shrub	NA
159.	<i>Justicia glauca</i>	Acanthaceae	--	Herb	NA
160.	<i>Kyllingasquamulata</i>	Cyperaceae	--	Sedge	NA
161.	<i>Lanneacoromandelica</i>	Anacardiaceae	--	Tree	NA
162.	<i>Lantana camara</i>	Verbenaceae	--	Shrub	NA
163.	<i>Leersiahexandra</i>	Poaceae	--	Grass	LC
164.	<i>Lemnagibba</i>	Lemnaceae	--	Herb	LC
165.	<i>Lemnaperpusilla</i>	Lemnaceae	--	Herb	LC
166.	<i>Leucaena leucocephala</i>	Mimosaceae	--	Tree	NA
167.	<i>Leucas aspera</i>	Labiatae	--	Herb	NA
168.	<i>Limnophila heterophylla</i>	Scrophularaceae	--	Herb	LC
169.	<i>Limnophila indica</i>	Scrophularaceae	--	Herb	LC
170.	<i>Lindenbergia indica</i>	Scrophularaceae	--	Herb	LC
171.	<i>Linderniaantipoda</i>	Scrophularaceae	--	Herb	LC
172.	<i>Linderniacaespitosa</i>	Scrophularaceae	--	Herb	LC
173.	<i>Lindernia crustacea</i>	Scrophularaceae	--	Herb	LC
174.	<i>Linderniaoppositifolia</i>	Scrophularaceae	--	Herb	LC
175.	<i>Ludwigiaadscendens</i>	Onagraceae	--	Herb	NA
176.	<i>Ludwigia perennis</i>	Onagraceae	--	Herb	LC
177.	<i>Mangifera indica</i>	Anacardiaceae	Mamaram	Tree	DD
178.	<i>Melia azedarach</i>	Meliaceae	Kattuvempoo	Tree	LC
179.	<i>Merremia hederacea</i>	Convolvulaceae	--	Climber	NA
180.	<i>Mollugo pentaphylla</i>	Molluginaceae	--	Herb	NA
181.	<i>Monochoria vaginalis</i>	Pontederiaceae	--	Herb	LC
182.	<i>Morindapubescens</i>	Rubiaceae	Manjanathi	Tree	NA
183.	<i>Mukiamaderaspatana</i>	Cucurbitaceae	--	Climber	NA
184.	<i>Murdannia pauciflora</i>	Commelinaceae	--	Herb	LC
185.	<i>Nelumbo nucifera</i>	Nelumbonaceae	Thamarai	Herb	NA
186.	<i>Nymphaea nouchali</i>	Nymphaeaceae	--	Herb	LC
187.	<i>Nymphaea pubescens</i>	Nymphaeaceae	Alli	Herb	LC
188.	<i>Oplismenuscompositus</i>	Poaceae	--	Grass	NA
189.	<i>Oryza sativa</i>	Poaceae	Nellu	Grass	LC
190.	<i>Otteliaalismoides</i>	Hydrocharitaceae	--	Herb	LC
191.	<i>Pandanus fascicularis</i>	Pandanaceae	Thallai	Shrub	NA
192.	<i>Panicum repens</i>	Poaceae	--	Grass	LC
193.	<i>Panicum trypheron</i>	Poaceae	--	Grass	NA
194.	<i>Paspalidiumgeminatum</i>	Poaceae	--	Grass	LC
195.	<i>Paspalum conjugatum</i>	Poaceae	--	Grass	LC
196.	<i>Paspalum scrobiculatum</i>	Poaceae	--	Grass	LC
197.	<i>Passiflora foetida</i>	Passifloraceae	--	Climber	NA
198.	<i>Pavonia odorata</i>	Malvaceae	--	Herb	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
199.	<i>Pedaliium murex</i>	Pedaliaceae	--	Herb	NA
200.	<i>Pennisetum polystachion</i>	Poaceae	--	Grass	LC
201.	<i>Pentatropis capensis</i>	Asclepiadaceae	--	Climber	NA
202.	<i>Pergulariadaemia</i>	Asclepiadaceae	--	Climber	NA
203.	<i>Peristrophepaniculata</i>	Acanthaceae	--	Herb	NA
204.	<i>Perotis indica</i>	Poaceae	--	Herb	NA
205.	<i>Phoenix loureirii</i>	Arecaceae	--	Tree	NA
206.	<i>Phyla nodiflora</i>	Verbenaceae	--	Herb	LC
207.	<i>Phyllanthus amarus</i>	Euphorbiaceae	--	Herb	NA
208.	<i>Phyllanthus reticulatus</i>	Euphorbiaceae	--	Shrub	NA
209.	<i>Pistia stratiotes</i>	Araceae	--	Herb	LC
210.	<i>Pithecellobium dulce</i>	Mimosaceae	--	Tree	LC
211.	<i>Plygonumglabrum</i>	Polygonaceae	--	Herb	NA
212.	<i>Polygonum barbatum</i>	Polygonaceae	--	Herb	LC
213.	<i>Pongamia pinnata</i>	Papilionaceae	Pungammaram	Tree	LC
214.	<i>Portulaca oleracea</i>	Portulacaceae	--	Herb	NA
215.	<i>Prosopis juliflora</i>	Mimosaceae	Seemaikaruvai	Tree	NA
216.	<i>Rhizophora mucronata</i>	Rhizophoraceae	--	Herb	LC
217.	<i>Rhynchelytrum repens</i>	Poaceae	--	Grass	NA
218.	<i>Rhynchosporacorymbosa</i>	Cyperaceae	--	Sedge	LC
219.	<i>Riveahypocrateriformis</i>	Convolvulaceae	--	Climber	NA
220.	<i>Ruellia tuberosa</i>	Acanthaceae	--	Herb	NA
221.	<i>Rungiapectinata</i>	Acanthaceae	--	Herb	NA
222.	<i>Saccharum spontaenum</i>	Poaceae	Naanal	Grass	NA
223.	<i>Sacciolepis indica</i>	Poaceae	--	Grass	NA
224.	<i>Sarcostemmasecamone</i>	Asclepiadaceae	Pallchedi	Herb	NA
225.	<i>Scirpusarticulatus</i>	Cyperaceae	--	Sedge	LC
226.	<i>Securinegaleucopyrus</i>	Euphorbiaceae	--	Shrub	NA
227.	<i>Setaria intermedia</i>	Poaceae	--	Grass	NA
228.	<i>Setariaverticillata</i>	Poaceae	--	Grass	NA
229.	<i>Sida acuta</i>	Malvaceae	--	Herb	NA
230.	<i>Sida cordata</i>	Malvaceae	--	Herb	NA
231.	<i>Sida cordifolia</i>	Malvaceae	--	Herb	NA
232.	<i>Solanum americanum</i>	Solanaceae	--	Herb	NA
233.	<i>Solanum nigrum</i>	Solanaceae	--	Herb	NA
234.	<i>Solanum trilobatum</i>	Solanaceae	--	Climber	NA
235.	<i>Solanum virginianum</i>	Solanaceae	--	Herb	NA
236.	<i>Sopubiadelphiniifolia</i>	Scrophularaceae	--	Herb	NA
237.	<i>Spermacocehispidia</i>	Rubiaceae	--	Herb	NA
238.	<i>Sphaeranthusamaranthoides</i>	Compositae	--	Herb	LC
239.	<i>Sphaeranthus indicus</i>	Compositae	--	Herb	LC
240.	<i>Sporobolus indicus</i>	Poaceae	--	Grass	NA
241.	<i>Sporobolus maderaspatanus</i>	Poaceae	--	Grass	NA
242.	<i>Stachytarphetajamaicensis</i>	Verbenaceae	--	Herb	NA
243.	<i>Syzygiumcumini</i>	Myrtaceae	--	Tree	LC
244.	<i>Tamarindus indica</i>	Caesalpiniaceae	Puliyamaram	Tree	LC
245.	<i>Taragiaplukenetii</i>	Euphorbiaceae	--	Herb	NA
246.	<i>Tephrosia purpurea</i>	Papilionaceae	--	Herb	LC
247.	<i>Tephrosia villosa</i>	Papilionaceae	--	Herb	LC
248.	<i>Terminalia arjuna</i>	Combretaceae	--	Tree	NA
249.	<i>Thespesia populnea</i>	Malvaceae	--	Tree	LC

S.No	Botanical Name	Family	Common Name	Habit	IUCN
250.	<i>Tinospora cordifolia</i>	Menispermaceae	--	Climber	NA
251.	<i>Trapa natans</i>	Trapaceae	--	Herb	LC
252.	<i>Tribulus terrestris</i>	Zygophyllaceae	--	Herb	NA
253.	<i>Trichodesma indicum</i>	Boraginaceae	--	Herb	NA
254.	<i>Tridax procumbens</i>	Compositae	--	Herb	NA
255.	<i>Tylophora indica</i>	Asclepiadaceae	--	Climber	NA
256.	<i>Typha angustata</i>	Typhaceae	--	Herb	LC
257.	<i>Utricularia aurea</i>	Lentibulariaceae	--	Herb	LC
258.	<i>Vallisneria natans</i>	Hydrocharitaceae	--	Herb	LC
259.	<i>Vernonia cinerea</i>	Compositae	--	Herb	NA
260.	<i>Waltheria indica</i>	Sterculiaceae	--	Herb	NA
261.	<i>Xanthium indicum</i>	Compositae	--	Herb	NA
262.	<i>Ziziphus mauritiana</i>	Rhamnaceae	--	Shrub	NA
263.	<i>Zornia diphylla</i>	Papilionaceae	--	Herb	NA

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

3.11.3 Fauna Diversity

Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area. Additionally, reference of relevant literatures (published/unpublished) and dialogues with local villagers were also carried out to consolidate the presence of faunal distribution in the area (Smith 1933-43, Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar 1988).

3.11.3.1 Bird species

Total 117 bird species belonging to 42 families were recorded during Pre-Monsoon study period are provided in Table 3.19.

Table 3-19 List of Birds species in the Study Area

S.No	Scientific Name	Common Name	Family Name	IUCN
1.	<i>Pelecanus philippensis</i>	Spotted billed Pelican	Pelicanidae	NT
2.	<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae	LC
3.	<i>Phalacrocoax carbo</i>	Large Cormorant	Phalacrocoracidae	NA
4.	<i>Phalacrocorax indicus</i>	Indian Shag	Phalacrocoracidae	
5.	<i>Anhinga rufa</i>	Darter or Snake Bird	Phalacrocoracidae	LC
6.	<i>Ardea alba</i>	Large Egret	Ardeidae	LC
7.	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	LC
8.	<i>Egretta intermedia</i>	Median or Smaller Egret	Ardeidae	
9.	<i>Egretta garzetta</i>	Little Egret	Ardeidae	LC
10.	<i>Ardea purpurea</i>	Purple heron	Ardeidae	LC
11.	<i>Ardea cinerea</i>	Grey Heron	Ardeidae	LC
12.	<i>Ardeola striata</i>	Little Green Heron	Ardeidae	
13.	<i>Ardeola grayii</i>	Paddy bird or Pond	Ardeidae	

		Heron		
14.	<i>Ixobrychuscinnamomeus</i>	Chestnut Bittern	Ardeidae	LC
15.	<i>Ixobrychus sinensis</i>	Yellow Bittern	Ardeidae	LC
16.	<i>Ixobrychusflavicollis</i>	Black Bittern	Ardeidae	LC
17.	<i>Mycteria leucocephala</i>	Painted Stork	Ciconidae:	NT
18.	<i>Anastomusoscitans</i>	Openbill Stork	Ciconidae:	LC
19.	<i>Threskiornis aethiopica</i>	White Ibis	Threskiornithidae	
20.	<i>Plegadisfalcinellus</i>	Glossy Ibis	Threskiornithidae	LC
21.	<i>Elanus caeruleus</i>	Blackwinged Kite	Accipitridae	LC
22.	<i>Haliastur Indus</i>	Brahminy Kite	Accipitridae	LC
23.	<i>Pernis ptilorhyncus</i>	Honey Buzzard	Accipitridae	LC
24.	<i>Accipiter badius</i>	Shikra	Accipitridae	LC
25.	<i>Aquila clanga</i>	Greater spotted eagle (vu)	Accipitridae	VU
26.	<i>Hieraaetus pennatus</i>	Booted Hawk-Eagle	Accipitridae	LC
27.	<i>Circus pygargus</i>	Montagu's harrier	Accipitridae	LC
28.	<i>Circus aeruginosus*</i>	Marsh Harrier	Accipitridae	LC
29.	<i>Circus macrourus</i>	Pale harrier	Accipitridae	NT
30.	<i>Falco tinnunculus</i>	Kestrel	Falconidae	LC
31.	<i>Francolinus pondicerianus</i>	Grey Partridge	Phasianidae	LC
32.	<i>Pavocristatus</i>	Common Peafowl	Phasianidae	LC
33.	<i>Fulicaatra</i>	Coot	Rallidae	LC
34.	<i>Streptopeliadecaocto</i>	Ring Dove	Columbidae	LC
35.	<i>Streptopelia chinensis</i>	Spotted Dove	Columbidae	
36.	<i>Streptopelia senegalensis</i>	Little Brown dove	Columbidae	LC
37.	<i>Streptopeliatranquebarica</i>	Red turtle dove	Columbidae	LC
38.	<i>Chalcophaps indica</i>	Emerald or Bronzewinged Dove	Columbidae	LC
39.	<i>Psittaculakrameri</i>	Roseringed Parakeet	Psittacidae	LC
40.	<i>Caculusvarius</i>	Common Brainfever Bird	Cuculidae	
41.	<i>Clamatorjacobinus</i>	Pied Crested Cuckoo	Cuculidae	LC
42.	<i>Eudynamysscolopacea</i>	Koel	Cuculidae	LC
43.	<i>Tyto alba</i>	Barn or Screech owl	Strigidae	LC
44.	<i>Apus melba</i>	Alpine swift	Apodidae	LC
45.	<i>Apus affinis</i>	House Swift	Apodidae	LC
46.	<i>Cypsiurusparvus</i>	Palm Swift	Apodidae	LC
47.	<i>Cerylerudis</i>	Pied Kingfisher	Alcedinidae	LC
48.	<i>Alcedoatthis</i>	Small Blue Kingfisher	Alcedinidae	LC
49.	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	Alcedinidae	LC
50.	<i>Meropsphilippinus</i>	Bluetailed Bee-Eater	Meropidae	LC
51.	<i>Meropsorientalis</i>	Green Bee-Eater	Meropidae	LC
52.	<i>Coracias benghalensis</i>	Indian roller Or Bluejay	Coracidae	LC
53.	<i>Upupa epops</i>	Hoopoe	Upupidae	LC

54.	<i>Megalaimahaemacephala</i>	Crimsonbreasted Barbet	Capitonidae	LC
55.	<i>Megalaimaviridis</i>	White-Cheeked Barbet	Capitonidae	LC
56.	<i>Dinopiumbenghalense</i>	Lesser Woodpecker	Picidae	LC
57.	<i>Pitta brachyuran</i>	Indian Pitta	Pittidae	
58.	<i>Eremopterix grisea</i>	Ashycrowned Finch-Lark	Alaudidae	LC
59.	<i>Mirafraerythroptera</i>	Redwinged Bushlark	Alaudidae	LC
60.	<i>Mirafrajavonica</i>	Singing Bush Lark	Alaudidae	LC
61.	<i>Hirundorustica</i>	Swallow	Hirundinidae	LC
62.	<i>Hirundosmithii</i>	Wiretailed Swallow	Hirundinidae	LC
63.	<i>Hirundodaurica</i>	Redrumped Swallow	Hirundinidae	
64.	<i>Hirundodaurica</i>	Striated Or Red-Rumped Swallow	Hirundinidae	
65.	<i>Laniusvittatus</i>	Baybacked Shrike	Danidae	LC
66.	<i>Laniuscristatus</i>	Brown Shrike	Danidae	LC
67.	<i>Oriolusoriolus</i>	Golden Oriole	Oriolidae	LC
68.	<i>Dicrurusadsimilis</i>	Black Drongo Or King-Crow	Dicruridae	LC
69.	<i>Dicrurusleucophaeus</i>	Grey Or Ashy Drongo	Dicruridae	LC
70.	<i>Artamusfuscus</i>	Ashy Swallow-Shrike	Artamidae	LC
71.	<i>Sturnus malabaricus</i>	Greyheaded Myna	Sturnidae	LC
72.	<i>Sturnus pagodarum</i>	Brahminy,Myna	Sturnidae	LC
73.	<i>Sturnus roseus</i>	Rosy Pastor	Sturnidae	LC
74.	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	LC
75.	<i>Dendrocittavagabunda</i>	Tree Pie	Corvidae	LC
76.	<i>Corvus splendens</i>	House Crow	Corvidae	LC
77.	<i>Corvus macrorhynchos</i>	Jungle Crow	Corvidae	LC
78.	<i>Tephrodornispondicerianus</i>	Common Wood Shrike	Campephagidae	LC
79.	<i>Coracinamelanoptera</i>	Black-Headed Cuckoo-Shrike	Campephagidae	LC
80.	<i>Pericrocotuscinnamomeus</i>	Small Minivet	Campephagidae	LC
81.	<i>Aegithina tiphia</i>	Common Iora	Irenidae	LC
82.	<i>Pycnonotuscafer</i>	Redvented Bulbul	Pycnonotidae	LC
83.	<i>Pycnonotusluteolus</i>	Whitebrowed Bulbul	Pycnonotidae	LC
84.	<i>Pomatorhinushorsefieldi</i>	Slaty-Headed Scimitar Babbler	Muscicapidae	
85.	<i>Turdoldesmalcolmi</i>	Large Grey Babbler	Muscicapidae	
86.	<i>Turdoidesaffinis</i>	Whiteheaded Babbler	Muscicapidae	LC
87.	<i>Muscicapalatirostris</i>	Brown Flycatcher	Subfamily:Muscicapinae	
88.	<i>Terpsiphone paradise</i>	Paradise Flycatcher	Subfamily:Muscicapinae	
89.	<i>Priniasubflava</i>	Plain Wren Warbler	Subfamily:Sylviinae	LC
90.	<i>Priniasocialis</i>	Ashy Wren Warbler	Subfamily:Sylviinae	LC
91.	<i>Orthotomussutorius</i>	Tailor Bird	Subfamily:Sylviinae	LC
92.	<i>Acrocephalusstentoreus</i>	Indian Great Reed Warbler	Subfamily:Sylviinae	LC
93.	<i>Acrocephalusdumetorum</i>	Blyth's Read Warbler	Subfamily:Sylviinae	LC

94.	<i>Acrocephalus Agricola</i>	Paddy Field Warbler	Subfamily:Sylviinae	LC
95.	<i>Sylvia curruca</i>	Orphean Warbler	Subfamily:Sylviinae	LC
96.	<i>Phylloscopus magnirostris</i>	Large Billed Leaf Warbler	Subfamily:Sylviinae	LC
97.	<i>Phylloscopus trochiloides</i>	Greenish Leaf Warbler	Subfamily:Sylviinae	LC
98.	<i>Copsychus saularis</i>	Magpie Robin	Subfamily:Turdinae	LC
99.	<i>Saxicoloides fulicata</i>	Indian Robin	Subfamily:Turdinae	LC
100.	<i>Anthus novaeseelandiae</i>	Paddyfield Pipit	Motacillidae	LC
101.	<i>Motacilla indica</i>	Forest Wagtail	Motacillidae	
102.	<i>Motacilla flava</i>	Yellow Wagtail	Motacillidae	LC
103.	<i>Motacilla citreola</i>	Citrine Wagtail	Motacillidae	LC
104.	<i>Motacilla cinerea</i>	Grey Wagtail	Motacillidae	LC

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

3.11.3.2 Mammals

No wild mammalian species were directly sighted during the field survey. Dialogue with local villagers located around the study area also could not confirm presence of any wild animal in that area.

Table 3-20 Mammals recorded in the Study area and their Conservation Status

S.No	Species name	Common name	IUCN Conservation Status
1.	<i>Eutropismacularia</i>	Common skink	Not assessed
2.	<i>Ptyas mucosus</i>	Rat Snake	Not assessed
3.	<i>Nerodiasipedon</i>	Fresh water snake	Not assessed
4.	<i>Rana tigrina</i>	Common yellow frog	Least Concern
5.	<i>Calotes versicolor</i>	Common Garden Lizard	Not assessed
6.	<i>Hemidactylus sp.</i>	House lizard	Not assessed
7.	<i>Ophisops leschenaultii</i>	Snake-eyed lizard	Not assessed
8.	<i>Rana hexadactyla</i>	Frog	Least Concern

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

3.11.3.3 Reptiles & Amphibians

Reptiles and amphibian species were recorded in this area through directly sighted during the field survey.

Table 3-21 Reptiles & Amphibians recorded in the Study area and their Conservation Status

S.No	Species name	Common name	IUCN Conservation Status
1.	<i>Mus musculus</i>	Common Mouse	Not assessed
2.	<i>Funambulus pennanti</i>	Palm -Squirrel	Not assessed
3.	<i>Mus rattus</i>	Indian rat	Not assessed
4.	<i>Lepus nigricollis</i>	Indian Hare	Least Concern
5.	<i>Rattus norvegicus</i>	Brown Rat	Least Concern
6.	<i>Felis catus</i>	Cat	Not assessed

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

3.11.3.4 Butterfly Species

Butterfly can also serve as useful indicators of habitat biodiversity. They are responsible for a large part of the complex interconnections that characterize natural ecosystems. The butterfly communities that are present in forests help to maintain crucial ecological processes and preserve biodiversity as a whole. They participate in most of the ecological processes that sustain ecosystems. A total of 56 species of butterflies under 7 families and 32 genera were observed and recorded. Pieridae (15) and Nymphalidae (14) were recorded as the most dominant families in terms of number of species, followed by Papilionidae (8) Lycaenidae (7) Danaidae (5) Hesperidae (6) and Acraeidae (1) collected during the study period.

Table 3-22 Occurrence of butterfly species in buffer zone

S.No	Scientific Name	Common Name
Family Papilionidae		
1.	PachlioptaaristolochiaeFabricius	The Common Rose
2.	Pachliopta hector Linnaeus	The Crimson Rose
3.	Papiliodemoleus Linnaeus	The Lime Butterfly
4.	Papiliopolytes Linnaeus	The Common Mormon
5.	Graphiumdoson Felder	The Common Jay
6.	Graphiumagamemnon Linnaeus	The Tailed Jay
7.	Pathysacrino Cramer	The common banded peacock
8.	Papiliopolymnestor Cramer	The Blue Mormon
Family Pieridae		
9.	Hebononiaglaucippe Linnaeus	The Great Orange Tip
10.	Delias eucharis Dury	The Common Jezebel
11.	LeptosianinaFabricius,	The Psyche
12.	CeporanerissaFabricius	The Common Gull
13.	Appiasalbina Felder & Felder	The Common Albatross
14.	Euremabrigitta rubella Wallace	The Small Grass Yellow
15.	Euremahecabesimulata Moore	The Common Grass Yellow
16.	CatopsiliapyrantheLinnaeus	The Mottled Emigrant
17.	CatopsiliapomonaFabricius	The Lemon Emigrant
18.	CatopiliaflorellaFabricius	The Common Vagrant
19.	ColotisetridaBoisduval	The Little Orange Tip
20.	Pareroniaceylonica Felder	The Dark Wanderer
21.	Ixias Marianne Cramer	The White Orange Tip
22.	Ixis pyrene Linnaeus	The Orange Tip
23.	Colotis eucharis	The Plain Orange Tip
Family Lycaenidae		
24.	CastaliusrososimonrososimonFabricius	The Common Pierrot
25.	SyntarucuspliniusFabricius	Zebra Blue
26.	Chiladesladius Cramer	The Lime Blue
27.	ChiladesparrhasiusFabricius	The Small Cupid
28.	Chiladespandavapandava Horsfield	The Plains Cupid
29.	SpindasisvulcanusFabricius	The Common Silver Line
30.	RathindaamorFabricius	The Monkey Puzzle
Family Nymphalidae		

31.	<i>Ariadne ariadne indica</i> Moore	The Angled Castor
32.	<i>Ariadne merionemerione</i> Cramer	The Common Castor
33.	<i>Junoniaiphitaplualis</i> Fruhstorfer	The Chocolate Pansy
34.	<i>Junoniaorithyaswinhoei</i> Butler	The Blue Pansy
35.	<i>Junonialemonias</i> Linnaeus	The Lemon Pansy
36.	<i>Hypolimnasmisippus</i> Linnaeus	The Common or Danaid Eggfly
37.	<i>Hypolimnasbolinajacintha</i> Drury	The Great Eggfly
38.	<i>Neptishylasvarmona</i> Moore	The Common Sailor
39.	<i>Neptisjumbahjumbah</i> Moore	The Chestnut Streaked) Sailor
40.	<i>Phalantaphalantha</i> Drury	The Leopard Butterfly
41.	<i>Melanitisedaleda</i> Drury	The Common Evening Brown
42.	<i>Melanitisphe dimavaraha</i> Moore	The Dark Evening Brown
43.	<i>Orostrionamedusmandata</i> Moore	The Nigger
44.	<i>Euthalianais</i> Forster	Baronet
Family Danaidae		
45.	<i>Danaus chrysippuschrysippus</i> Linnaeus	The Plain Tiger
46.	<i>Tirumala limniaceexoticus</i> Gmelin	The Blue Tiger
47.	<i>Euploea core core</i> Cramer	The Common Crow
48.	<i>Euploea sylvestercoreta</i> Godart	The Double Branded Crow
49.	<i>Danaus.genutiagenutia</i> Cramer	Common tigers
50.	Family Acraeidae	
51.	<i>Acraea terpsicore</i> Linnaeus	The Tawny Coster
Family Hesperidae		
52.	<i>Borbobevanibevani</i> Moore	The Bevan's Swift
53.	<i>Suastusgremiusgremius</i> Fabricius	The Indian palm bob
54.	<i>Pelopidas mathiasmathias</i> Fabricius	The Small branded swift
55.	<i>Caltoriscanara</i> Moore	The Kanara Swift
56.	<i>Borbocinnara</i> Wallengren	The Rice Swift
57.	<i>Iambrixsalsalalutipennis</i> Evans	Cestnut bob

Livestock like cattle, buffalo, goat, poultry, duck and pig are reared for dairy products, meat, egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area.

3.11.3.5 Aquatic Ecology

Introduction

The study area intersected with few natural drainages and lake. A number of samples were investigated for enumeration of aquatic fauna. In order to study aquatic flora and faunal life one-time survey was conducted during the post-monsoon season. Major component of the aquatic life under the study area are listed below.

Phytoplankton and Zooplankton

The aquatic ecological study was conducted in and surrounding lake were 10 water samples from collected sub surface level.

Significance of Plankton

Planktons can be broadly grouped in to two categories those with plant origin are called ‘Phytoplankton’ and those with animal origin are called ‘Zooplankton’.

Phytoplankton

Phyto plankton samples were collected without filtering the water. To preserve, 0.3m Lugol’s solution was added to 100ml sample. Subsequently phytoplankton were concentrated by centrifugation and analysed microscopically in laboratory. Identification of phytoplankton was done using standard taxonomic keys. The Lackey Drop (micro transect) method (Lackey 1938) is a simple method for obtaining counts of considerable accuracy (APHA 2012). 9 species were recorded from the study area. A total of 6 species were recorded.

Table 3-23 List of Phytoplankton

S. No	Phytoplankton
1.	<i>Oscillatoria subbrevis</i>
2.	<i>Pediastrum duplex</i>
3.	<i>Spirogyra sp.</i>
4.	<i>Navicularhynchocephala</i>
5.	<i>Microcystis aeruginosa</i>
6.	<i>Anabena sp.</i>
7.	<i>Nitzschia sp.</i>
8.	<i>Flagilaria sp.</i>
9.	<i>Cyclotella sp.</i>

Zooplankton

Sample collection was carried out in the similar method as that of phytoplankton. Three major groups of zooplankton, namely, Cladocera, Copepoda, Rotifera, were found. A total 14 species were observed. Literature revealed that the rotifers were commonly found in the mesotrophic and oligotrophic waters and are significant component of zooplankton.

Table 3-24 List of Zooplankton

S. No	Species
Rotifera	
1.	<i>Assulinamuscorum</i>
2.	<i>Brachionus falcatus</i>
3.	<i>Brachionus calyciflorus</i>
4.	<i>Brachionus angularis</i>
5.	<i>Lecanecurvicornis</i>
6.	<i>Polyarthra vulgaris</i>
7.	<i>Filinia longiseta</i>
Copepoda	
8.	<i>Mesocyclops shyalinus</i>
9.	<i>Mesocyclops shyalinus</i>
10.	<i>Cyclopoid copepodite</i>
11.	<i>Cyclopoid nauplii</i>

Cladocera	
12.	<i>Chydorussphaericus</i>
Ostracoda	
13.	<i>Cypris subglobosa</i>
Miscellaneous - Aquatic insects	
14.	<i>Mosquito larvae</i>

3.11.4 Impact and Management Plan for Biological Environment

The proposed plant is located at near Pudukkudiyannur is a populated place which is located in nearby to Kodakkal Area. The proposed project will not have any impact of terrestrial and aquatic ecology of the area. Therefore, in and around area were one reserve forest and natural area. In addition to that, Industrial area decided to develop the greenbelt by planting native species to maintain the good environment.

3.11.4.1 Impact on Wildlife

There is no National Park, Wildlife Sanctuary, Biosphere Reserve, Wildlife corridors and Tiger/Elephant Reserve found within 10 km radius of the project site.

3.11.4.2 Impact on Flora

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

❖ Greenbelt development

The main objective of green belt development is to provide a barrier between the source of pollution and the surrounding area. Green belt development around the various project appurtenances is proposed, this will go a long way to protect environment and mitigate pollution levels in the area. Development of green belt shall also prevent soil erosion and washing away of the topsoil besides helping in stabilizing the functional ecosystem, make the climate more conducive and restore water balance.

❖ Plantation work

A 20-25m wide green belt shall be proposed in the avenue plantation will be undertaken besides the project area and near village. Plantation comprising of medium height trees (7 m to 10 m) are proposed for the green belt. Selection of species for green belt Development of the green belt is one of

the most sensitive issues and shall be done with due care. Selection of proper locally grown species in addition to checking of their growth rate, quality, thickness of canopy cover, etc. shall be duly done as it helps in abatement of fugitive noise, reduce the pollution level, thus making the place worth dwelling for the diversified species flora. The plant species suitable for green belt development need to be selected based on the following criteria.

- Native plant species will be preferred
- Fast growing plants will be planted
- Plants having thick canopy cover will be used
- Preferably perennial and evergreen species will be selected
- Plants having large leaf area index will be considered
- Road sides will be planted with local vegetation

While making choice of plant species for cultivation in green belts, weightage has to be given to the natural factor of bio-climate. It is also presumed that the selected plants will be grown as per normal horticultural or forestry practices. Trees are important sinks for air pollutants. Trees absorb noise and by enhancing the green cover, improve the ecology and aesthetics and affect the local micrometeorology. Trees also have major long-term impacts on soil quality and the ground water table. By using suitable plant species, green belts can be developed in strategic zones to provide protection from emitted and noise. The suitable variety/species shall be finalized in consultation with local forest officer and horticultural experts. Mixed plantation shall be done keeping optimum spacing between the saplings.

Table 3-25 Selected list of plant species for Greenbelt development

S.No	BINOMIAL	FAMILY	COMMON NAME	HABIT
1.	<i>Acacia nilotica</i>	Mimosaceae	Karuvelam	Tree
2.	<i>Acacia planifrons</i>	Mimosaceae	Kodaiavelam, Udaimaram	Tree
3.	<i>Bauhinia purpurea</i>	Caesalpiniaceae	Mantharai	Tree
4.	<i>Delonix regia</i>	Caesalpiniaceae	MayilKondrai	Tree
5.	<i>Ficus benghalensis</i>	Moraceae	Aal, Ichi, per-al	Tree
6.	<i>Ficus religiosa</i>	Moraceae	Arasu	Tree
7.	<i>Melia azedarach</i>	Meliaceae	Malaivaambu	Tree
8.	<i>Phyllanthus emblica</i>	Euphorbiaceae	Nelli, Muzhunelli	Tree
9.	<i>Pithecellobium dulce</i>	Mimosaceae	Kodukkaipuli	Tree
10.	<i>Pongamia pinnata</i>	Fabaceae	Punga maram	Tree
11.	<i>Psidium guajava</i>	Myrtaceae	Koyya	Tree
12.	<i>Syzygiumcumini</i>	Myrtaceae	Navaal, Nava	Tree
13.	<i>Tamarindus indica</i>	Caesalpiniaceae	Puliyamaram	Tree
14.	<i>Tectona grandis</i>	Verbenaceae	Thekku	Tree
15.	<i>Terminalia catappa</i>	Combretaceae	Natvadumai, NaattuBadaam	Tree
16.	<i>Wrightia tinctoria</i>	Apocynaceae	Nilapaalai, Vetpaalai	Tree

17.	<i>Ziziphus mauritiana</i>	Rhamnaceae	Ilandhai	Tree
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3.11.4.3 Impact on Fauna

The plant unit area is in non-forest land where presence of fauna is very rare. As such, there will be no adverse impact of the plant unit activity on fauna around the plant unit area. A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) are presented in Table-3.21 species recorded/reported from study area, there are no endangered, threatened wild animal species in study area.

3.11.4.4 Impact on Aquatic Ecology

There are several lakes present within 10 km radius of the project site but no impact envisaged on aquatic ecology from the operation of facilities in construction or operational phases as there is water body within plant site boundary.

The following are the suggestions for the management of the in and around water body.

- ❖ Growing of floating hydrophytes and systematic removal in invasive species.
- ❖ Community awareness on pond water resources, conservation and management should be enhanced.
- ❖ Mass awareness programs should be need.
- ❖ The conservation of wetlands should aim to support the implementation activities such as cleaning campaigns, removal of construction debris, development of recreational areas, water retention structures and planting of trees in the site.

Proper awareness programmes for the protection of wetlands must be under taken, following slogan may be used for mass awareness. "Wetlands are Kidney of Nature- Protect them".

3.12 Socio Economic profile of Project Influenced Area

As per the 2011 Census, Vellore district consists of 3 Revenue Divisions viz., Vellore (Taluks include Vellore, Katpadi, Gudiyatham), Ranipet (Taluks include Walajah, Arakonam, Arcot), and Tirupathur (Taluks include Thirupathur, Vaniyambadi, Ambur). This district has 9 Taluks, 20 Community Development Blocks, 52 Firkas, 1 Municipal Corporation, 13 Municipalities, 22 Town Panchayats and 36 Census Towns. Vellore district is situated in the northern part of Tamil Nadu bordering Andhra Pradesh. The district bounded by Andhra Pradesh on the north, Thiruvallur district on the northeast, Kancheepuram district on the east, Tiruvannamalai district on the south and Krishnagiri district on the West. The total geographical area of the district is 6075 sq. kms. In terms of size, Vellore district ranked 4th in comparison to other district in the State.

Vellore district ranked 3rd place in terms of the highest population in the State. The district has recorded population density of 648persons/sq.km. The urban population in the district was 43.2% to

the total population. The decadal population growth of the district during 2001-2011 was 13.2%. The district sex ratio was 1007, higher than the State sex ratio of 996. The district has recorded the 3rd highest Scheduled Caste sex ratio of 1026 among the districts. The district has recorded the literacy of 79.2%.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLOR E.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.12.1 Socio Economic Aspects

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

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

The following **Table 3.26** provides the certain important social indicators of Vellore District.

Table 3-26 Social Indicators of the PIA district

S.No	Social Indicators	Vellore District
1.	Decadal variation %	13.2
2.	Urban population %	43.24
3.	Rural Population %	56.76
4.	Sex ratio	1007
5.	0-6 age Child sex ratio	944
6.	Population density (Persons per square Km)	648
7.	Scheduled caste population %	21.85
8.	Scheduled tribe population %	1.85
9.	Literacy rate %	79.17
10.	Work Participation rate %	37.5
11.	Main Workers %	80.52

12.	Marginal Workers %	19.48
13.	Cultivators %	10.37
14.	Agricultural labourers %	23.2
15.	Workers in household industries %	8.08
16.	Other workers %	58.36

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.12.1.1 Population and Household Size

In 2011 census, the total population of Vellore district was 3936331. Of this, rural population was 2234344 and urban population was 1701987. In 2001, they were 3477317, 2169319 and 1307998 respectively. Arakonam taluk has the highest number of inhabited villages (133) while Vaniyambadi taluk has the lowest number (48) of such villages. Madapalli village in Tirupathur taluk had the highest population of 14,868 and Madakadappa R.F. village in Vaniyambadi taluk recorded the lowest population of 14 in the district. Ambur Reserve Forest Village in Ambur taluk is the largest village with an area of 10656.09 hectares and Ambur Plantation Reserve Forest in Ambur taluk is the smallest village with an area of 2.47 hectares. The district has recorded the 3rd highest percentage of household industry workers to total workers of 8.1% among the districts.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.12.1.2 Sex Ratio

The sex ratio is defined as number of females to 1000males. The total sex ratio in the district as per 2011 census was 1007. This was recorded as 997 in 2001 census. The child sex ratio in the district during 2011 census was 944 and this was 943 in 2001 census.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.12.1.3 Scheduled Castes and Scheduled Tribes

The Scheduled Castes (SCs) population in Vellore district was 20.5% in 2001 census which has increased to 21.9% in 2011 census. The rural-urban composition of SCs was 24.5% and 18.4% respectively in 2011 census. The Scheduled Tribes (STs) population in the district was 1.8% in 2001 census and returned with a marginal increase to 1.9% in 2011 census. The rural-urban composition of STs in 2011 census was 2.9% and 0.5% respectively.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

3.12.1.4 Education & Literacy

In Census, a person aged 7 and above is considered literate, if he or she can read and write with understanding in any language. The literacy rate in the Vellore district has increased in 2011 census compared to 2001 census. The rural and urban literacy in the district has recorded significant disparity. The rural literacy was 67.4% in 2001 which has marginally increased to 7.3% in 2011 with 74.7% while the urban literacy in the district was 80.5% in 2001. The urban literacy in the district has seen significant increase in 2011 census compared to 2001 census. In 2011 census, Vellore district has returned 79.2% as literate population; males with 86.5% and females with 71.9%. The total literacy in 2001 was 72.4%; males with 82.4% and females at 62.8%.

Source:

https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

Note: Ranipet district was a part of Vellore district before the bifurcation on 28th November 2019. Since secondary sources are available only for Vellore district, however Vellore district comprises Ranipet district details before bifurcation.

Table 3-27 Education Infrastructures in the Vellore District

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
Primary	1439	660	1307	401
Primary + Upper Primary	460	84	410	44
P + UP+ Secondary + Higher Secondary	13	122	8	68
UP only	0	1	0	1
UP + Secondary + Higher Secondary	175	53	138	11
P + UP + Secondary	13	79	11	55
UP + Secondary	174	25	166	15

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

3.12.1.5 Health Facilities

Primary Health Centres (PHCs) and Health Sub-centres (HSCs) are providing the preventive, curative and rehabilitative health care services to the rural people. The district has good number of public health systems accessible and affordable apart from the private health facilities. The Health Facilities given in **Table 3-28**.

Table 3-28 Medical Facilities available in Vellore District

		Facilities As on November 19, 2020									
		Total Facility					Active Facilities				
District	Type of Facility	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]
Vellore District	SC	455	455	0	0	455	454	454	0	0	454
	PHC	104	104	0	22	82	100	100	0	22	78
	CHC	21	20	1	1	20	21	20	1	1	20
	SDH	13	13	0	11	2	13	13	0	11	2
	DH	1	1	0	0	1	1	1	0	0	1
	Total		594	593	1	34	560	589	588	1	34

(Source: National Health Mission, as on November 19, 2020)

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

3.12.2 Social Economic Profile of the study area

The villages and towns covering 10 km radius from the boundary of the project site is taken for the study. **Table 3-29** shows the socio-economic indicators within the study area.

Table 3.29 Population profile within the study area

S. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0-5 Km								
Vellore District-Wallajah Taluk								
1.	Somasamudram	948	4190	2109	2081	501	2070	0
2.	Pandiyanellore	822	3519	1786	1733	405	1263	27
3.	Rendadi	1128	4849	2465	2384	587	692	3
4.	Kallalan Kuppam	169	688	344	344	60	76	0
5.	Kodakkal	1833	7948	3986	3962	867	2126	4
6.	Pulivalam	991	4309	2194	2115	467	841	112
7.	Kadappanthangal	271	1111	583	528	110	501	0
8.	Venkatapuram(Mel)	369	1419	722	697	121	545	0
9.	Sholingur (TP) WARD NO.-0001	296	1180	600	580	124	30	10
10.	Sholingur (TP) WARD NO.-0002	319	1439	745	694	185	0	0
11.	Sholingur (TP) WARD NO.-0003	184	841	421	420	97	827	5
12.	Sholingur (TP) WARD NO.-0004	542	2224	1152	1072	229	84	0
13.	Sholingur (TP) WARD NO.-0005	330	1393	706	687	148	9	0
14.	Sholingur (TP) WARD NO.-0006	229	1016	480	536	98	11	0
15.	Sholingur (TP) WARD NO.-0007	479	1963	962	1001	195	45	0
16.	Sholingur (TP) WARD NO.-0008	502	1951	954	997	226	38	0
17.	Sholingur (TP) WARD NO.-0009	359	1462	732	730	150	45	12
18.	Sholingur (TP) WARD NO.-0010	996	4185	2056	2129	491	234	89
19.	Sholingur (TP) WARD NO.-0011	474	2045	1017	1028	249	71	13
20.	Sholingur (TP) WARD NO.-0012	370	1528	763	765	139	4	0
21.	Sholingur (TP) WARD NO.-0013	406	1742	889	853	172	12	0
22.	Sholingur (TP) WARD NO.-0014	652	2819	1412	1407	301	650	7
23.	Sholingur (TP) WARD NO.-0015	138	613	308	305	65	1	0
24.	Sholingur (TP) WARD NO.-0016	508	2169	1050	1119	218	42	3
25.	Sholingur (TP) WARD NO.-0017	292	1166	611	555	105	0	0
26.	Sholingur (TP) WARD NO.-0018	283	1120	558	562	105	4	0
Vellore District-Arakonam Taluk								
27.	Karikkal	857	3704	1918	1786	392	1584	41

S. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
28.	Nandimangalam	248	1034	536	498	97	119	0
29.	Soorai	627	2763	1390	1373	325	584	0
Tiruvallur District- Pallipattu Taluk								
30.	Deepangudi	435	1656	822	834	154	884	3
31.	Keerangudi	392	1526	741	785	165	693	0
32.	Pulavanallur	346	1412	722	690	137	504	0
33.	Vadakandam	738	2779	1349	1430	265	1205	1
34.	Mannakkal	541	2134	1062	1072	200	758	0
5-10 Km								
Vellore District- Wallajah Taluk								
35.	Palleri	207	832	430	402	100	52	33
36.	Kondakuppam	687	2915	1452	1463	305	620	15
37.	Thagarakuppam	673	2810	1397	1413	348	125	19
38.	Sengalnatham	614	2535	1255	1280	318	75	20
39.	Sekkadikuppam	263	959	499	460	133	18	0
40.	Kesavanan Kuppam	280	1169	586	583	115	4	0
41.	Jambukulam	795	3301	1647	1654	343	666	51
42.	Katharikuppam	312	1307	679	628	145	18	0
43.	Velam	1458	6247	3148	3099	642	1983	3
44.	Kolatheri	234	936	475	461	108	391	0
45.	Marudalam	1121	4702	2346	2356	555	465	0
46.	Kattarampakkam	541	2105	1058	1047	201	214	0
47.	Thalangai	616	2510	1267	1243	290	228	0
48.	Vanghur	1007	4112	2116	1996	491	452	28
49.	Govindacherikuppam	665	2839	1445	1394	317	615	3
50.	Govindacheri	137	593	290	303	69	342	0
51.	Ozhughur	854	3596	1826	1770	384	535	0
Vellore District- Arakonam Taluk								
52.	Vengapattu	963	4037	2045	1992	436	718	0
53.	Paravathur	636	2687	1358	1329	290	1357	63
54.	Vailambadi	394	1495	752	743	164	105	7
55.	Gudalur	949	4033	2004	2029	433	646	0

S. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
56.	Thalikkal	819	3476	1771	1705	405	916	4
57.	Ayipedu	801	3558	1737	1821	419	1760	13
58.	Ariyur	172	753	385	368	79	295	0
59.	Ayal	497	2096	1039	1057	252	1146	3
60.	Polipakkam	1061	4204	2102	2102	502	20	4
61.	Tappur	562	2601	1315	1286	277	640	0
62.	Pazayapalayam	560	2894	1467	1427	335	184	0
Thiruvallur District- Pallipattu Taluk								
63.	Naranamangalam	404	1618	838	780	187	555	0
64.	Sengalipuram	884	3289	1619	1670	332	1071	0
65.	Perumangalam	161	621	311	310	68	292	0
66.	Annavasal	260	939	482	457	78	512	0
67.	Manapparavai	340	1239	639	600	122	396	0
68.	Manjakkudi	651	2503	1265	1238	228	1110	0
69.	52.Pudukkudi	799	2979	1489	1490	304	1001	0
70.	Simizhi	622	2464	1230	1234	220	223	0
71.	Kappanamangalam	486	1840	941	899	173	462	0
72.	Arasavanangadu	422	1588	766	822	157	488	0
73.	Engan	774	2909	1472	1437	317	1163	0
Thiruvallur District- Tiruttani Taluk								
74.	T.C.Kandigai	303	1146	539	607	123	228	48
75.	V.K.N.Kandigai	376	1500	746	754	133	558	132
Andhra Pradesh- Chittoor Division								
76.	Palasamudram	1020	4451	2244	2207	513	2647	65
Total		43454	180285	90617	89668	19561	41848	841

(Source: Census 2011)

3.12.2.1 Employment and Livelihood

Majority of population in the study area comes under other working categories. As agriculture cannot be a main sustenance for most of farmers, they have dual professions. Farming is mostly seasonal, they involve in other livelihood activities like business, non-agriculture labour, agriculture labour and other service sectors. Fragmentation of landholding leads to adopt to have additional occupation. Irrigation sources in the district are poor and the agriculture depends on seasonal rainfall. The district has recorded the 3rd highest percentage of household industry workers to total workers of 8.1% among the districts. The Vellore district is one of the most vital and vibrant districts in terms of industrial development in the State. It has a dominant presence in the leather and leather based industries. Vellore District accounts for more than 37% of the county's export leather and leather related products such as finished leather, shoe uppers, shoes, garments, gloves and so on. The leather industry occupies a very important place in the industrial map of Vellore district. There are 1,226 leather units spread over in the district mainly in Ranipet, Ambur and Vaniyambadi. The district has many big and small industries. The silk weaving industries are located at Wallajah. Leather, sugar, ceramics, chemicals and other allied small scale industries are located in different taluks. SIDCO Industrial Estates is established at Katpadi, Ranipet, Mukundarayapuram, Vannivedu and Arakonam. Of these, 901 factories are employing about 28204 workers; 16429 males and 11775 females. There were 227 footwear factories with 15974 employees in this district.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

Table 3.30 Summaries of Employment and Livelihood within the study area

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
0-5 Km												
Vellore District-Wallajah Taluk												
1.	Somasamudram	1750	1394	356	242	12	354	168	121	76	677	100
2.	Pandiyanellore	1762	945	817	51	10	59	62	33	20	802	725
3.	Rendadi	2493	1967	526	438	12	516	100	247	113	766	301
4.	Kallalan Kuppam	320	62	258	16	63	9	83	3	62	34	50
5.	Kodakkal	3344	2461	883	357	84	737	591	247	48	1120	160
6.	Pulivalam	2408	1567	841	309	23	577	157	43	15	638	646
7.	Kadappanthangal	549	407	142	18	0	79	106	6	1	304	35
8.	Venkatapuram(Mel)	685	305	380	49	14	42	213	6	39	208	114
9.	Sholingur (TP) WARD NO.-0001	396	372	24	0	0	18	4	15	2	339	18
10.	Sholingur (TP) WARD NO.-0002	727	685	42	279	0	87	2	19	9	300	31
11.	Sholingur (TP) WARD NO.-0003	361	334	27	9	0	84	5	5	0	236	22
12.	Sholingur (TP) WARD NO.-0004	815	738	77	6	0	8	5	27	18	697	54
13.	Sholingur (TP) WARD NO.-0005	458	415	43	2	0	0	1	18	7	395	35
14.	Sholingur (TP) WARD NO.-0006	340	235	105	3	0	2	4	0	2	230	99
15.	Sholingur (TP) WARD NO.-0007	674	651	23	4	3	2	0	17	2	628	18
16.	Sholingur (TP) WARD NO.-0008	681	526	155	28	7	13	17	13	27	472	104
17.	Sholingur (TP) WARD NO.-0009	572	500	72	3	1	1	3	6	52	490	16
18.	Sholingur (TP) WARD NO.-0010	1419	1322	97	29	3	65	5	62	16	1166	73
19.	Sholingur (TP) WARD NO.-0011	873	843	30	8	0	26	0	80	1	729	29
20.	Sholingur (TP) WARD NO.-0012	508	433	75	4	1	5	16	25	4	399	54
21.	Sholingur (TP) WARD NO.-0013	602	380	222	28	2	20	2	5	7	327	211
22.	Sholingur (TP) WARD NO.-0014	1170	1156	14	11	0	44	2	131	5	970	7
23.	Sholingur (TP) WARD NO.-0015	200	175	25	1	0	2	0	2	0	170	25
24.	Sholingur (TP) WARD NO.-0016	950	941	9	4	0	1	0	370	1	566	8
25.	Sholingur (TP) WARD NO.-0017	468	378	90	0	0	2	2	77	18	299	70
26.	Sholingur (TP) WARD NO.-0018	381	380	1	0	0	0	0	69	0	311	1
Vellore District-Arakonam Taluk												
27.	Karikkal	1489	1156	333	138	7	273	126	6	1	739	199
28.	Nandimangalam	404	391	13	155	5	39	5	8	0	189	3

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
29.	Soorai	1555	1214	341	375	3	489	101	62	22	288	215
Tiruvallur District- Pallipattu Taluk												
30.	Deepangudi	763	692	71	59	4	428	62	13	2	182	3
31.	Keerangudi	787	527	260	53	34	326	201	0	1	148	24
32.	Pulavanallur	580	561	19	52	0	256	2	20	0	233	17
33.	Vadakandam	1326	715	611	73	55	334	486	14	14	294	56
34.	Mannakkal	906	904	2	89	0	448	0	23	0	344	2
5-10 Km												
Vellore District- Wallajah Taluk												
35.	Palleri	504	500	4	427	1	0	0	3	0	70	3
36.	Kondakuppam	1698	1362	336	143	9	363	189	199	58	657	80
37.	Thagarakuppam	1717	834	883	208	31	151	407	42	289	433	156
38.	Sengalnatham	983	222	761	4	217	79	316	6	152	133	76
39.	Sekkadikuppam	481	453	28	199	0	101	2	8	0	145	26
40.	Kesavanan Kuppam	426	248	178	37	2	133	144	3	9	75	23
41.	Jambukulam	1405	1167	238	326	19	467	167	50	19	324	33
42.	Katharikuppam	640	562	78	165	0	10	77	21	0	366	1
43.	Velam	2819	2720	99	254	9	772	40	53	6	1641	44
44.	Kolatheri	424	424	0	58	0	151	0	7	0	208	0
45.	Marudalam	2090	1766	324	461	37	433	145	35	15	837	127
46.	Kattarampakkam	945	660	285	152	6	311	214	6	24	191	41
47.	Thalangai	1131	1066	65	275	3	508	49	28	3	255	10
48.	Vanghur	2286	1973	313	577	14	777	247	136	12	483	40
49.	Govindacherikuppam	1431	1411	20	176	3	848	8	33	0	354	9
50.	Govindacheri	175	174	1	10	1	98	0	0	0	66	0
51.	Ozhughur	1600	1556	44	386	5	410	26	63	2	697	11
Vellore District- Arakonam Taluk												
52.	Vengapattu	2323	1725	598	458	66	1026	393	8	1	233	138
53.	Paravathur	1417	921	496	26	2	541	399	5	38	349	57
54.	Vailambadi	925	530	395	196	34	153	147	19	67	162	147
55.	Gudalur	1867	1469	398	215	3	771	334	49	29	434	32
56.	Thalikkal	1773	249	1524	1	5	13	1405	5	84	230	30
57.	Ayipedu	1724	1720	4	178	0	1194	2	5	1	343	1

S. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
58.	Ariyur	336	91	245	1	5	0	1	1	179	89	60
59.	Ayal	1088	1079	9	119	0	677	7	28	0	255	2
60.	Polipakkam	2018	1479	539	344	17	735	330	43	148	357	44
61.	Tappur	1539	891	648	223	83	595	531	22	19	51	15
62.	Pazayapalayam	1215	1037	178	266	6	657	159	8	3	106	10
Thiruvallur District- Pallipattu Taluk												
63.	Naranamangalam	546	396	150	92	47	167	75	3	2	125	26
64.	Sengalipuram	1330	1168	162	131	1	640	113	7	3	356	45
65.	Perumangalam	327	323	4	34	0	250	4	0	0	35	0
66.	Annavasal	390	354	36	38	1	264	26	0	4	52	5
67.	Manapparavai	635	478	157	67	0	219	152	3	0	180	5
68.	Manjakkudi	1018	1001	17	39	4	662	5	25	1	266	7
69.	52.Pudukkudi	1162	1101	61	182	7	586	28	22	3	300	23
70.	Simizhi	1274	884	390	121	34	551	297	18	8	181	51
71.	Kappanamangalam	708	687	21	64	2	395	10	12	3	214	6
72.	Arasavanangadu	637	540	97	29	2	277	80	6	2	224	13
73.	Engan	1418	1206	212	71	19	920	150	11	6	200	37
Thiruvallur District- Tiruttani Taluk												
74.	T.C.Kandigai	536	249	287	45	4	62	209	2	2	140	72
75.	V.K.N.Kandigai	893	148	745	66	34	12	161	1	2	69	548
Andhra Pradesh- Chittoor Division												
76.	Palasamudram	2140	1611	529	497	80	758	219	24	1	332	229
	Total	82710	64167	18543	10254	1156	23083	9799	2813	1780	27908	5808

(Source: Census 2011)

3.12.2.2 Educational Infrastructure within study area

The district has good primary and secondary education infrastructure in urban and rural areas. The people around the study area have well connected to educational infrastructures. The following **Table 3-31** shows the literate's population and the percentage within the study area

Table 3.31 Literates population and the percentage within the study area

S. No	Name	Total Population	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
0-5 Km								
Vellore District-Wallajah Taluk								
1.	Somasamudram	4190	2855	1619	1236	1335	490	845
2.	Pandiyanellore	3519	2646	1429	1217	873	357	516
3.	Rendadi	4849	3133	1836	1297	1716	629	1087
4.	Kallalan Kuppam	688	417	240	177	271	104	167
5.	Kodakkal	7948	5160	2941	2219	2788	1045	1743
6.	Pulivalam	4309	2752	1600	1152	1557	594	963
7.	Kadappanthangal	1111	685	413	272	426	170	256
8.	Venkatapuram(Mel)	1419	1072	605	467	347	117	230
9.	Sholingur (TP) WARD NO.-0001	1180	876	477	399	304	123	181
10.	Sholingur (TP) WARD NO.-0002	1439	912	539	373	527	206	321
11.	Sholingur (TP) WARD NO.-0003	841	603	335	268	238	86	152
12.	Sholingur (TP) WARD NO.-0004	2224	1821	1000	821	403	152	251
13.	Sholingur (TP) WARD NO.-0005	1393	1132	593	539	261	113	148
14.	Sholingur (TP) WARD NO.-0006	1016	829	408	421	187	72	115
15.	Sholingur (TP) WARD NO.-0007	1963	1612	828	784	351	134	217
16.	Sholingur (TP) WARD NO.-0008	1951	1421	766	655	530	188	342
17.	Sholingur (TP) WARD NO.-0009	1462	951	509	442	511	223	288
18.	Sholingur (TP) WARD NO.-0010	4185	3126	1635	1491	1059	421	638
19.	Sholingur (TP) WARD NO.-0011	2045	1440	775	665	605	242	363
20.	Sholingur (TP) WARD NO.-0012	1528	1267	657	610	261	106	155
21.	Sholingur (TP) WARD NO.-0013	1742	1400	755	645	342	134	208
22.	Sholingur (TP) WARD NO.-0014	2819	2260	1186	1074	559	226	333
23.	Sholingur (TP) WARD NO.-0015	613	506	264	242	107	44	63
24.	Sholingur (TP) WARD NO.-0016	2169	1637	880	757	532	170	362
25.	Sholingur (TP) WARD NO.-0017	1166	934	539	395	232	72	160
26.	Sholingur (TP) WARD NO.-0018	1120	867	476	391	253	82	171
Vellore District- Arakonam Taluk								

S. No	Name	Total Population	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
27.	Karikkal	3704	2548	1452	1096	1156	466	690
28.	Nandimangalam	1034	649	395	254	385	141	244
29.	Soorai	2763	1837	1050	787	926	340	586
Thiruvallur District- Pallipattu Taluk								
30.	Deepangudi	1656	1153	618	535	503	204	299
31.	Keerangudi	1526	963	516	447	563	225	338
32.	Pulavanallur	1412	1029	561	468	383	161	222
33.	Vadakandam	2779	2232	1146	1086	547	203	344
34.	Mannakkal	2134	1566	848	718	568	214	354
5-10 Km								
Vellore District- Wallajah Taluk								
35.	Palleri	832	507	299	208	325	131	194
36.	Kondakuppam	2915	2006	1135	871	909	317	592
37.	Thagarakuppam	2810	1589	905	684	1221	492	729
38.	Sengalnatham	2535	1505	870	635	1030	385	645
39.	Sekkadikuppam	959	563	334	229	396	165	231
40.	Kesavanan Kuppam	1169	858	481	377	311	105	206
41.	Jambukulam	3301	2196	1234	962	1105	413	692
42.	Katharikuppam	1307	878	511	367	429	168	261
43.	Velam	6247	4407	2455	1952	1840	693	1147
44.	Kolatheri	936	614	353	261	322	122	200
45.	Marudalam	4702	3119	1764	1355	1583	582	1001
46.	Kattarampakkam	2105	1466	863	603	639	195	444
47.	Thalangai	2510	1697	973	724	813	294	519
48.	Vanghur	4112	2578	1548	1030	1534	568	966
49.	Govindacherikuppam	2839	1916	1085	831	923	360	563
50.	Govindacheri	593	446	239	207	147	51	96
51.	Ozhughur	3596	2481	1422	1059	1115	404	711
Vellore District- Arakonam Taluk								
52.	Vengapattu	4037	2464	1437	1027	1573	608	965
53.	Paravathur	2687	1796	1012	784	891	346	545

S. No	Name	Total Population	Literates Population Person	Literates Population Male	Literates Population Female	Illiterate Persons	Illiterate Male	Illiterate Female
54.	Vailambadi	1495	889	539	350	606	213	393
55.	Gudalur	4033	2433	1430	1003	1600	574	1026
56.	Thalikkal	3476	2434	1385	1049	1042	386	656
57.	Ayipedu	3558	2212	1249	963	1346	488	858
58.	Ariyur	753	501	279	222	252	106	146
59.	Ayal	2096	1371	761	610	725	278	447
60.	Polipakkam	4204	2513	1472	1041	1691	630	1061
61.	Tappur	2601	1711	991	720	890	324	566
62.	Pazayapalayam	2894	1822	1058	764	1072	409	663
Thiruvallur District- Pallipattu Taluk								
63.	Naranamangalam	1618	1224	661	563	394	177	217
64.	Sengalipuram	3289	2335	1236	1099	954	383	571
65.	Perumangalam	621	414	226	188	207	85	122
66.	Annavasal	939	712	393	319	227	89	138
67.	Manapparavai	1239	811	456	355	428	183	245
68.	Manjakkudi	2503	1939	1048	891	564	217	347
69.	52.Pudukkudi	2979	2340	1220	1120	639	269	370
70.	Simizhi	2464	1858	1021	837	606	209	397
71.	Kappanamangalam	1840	1439	776	663	401	165	236
72.	Arasavanangadu	1588	1109	584	525	479	182	297
73.	Engan	2909	2041	1087	954	868	385	483
Tiruvallur District- Tiruttani Taluk								
74.	T.C.Kandigai	1146	678	371	307	468	168	300
75.	V.K.N.Kandigai	1500	869	502	367	631	244	387
AndhraPradesh-Chittoor Division								
76.	Palasamudram	4451	2937	1667	1270	1514	577	937
Total		180285	123969	69223	54746	56316	21394	34922

(Source: Census 2011)

3.12.2.3 Health facility within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There were no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The local transport facilities and the communication facilities are the main reasons to get immediate medical attention. The incidents of institutional delivery are high due to awareness, education, economic development, proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced. The health facilities within the study area are given in **Table 3-32**.

Table 3-32 Health facility within the study area

S.No	Type	Numbers
1	Community health centre	3
2	Primary health centre	10
3	Primary health sub-centre	77
4	Maternity and Child Welfare Centre	17
5	TB hospital/Clinic	10
6	Hospital Allopathic	4
7	Hospital Alternative Medicine	3
8	Dispensary Health Centre	10
9	Veterinary hospital	15
10	Mobile health clinic	1
11	Family Welfare Centre	10
12	Non-Government Medical facilities Out Patient	6

(Source: Census 2011)

3.12.2.4 Summary

The Socioeconomic profile of the study area shows that the majority of people in the study area work in non-agricultural sector, however in rural area majority of the people in the rural area depends on agricultural sector. They have good educational infrastructures and the people in the study area are well connected to the educational infrastructures. The average literacy rate of the study area is 67.0%. The people in the study area are well connected to Government primary health centres and Primary health sub-centres.

Table 3-33 Summaries of Socio-economic indicators within the study area

S.No	Particulars	Study Area	Unit
0-5 km			
1.	Number of villages in the Study Area	34	Nos.
2.	Total Households	18074	Nos.
3.	Total Population	75897	Persons
4.	Children Population (<6 Years Old)	8150	Persons
5.	SC Population	16552	Persons
6.	ST Population	330	Persons
7.	Total Working Population	32716	Persons
8.	Main Workers	25732	Persons
9.	Marginal Workers	6984	Persons
10.	Cultivators	3236	Persons
11.	Agricultural labours	7877	Persons
12.	Household Industries	2378	Persons
13.	Other Workers	19215	Persons
14.	Literates	54291	Persons
15.	Illiterates	21606	Persons
5-10 km			
16.	Number of villages in the Study Area	42	Nos.
17.	Total Households	25380	Nos.
18.	Total Population	104388	Persons
19.	Children Population (<6 Years Old)	11411	Persons
20.	SC Population	25296	Persons
21.	ST Population	511	Persons
22.	Total Working Population	49994	Persons
23.	Main Workers	38435	Persons
24.	Marginal Workers	11559	Persons
25.	Cultivators	8174	Persons
26.	Agricultural labours	25005	Persons
27.	Household Industries	2215	Persons
28.	Other Workers	14501	Persons
29.	Literates	69678	Persons
30.	Illiterates	34710	Persons

4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The impacts due to mining operation and its mitigation measures adopted are detailed in this chapter. In general, the opencast mining operations cause environmental problems such as degradation of land, deteriorating air, water and soil quality, affecting the biological and socio-economic environment of the area, if adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause irreversible damage to the eco-system.

The opencast mining operations involve development of benches, approach roads, haul roads, blasting, excavation and handling & transportation of materials. If adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause environmental degradation and lead to irreversible damage to the ecosystem. Various environmental impacts, which have been identified due to the mining operations proposed project, are discussed in the following sections. The environmental parameters most commonly affected by mining activities are:

- Air quality including Climate
- Noise levels and ground vibrations
- Water resources and quality
- Land use Pattern
- Soil quality
- Flora and Fauna
- Socio-Economic conditions
- Occupational Health.

4.1 Land Environment

The total extent of lease area is 20.95.0 Ha. The Land is classified as a Government land. The lease area exhibits hilly terrain ($\approx 170\text{mAMSL}$) topography covered by massive granite formation. Quarry lease was granted over an extent of 20.95.0Ha. In S.F.No.1193/1, Part-5 & Part-16, Kodakkal Village, Sholinghur Taluk, Ranipet District, Tamil Nadu state. Precise area communication letter was granted vide Government letter No. 3040/MME.1/2022-1, dated: 02.06.2022 for 20 years of mining. Precise area communication letter is enclosed as **Annexure-2**. The land use pattern is given in **Table 4-1**.

4.1.2 Land Degradation

The impact on land pattern in the area has been and will be due to the following:

- Land degradation due to disposal of large volume of waste materials.
- Creation of infrastructural facilities like office, rest shelter, first-aid centre and other service facilities.
- Exposure of topsoil to wind and water erosion.

Table 4-1 Land Use Pattern of the lease area

S. No	Land Use	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Area under Quarry	0.75.0	0.92.5
2	Waste Dump	4.61.0	4.61.0
3	Infrastructure	0.04.0	0.04.0
4	Road	--	0.85.0
5	Green Belt	0.06.5	0.06.5
6	Un utilized Area	13.08.0	14.46.5
Total		18.54.5	20.95.5

4.1.3 Mitigation Measures

- Dust suppression on exposed areas using water tankers.
- Contour overburden dump to minimize erosion
- Plantation around service building, along road, in and around safety zone using native plant sapling.
- Compliance with mine decommissioning plan.
- The following precautions will be taken to reduce the risk of dump failure:
 - OB benches will be made of <10m height in each tier. Angle of repose of OB dump to be around 26°. Construction of toe wall around the OB dump.
 - Drainage control structures like garland drain to be made around OB dump area to avoid water flow during monsoon below the OB dump.
 - Leveling, grading and drainage arrangement for OB dumps.
 - The deeper working pits, after completion of mining /quarrying left as it is which would serve as water ponds/water reservoirs.
 - The quarried pits after the end of the life of lease will be fenced to prevent inherent entry of public and cattle.
 - Management plan for topsoil utilization and conservation.
 - Progressive year-wise green belt development inside.

4.2 Air Environment

The main source of air pollution is from open cast mining activities is dust generation from excavation of granite, movement of vehicles for transportation of product to consumers, drilling, loading and unloading operation and wind erosion of dumps and also gaseous emission due to

operation of diesel driven mining equipment. The sources of air emission are detailed below in **Table 4-2**.

Table 4-2 Sources of air pollution at quarry

S. No	Source of emission	Pollutant
1.	Excavation of Granite	PM
2.	Operation of diesel driven equipment	Gaseous emission
3.	Transportation of product	PM

The major air pollution sources from the mining operations are DG sets, mining activities like drilling, and transportation. The DG sets are provided with stacks of adequate height to disperse the emanating flue gases containing suspended particulate matter, oxides of Sulphur and nitrogen without affecting the ground level concentrations. The emissions mainly generated from the mining activities are Blasting, Drilling, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling.

4.2.1 Mitigation measures

- Use of dust aprons on drilling equipment and adopting wet drilling methods.
- Delay blasting under unfavorable wind and atmospheric conditions
- The production of blast fumes containing noxious gases will be reduced by the following methods:
 - Use of adequate booster/primer.
 - Proper stemming of the blast hole.
 - Development of greenbelt.

Table 4-3 Fugitive dust control in mine

S. No	Activities	Best practices
1	Drilling	➤ Drills should be provided with dust extractors (dry or wet system)
2	Blasting	<ul style="list-style-type: none"> ➤ Water spray before blasting ➤ Water spray on blasted material prior to transportation ➤ Use of control blasting technique
3	Transportation of mined material	<ul style="list-style-type: none"> ➤ Covering of the trucks/dumpers to avoid spillage ➤ Compacted haul road ➤ Speed control on vehicles ➤ Development of a green belt of suitable width on both sides of road, which acts as wind break and traps fugitive dust

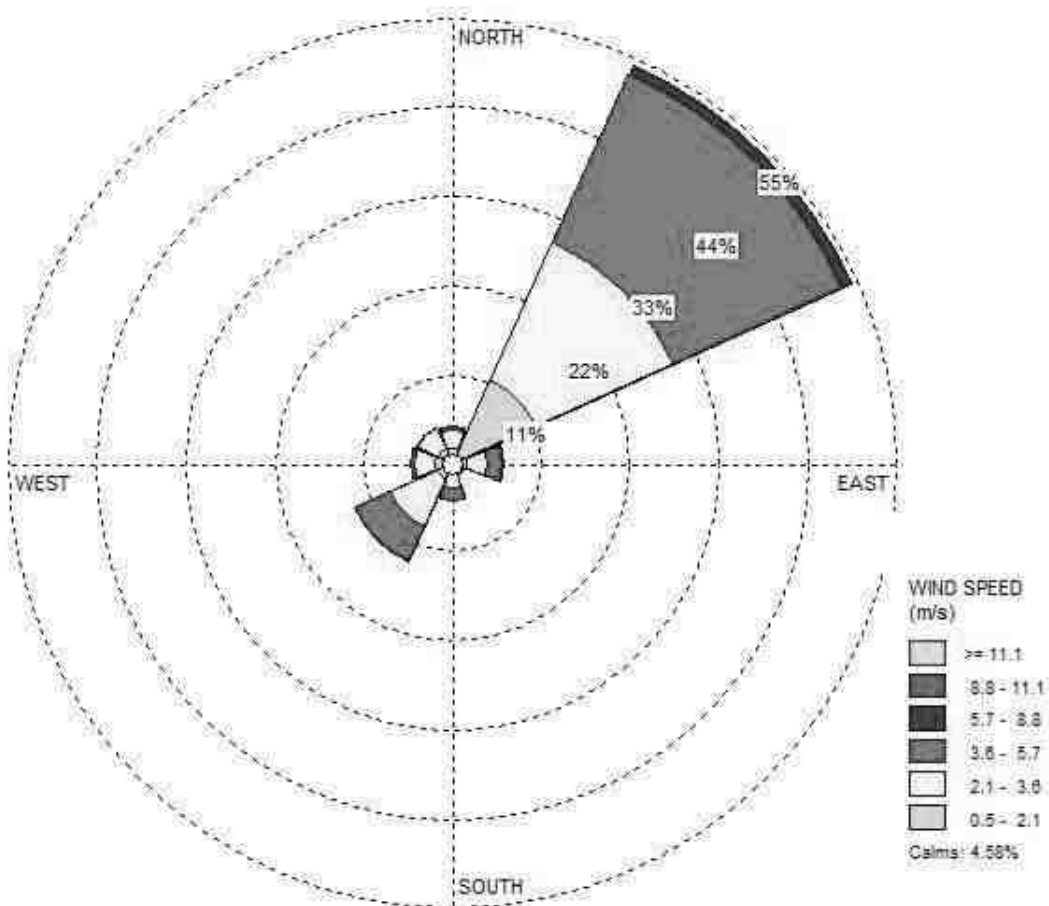
Table 4-4 Dust control measures in quarry

S. No	Operation or source	Control options
1	Drilling	<ul style="list-style-type: none"> ➤ Liquid injection (water or water plus a wetting agent) ➤ Capturing and venting emissions to a control device.

2	Blasting	<ul style="list-style-type: none"> ➤ Water spray before blasting ➤ Water spray on blasted material prior to transportation ➤ Use of control blasting technique
3	Loading	<ul style="list-style-type: none"> ➤ Water spray
4	Hauling (emissions from roads)	<ul style="list-style-type: none"> ➤ Water spray, treatment with surface agents, soil stabilization, paving, traffic control.

4.2.2 Meteorological Data

The meteorological data for three months, i.e. from **Mid Jan 2023 to April 2023** was considered for the study. Data included for AERMET were daily wind speed, wind direction, temperature, relative humidity, air pressure, precipitation, and solar radiation recorded during the period. AERMET reformats meteorological data so that it can be used as input for AERMOD model. Meteorology considered for modeling is shown below.



**Figure 4-1 Wind rose diagram considered for dispersion modeling
(Jan mid.2023 to April mid.2023)**

4.2.3.1 AERMET Process

For the 3 phase AERMET processing of the meteorological data, specifications of the land use in the area are required to determine the terrain roughness for modeling. The land use was characterized for

in and around the site. The surface characteristics for the site and surroundings were selected and used to calculate the Albedo, Bowen ratio and surface roughness parameter.

The meteorological data were processed in the AERMET software to generate wind flow pattern & to generate surface meteorological data and profile meteorological data in a prescribed format that can be fed to AERMOD for modeling.

4.2.3.2 AERMOD Process

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

AERMOD is a steady-state plume model. In the Stable Boundary Layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the Convective Boundary Layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (pdf). This behavior of the concentration distributions in the CBL was demonstrated by Willis and Deardorff (1981) and Briggs (1993). Additionally, in the CBL, AERMOD treats “plume lofting,” whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL, AERMOD treats the enhancement of lateral dispersion resulting from plume meander. The emissions mainly generated from the mining activities are Blasting, Drilling, Scrapping, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling are estimated and used as inputs for the air dispersion modeling as shown in **Table 4.6 to Table 4.9**.

Maximum incremental value for SO₂, NO_x and PM are shown in **Figure 4.2 to Figure 4.6** and Top 10 highest Ground Level Concentration (GLC) obtained from modeling are given in **Table 4.10 to Table 4.14** respectively.

4.2.3.3 Emission Calculations

Each mining activity is a source of emission and the estimation of emissions depends on parameters such as meteorological, topographic conditions and material characteristics. It is necessary to calculate the qty of emissions for work or a source on site to the atmosphere. The following emission formulas are used to calculate the emission rate for the different emission source.

4.2.3.4 Mining Operational data

Table 4-5 Overview of the Source Parameters

S. No	Description	Symbol	Quantity
1	Moisture Content (%)	m	1.64
2	Silt Content (%)	s	6
3	Production / Day (Tonn/Day)		22
4	Waste Dumping Area (Sq.Km)	a	0.0461
5	Open Pit Area (Sq.Km)	Aa	0.0075

Source:

- a) *Emission Estimation Technique Manual for Mining and Processing of Non-Metallic Minerals by NPI, Nov 1999*
- b) *Determination of the emission rate from various opencast mining operations, S. K. CHAULYA *, M. K. CHAKRABORTY, et. Al. Water, Air, and Soil Pollution 140: 21–55, 2002.*
- c) *Chaulya, S., 2006. Emission rate formulae for surface iron mining activities. Environmental Modeling Assessment, Issue 11, pp. 361-370.*
- d) *EPA. August, 2004. Section 11.19.2, Crushed Stone Processing and Pulverized Mineral Processing. In: Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, AP-42. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.*

4.2.3.5 Emission dispersion models

Each mining activity is a source of emission and the estimation of emissions depends on parameters such as meteorological, topographic conditions and material characteristics. The emission factors for PM_{2.5}, which is particulate matter of 2.5µm or less in diameter, were not available in literature. Thus, PM_{2.5} emissions have been calculated considering an assumption that 60% of for PM₁₀ emissions contribute to PM_{2.5}.

Table 4-6 Stack emission details

Source	Fuel used	Stack Details					Emissions (g/s)			
		No of Stack	Height (m) AGL	Dia (m)	Temp (°C)	Exit Velocity (m/s)	PM ₁₀	PM _{2.5}	SO ₂	NO _x
125 KVA DG	Diesel	1	3	0.3	180	10	5.81E-03	3.48E-03	5.38E-03	8.16E-02

Table 4-7 Vehicular Source Emission details

Source	Emission (g/s)		
	PM ₁₀	PM _{2.5}	NO _x
4 Wheeler (1no.)	6.94E-05	4.17E-05	6.94E-04
Heavy Duty Vehicles (2 no.)	1.11E-04	6.67E-05	1.94E-02
Total	1.81E-04	1.08E-04	2.01E-02

Table 4-8 Emissions considered for mining

Activities	TSPM Emission rate	PM ₁₀ Emission rate	PM _{2.5} Emission rate
Wet Drilling (g/s)	4.63E-05	9.26E-06	5.56E-06
Haulage (g/s)	5.16E-03	1.03E-03	6.20E-04
Waste Dumping (g/s)	2.54E-04	5.07E-05	3.04E-05
Open Pit (g/s.m ²)	1.02E-05	2.04E-06	1.23E-06

Table 4-9 Emission input for modelling

Activities	TSPM	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Line Source (Haul Road) (g/s)	5.16E-03	1.03E-03	6.20E-04	-	-
Area Source (Open Pit) (g/s.m ²)	1.02E-05	2.04E-06	1.23E-06	-	-
Area Source (Waste Dumping) (g/s)	2.54E-04	5.07E-05	3.04E-05	-	-
Point Source (DG) (g/s)	-	5.81E-03	3.48E-03	5.38E-03	8.16E-02
Point Source (Drilling) (g/s)	4.63E-05	9.26E-06	5.56E-06	-	-
Point Source (Vehicle)(g/s)	-	1.81E-04	1.08E-04	-	2.01E-02

Note:

a. Since emission factors are available for PM₁₀ the following assumptions are made for PM₁₀ and PM_{2.5} estimation

1. TSPM is considered as 5 times of PM₁₀
2. 60% of PM₁₀ is considered as PM_{2.5}

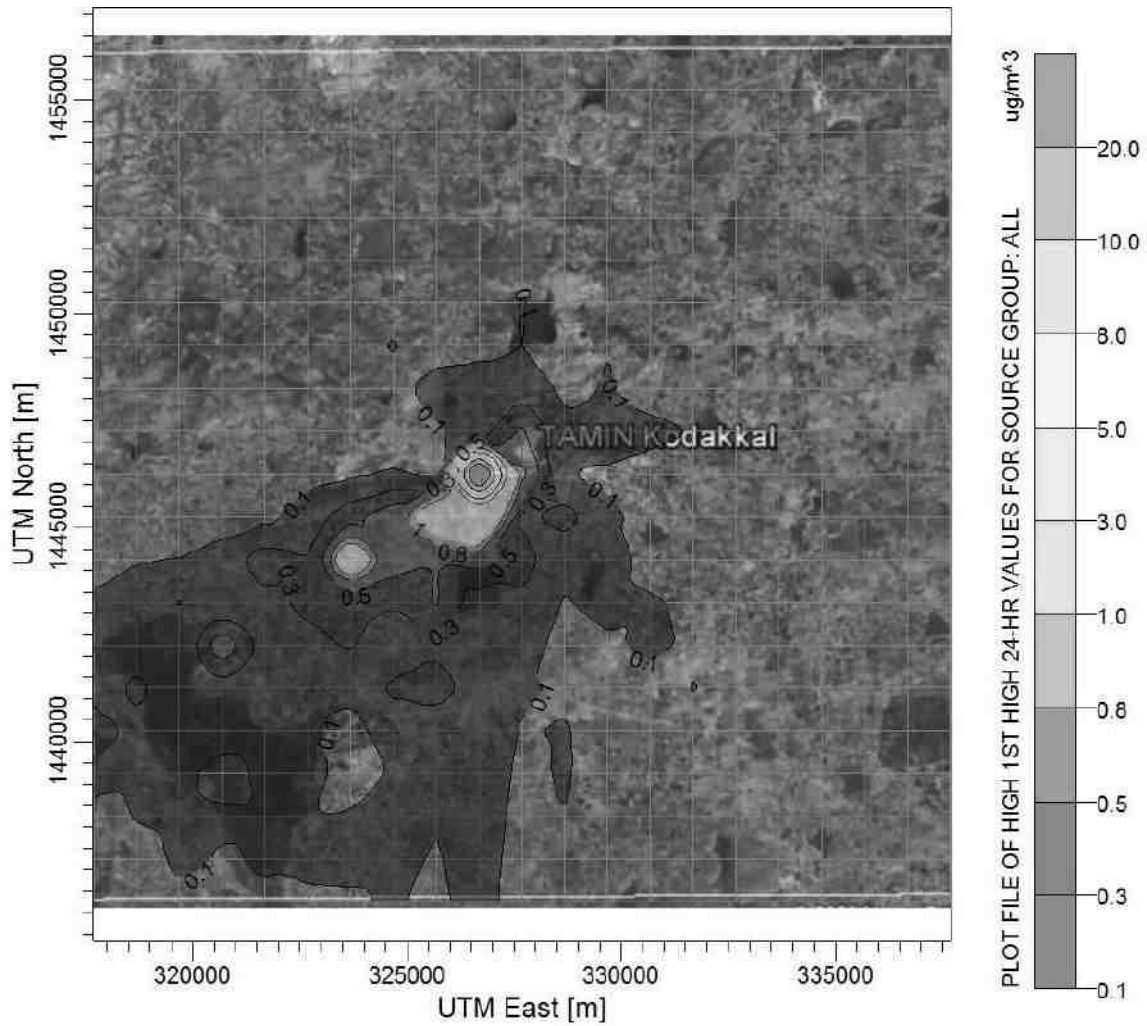


Figure 4-2 Predicted 24-Hrs GLC of Particulate matter TSPM within 10km Radius of the Study Area

Table 4-10 Predicted Top 10 Highest Concentrations TSPM

S.NO	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	326680	1446251	14.62566	1	W
2.	326680	1445251	2.24029	1.41	SW
3.	323680	1444251	1.56724	4.47	WSW
4.	325680	1445251	1.52862	2.24	WSW
5.	327680	1446251	0.88829	Project Site	
6.	324680	1445251	0.66306	3.16	WSW
7.	320680	1442251	0.64384	8.06	WSW
8.	324680	1444251	0.6352	3.60	WSW
9.	326680	1444251	0.61398	2.24	SSW
10.	327680	1447251	0.53122	1	N

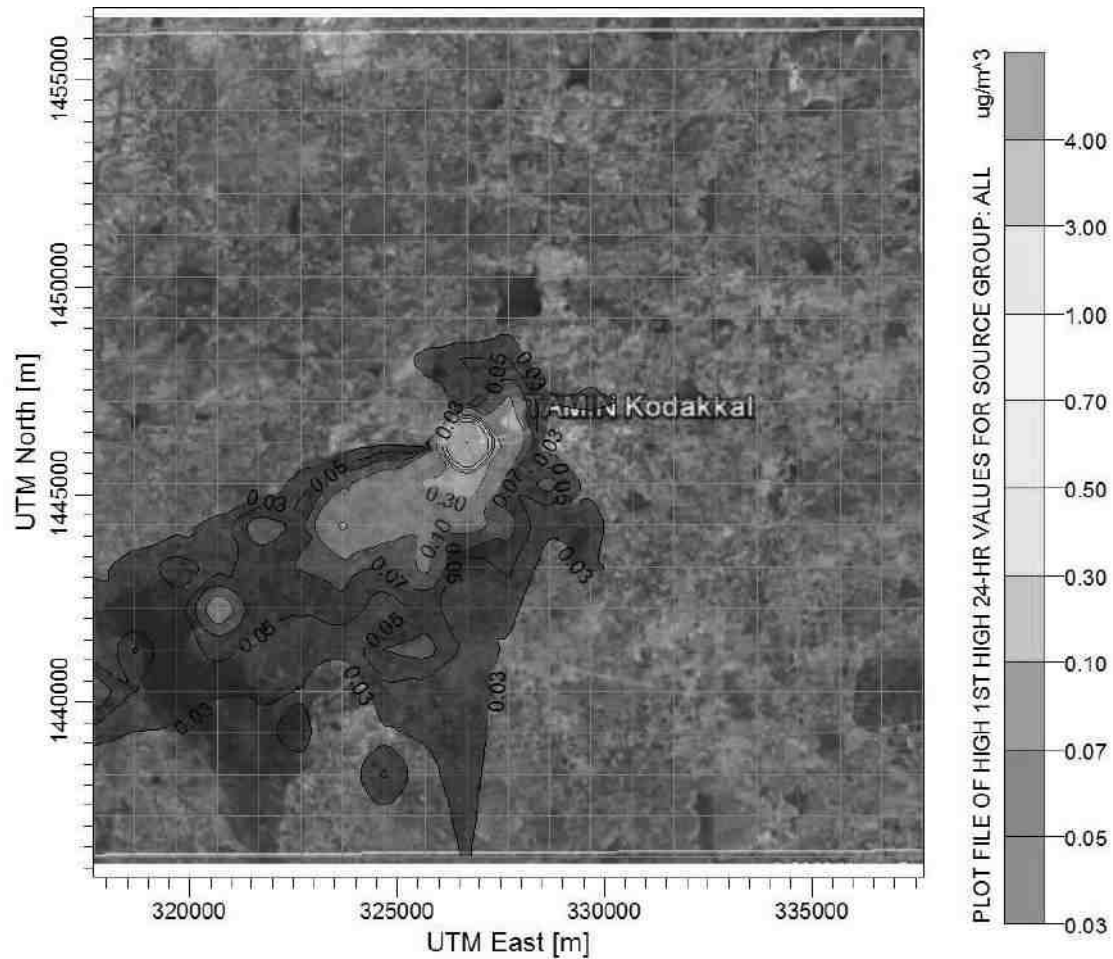


Figure 4-3 Predicted 24 Hrs GLC's of PM₁₀ within 10km radius of the study area

Table 4-11 Predicted Top 10 Highest Concentrations Particulate Matter PM₁₀

S.No	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	326680	1446251	3.02637	1	W
2.	326680	1445251	0.45257	1.41	SW
3.	323680	1444251	0.33281	4.47	WSW
4.	325680	1445251	0.31634	2.24	WSW
5.	327680	1446251	0.17856	Project Site	
6.	324680	1445251	0.14233	3.16	WSW
7.	320680	1442251	0.13541	8.06	WSW
8.	324680	1444251	0.13079	3.60	WSW
9.	326680	1444251	0.12417	2.24	SSW
10.	325680	1443251	0.11155	3.60	SSW

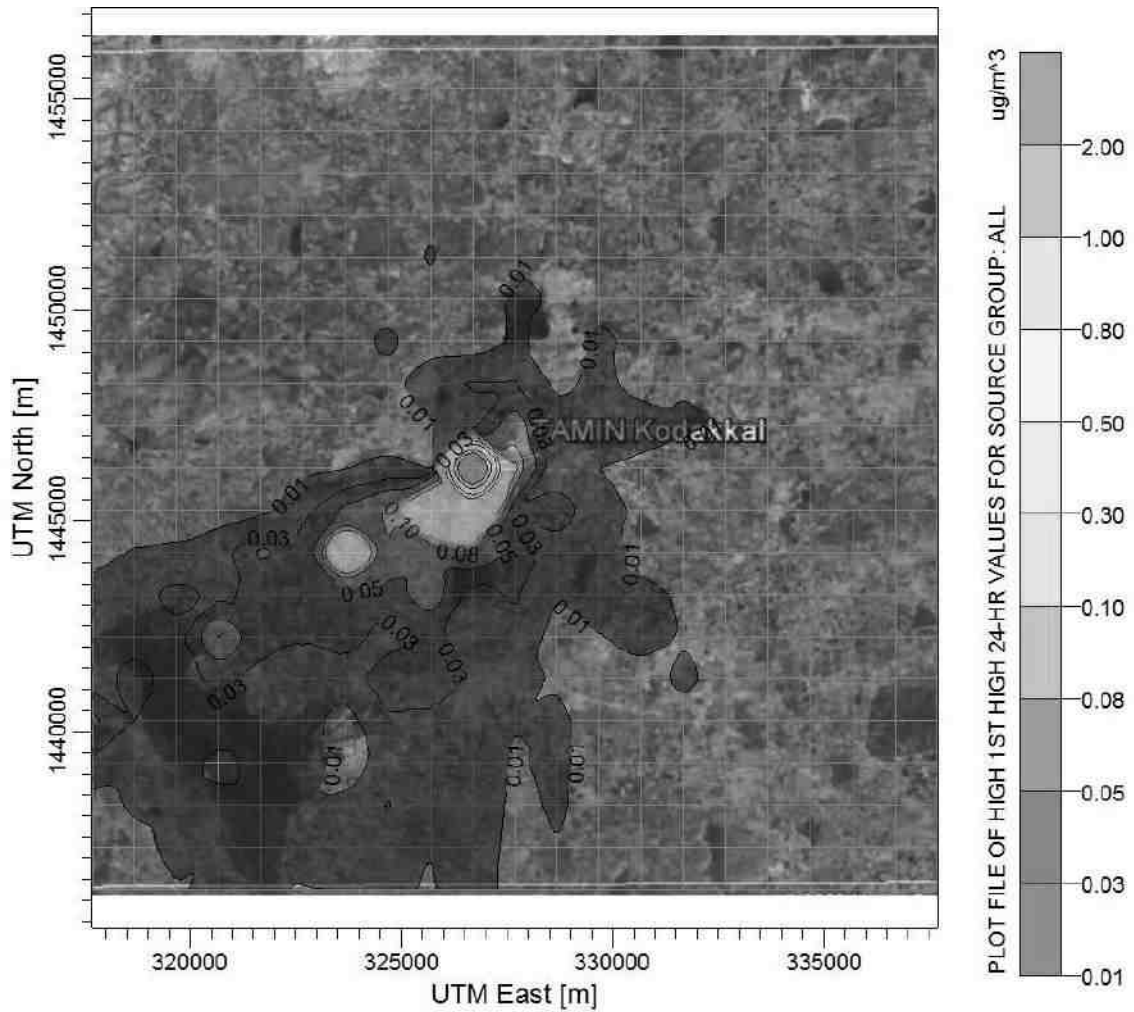


Figure 4-4 Predicted 24-Hrs GLC of Particulate matter PM_{2.5} within 10 km radius of the study area

Table 4-12 Predicted Top 10 Highest Concentrations Particulate Matter PM_{2.5}

S.No	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	326680	1446251	1.81299	1	W
2.	326680	1445251	0.27112	1.41	SW
3.	323680	1444251	0.19939	4.47	WSW
4.	325680	1445251	0.18951	2.24	WSW
5.	327680	1446251	0.10696	Project Site	
6.	324680	1445251	0.08527	3.16	WSW
7.	320680	1442251	0.08113	8.06	WSW
8.	324680	1444251	0.07835	3.60	WSW
9.	326680	1444251	0.07439	2.24	SSW
10.	325680	1443251	0.06683	3.60	SSW

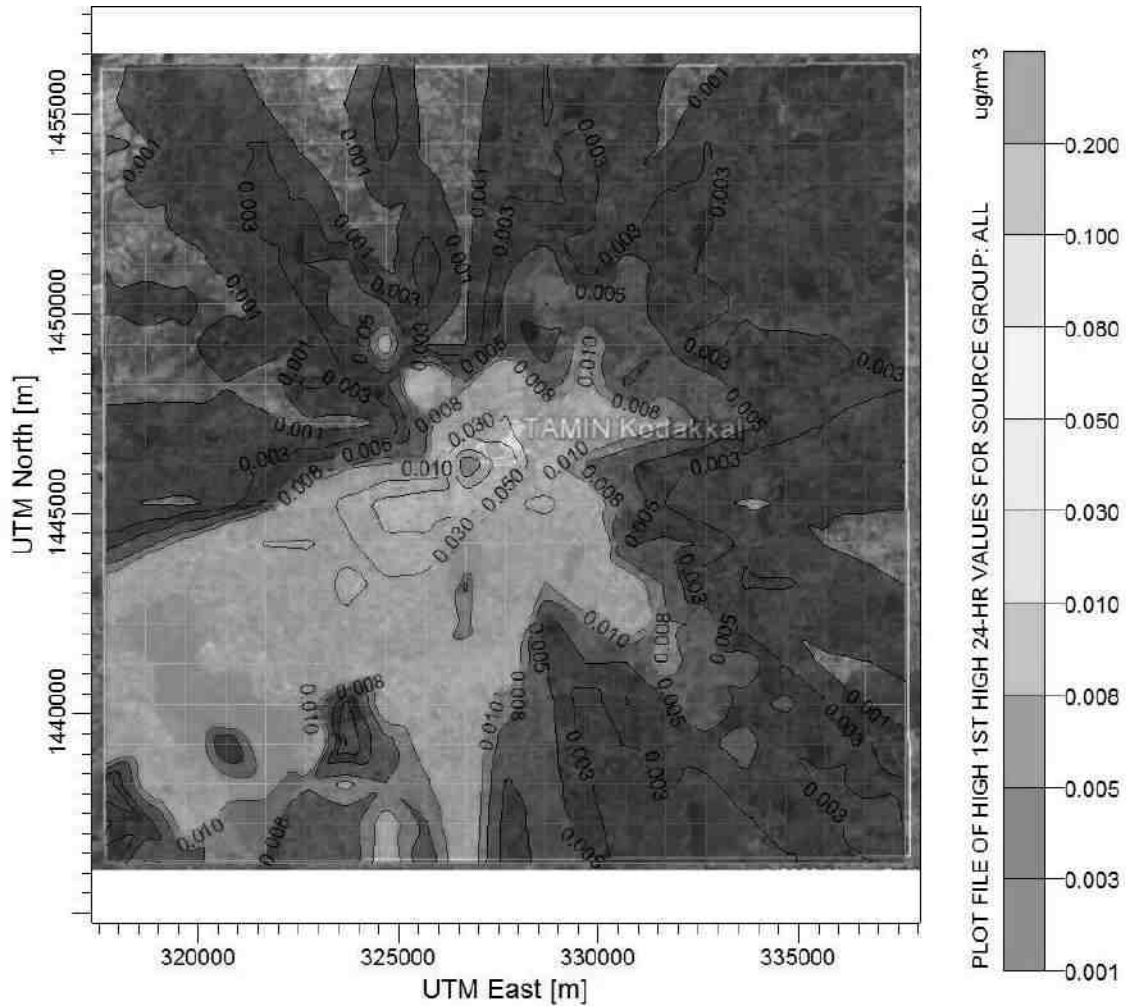


Figure 4-5 Predicted 24-Hrs' GLC's of SO₂ within 10 km Radius of the Study Area

Table 4-13 Predicted Top 10 Highest Concentrations of Sulphur Dioxide

S.No	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	326680	1446251	0.12345	1	W
2.	327680	1446251	0.07401	Project Site	
3.	326680	1445251	0.06924	1.41	SW
4.	325680	1445251	0.06799	2.24	WSW
5.	324680	1445251	0.05813	3.16	WSW
6.	324680	1444251	0.04802	3.60	WSW
7.	325680	1444251	0.04538	2.82	SW
8.	328680	1445251	0.03712	1.41	SE
9.	323680	1445251	0.03607	4.12	WSW
10.	323680	1443251	0.03584	4.98	WSW

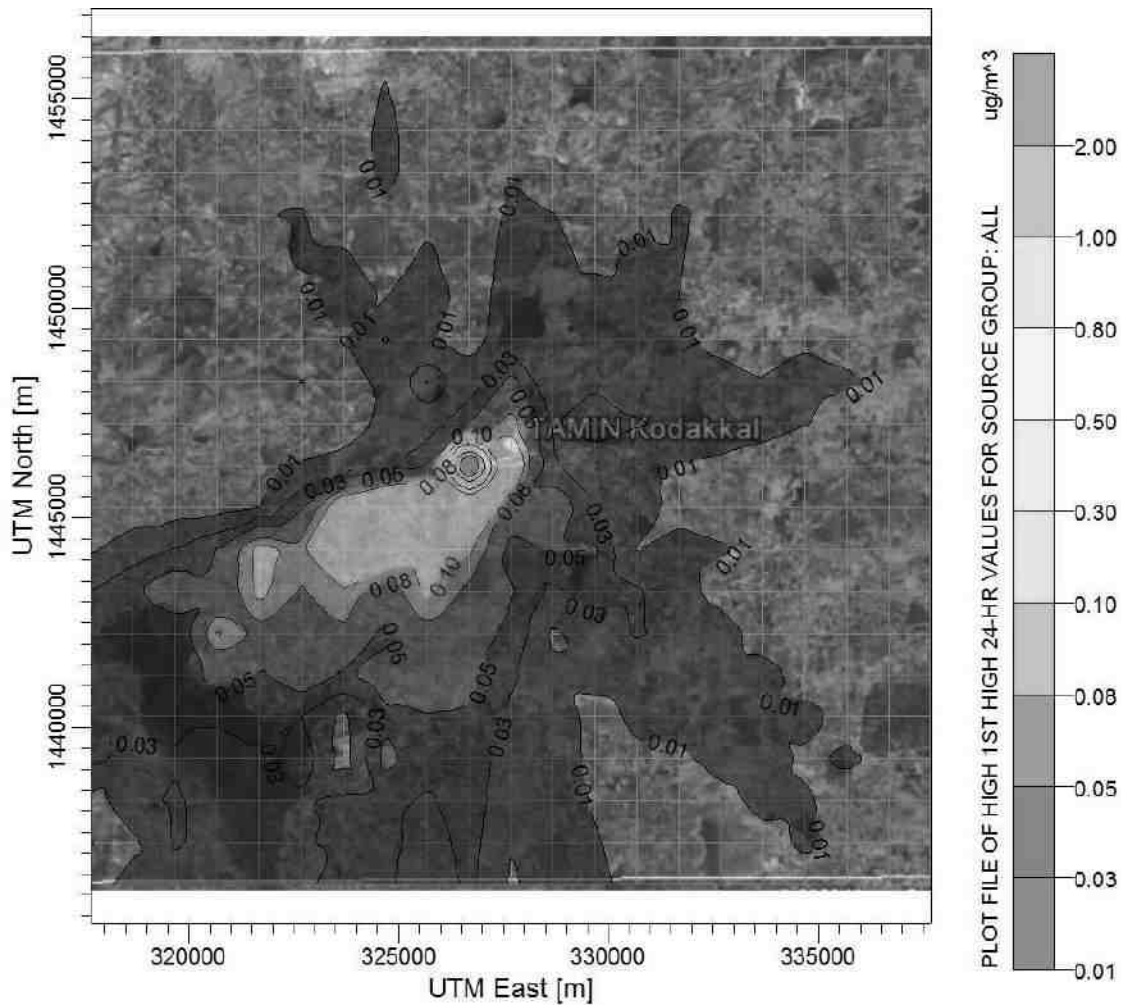


Figure 4-6 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-14 Predicted Top 10 Highest Concentrations Nitrogen Oxide

S.NO	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	326680	1446251	1.41063	1	W
2.	323680	1444251	0.26837	4.47	WSW
3.	325680	1445251	0.21003	2.24	WSW
4.	326680	1445251	0.18339	1.41	SW
5.	324680	1445251	0.17958	3.16	WSW
6.	327680	1446251	0.14764	Project Site	
7.	324680	1444251	0.13965	3.60	WSW
8.	323680	1445251	0.13683	4.12	WSW
9.	325680	1444251	0.11714	2.82	SW
10.	321680	1444251	0.11241	6.32	WSW

4.2.4 Conclusion

The total increase in concentrations above baseline status to estimate the percentage increase is summarized in the below **Table 4.15**.

Table 4-15 Total maximum GLCs from emissions

Pollutant	Max. Base Line Conc. ($\mu\text{g}/\text{m}^3$)	Estimated Incremental Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. ($\mu\text{g}/\text{m}^3$)	NAAQ standard	% contribution of concentration above Base line
TSPM	176	14.62	190	500	8.33
PM ₁₀	70.21	3.02	73.23	100	4.30
PM _{2.5}	45.49	1.81	47.3	60	3.98
SO ₂	17.29	0.12	17.41	80	0.69
NO _x	30.14	1.41	31.55	80	4.68

4.2.5 Impacts due to Transportation

The Granite is transported to consumer directly as per buyer's requirement. The granite will be transported through existing road by tippers and approx. no. of trips required is 2 times per week. This minimum trip does not create impact on existing transportation. The vehicular movement for the proposed project is given in Table 4.16.

Table 4-16 Existing & proposed vehicular movement per Hour (Peak Hour) SH-61

S. No	Type of Vehicle	Existing vehicles	Existing PCU	Proposed vehicles	Proposed PCU	Total vehicles after project implementation	PCU Factors IRC (SP 41)	Total PCU after project implementation
1	2 wheeler	97	72.75	7	5.25	104	0.75	78
2	3 wheelers	22	26.4	0	0	22	1.2	26.4
3	4 wheelers/ cars	59	59	2	2	61	1	61
4	truck/Lorry	43	159.1	11	40.7	54	3.7	199.8
5	agricultural tractor	27	135	0	0	27	5	135
6	light emission vehicle	4	5.6	0	0	4	1.4	5.6
	Total	252	457.850	20	47.95	272		505.8

Table 4-17 Traffic Volume after Implementation of the Project

For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification
Existing	252	457.85	1500	0.31	"A"	Free Flow Traffic
After implementation	272	505.8	1500	0.34	"A"	Free Flow Traffic

*LOS (Level of Service) categories are A-Free Flow, B- Reasonably Free Flow, C-Stable Flow, D- Approaching unstable flow, E- Unstable flow, F- Forced or breakdown flow

Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be Free Flow.

4.2.5.1 Mitigation Measures

The increment in the dust emissions will be mainly due to transportation activity. Therefore, emissions due to mineral handling during mining operation are not much and restricted to the lease area only. Proper mitigation measures are practiced during mining activities to control air pollution load below the prescribed limits are as follows:

- Regular water sprinkling on haul and access roads.
- Watering of haul roads and other roads at regular intervals
- Provision of green belt by vegetation for trapping dust.
- Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
- Utmost care will be taken to prevent spillage of sand and stone from the trucks.

4.3 Water Environment

The existing water environment quality has been studied and the study results are discussed in **Section 3.9 of Chapter-III**, which show that generally the water quality in the area is well within statutory standards.

The major sources of water pollution due to this quarry operation will be as below:

- Domestic sewage from the mine.
- Deterioration in surface / ground water quality of receiving body.
- Changes to hydraulic regime.

4.3.3 Wastewater Generation

There is no process effluent generation. The domestic sewage of 1.27 KLD will be disposed through septic tank followed by soakpit.

4.3.4 Mitigation Measures

4.3.4.1 Surface Water Pollution Control Measures

- A safety distance of 50m has been provided in the Southern side of the applied area and running through Patta lands of the Kodakkal village.

- Construction of garland drains of suitable size around mine area and dumps to prevent rain water descent into active mine areas.
- During monsoon season, the rain water will be collected by natural slope of area to water fed tank of the mine and it will be utilized for dust suppression and greenbelt development.
- The dump tops will be provided with inner slopes to control water flow to prevent erosion washouts. The dumps tops and slopes of in active areas will be covered with grasses, shrubs, mulching, etc, to prevent erosion, till final backfilling of dumps into mined out areas.
- Retaining walls of adequate dimensions will be provided at the top of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels
- The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water
- The worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes.
- The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB.

4.3.4.2 Ground Water Pollution Control Measures

- The domestic sewage from the toilets will be routed to septic tanks.
- Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out.

4.3.4.3 Rain Water Harvesting

- The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting.
- Construct barriers at suitable intervals along the path of the drains.
- Divert the water to de-silting cum rainwater harvesting pond in the mine area.
- Provide necessary overflow arrangement to maintain the natural drainage system.

4.3.4.4 Drainage pattern and Hydrogeology

- Catchment area inside the mine will be affected.

4.3.4.5 Mitigation measures

- The study has recommended new alignment in line with upstream drainage slope of the area to facilitate smooth entry of water into the diversion channel and ultimate discharge of water into the original stream. No reduction in surface run-off is envisaged.

4.4 Impact of Noise / Vibrations & Mitigation Measures

4.4.3 Impact of Noise on Working Environment

The main sources of noise in the mine are as follows:

- Transportation vehicles
- Loading & unloading of minerals.
- Drilling

4.4.4 Noise due to Drilling, Excavation and Transportation

The noise levels in the working environment will be maintained within the standards prescribed by Occupational Safety and Health Administration (OSHA). These standards were established with the emphasis on reducing the hearing loss. The permissible limits, as laid down by OSHA, are presented in **Table 4.18**.

Table 4-18 Permissible Exposure in Cases of Continuous Noise (OSHA, Govt. of India)

S. No	Sound Level (dB)	Continuous Duration (Hours)
1	85	8
2	88	4
3	91	2
4	94	1
5	97	0.5
6	100	0.25

4.4.5 Noise Due to Blasting

Blasting activities are involved in this Quarry as green belt will be developed around the mine which restricts the propagation of noise. The main source of noise in quarrying is due to usage of machinery like excavators, mining tippers and compressors and diesel generators.

Following mitigation measures should be taken to control noise pollution:

- Wherever the noise levels exceed 85 dB (A), workers should be provided with earmuffs, ear plugs etc.
- All vehicles and machinery will be properly lubricated and maintained regularly.
- Speed of the Vehicles entering and leaving the quarrying lease will be limited to 25 kmph.
- Unnecessary use of horns by the drivers of the vehicles shall be avoided.

4.4.5.1 Mitigate Measures

- Controlled blasting with proper spacing, burden and stemming will be maintained
- No secondary blasting.
- Minimum quantity of detonating fuse will be consumed by using alternatively Excel non-electrical initiation system.
- The blasting will be carried out during favorable atmospheric condition and less human activity timings.
- The prime movers/diesel engines will be properly maintained.
- Provision of sound insulated chambers for the workers deployed on machines.
- Proper designing of plant & machinery by providing inbuilt mechanism like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment.
- Greenbelts around infrastructure site, service building area and township.
- Trees will be planted on both sides of haul roads.

Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators.

4.4.5.2 Mitigate Measures

- Controlled blasting with proper spacing, burden and stemming will be maintained
- No secondary blasting.
- Minimum quantity of detonating fuse will be consumed by using alternatively Excel non-electrical initiation system.
- The blasting will be carried out during favourable atmospheric condition and less human activity timings.
- The prime movers/diesel engines will be properly maintained.
- Provision of sound insulated chambers for the workers deployed on machines.
- Proper designing of plant & machinery by providing inbuilt mechanism like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment.
- Greenbelts around infrastructure site, service building area and township.
- Trees will be planted on both sides of haul roads.
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators.

4.4.6 Impact of Vibration

Blasting activities are involved in Granite Quarry operations. The vibration during the moment of machinery will be minimal for a short span that will be well within the prescribed limits. Proposed

Peripheral green belt will be developed in 7.5m safety zone around the quarry. This will mitigate the Vibration.

4.4.6.1 Mitigation Measures

- Proper quantity of explosive, suitable stemming materials and appropriate delay system are to be adopted for safe blasting.
- Safe blasting zones are kept around the periphery of the quarry.
- Overcharging will be avoided. The charge per delay will be minimized and preferably more number of delays will be used per blasts.

4.5 Impact on Human Settlement

There are no monuments or places of worships in mine area. Ground vibration and noise pollution is maintained minimal and confined to the mine area. The quality of water both surface and ground water is good and all parameters of drinking water are as per IS standards. Water quality analysis will be carried out at periodical intervals during post project monitoring.

The PM, NO_x and SO₂ have been observed to be below the prescribed limit. Noise levels have also been found to be below the permissible limits at all the locations. Further, the noise generated in the lease area will get attenuated due to plantation and green belt all around the lease area. As preventive measures, greenbelt development around the mine lease area will be further strengthening for control of air emission to environment.

- All the employees when inducted will be medically examined. Further, they will also be medically examined at periodical interval.

4.6 Biological Environment

4.6.1 Mining activities and their impact on biodiversity

Table 4-19 Impacts on Biodiversity

S. No	Activity	Examples of aspects	Examples of biodiversity impact
1	Extraction	Land clearing	Loss of habitat, introduction of plant diseases, Siltation of water courses
2	Blasting, Digging and hauling	Dust, noise ,vibration, water pollution	Disruption of water courses ,impacts on aquatic ecosystems due to changes in hydrology and water quality
3	Waste dumping	Clearing, water and soil pollution	Loss of habitat, soil and water contamination, sedimentation.
4	Air emissions	Air pollution	Loss of habitat or species

5	Waste disposal	Oil and water pollution	Encouragement of pests, disease transfer, contamination of groundwater and soil
6	Building power lines	Land clearing	Loss or fragmentation of habitat
7	Provision of accommodation	Land clearing, soil and water pollution, waste generation	Loss of habitat, sewage disposal and disease impacts
8	Access roads	Land clearing	Habitat loss or fragmentation, water logging upslope and drainage shadows down slope
9	Population growth	Land clearing or increased hunting	Loss of habitat or species, stress on local and regional resources, pest introduction, clearing
10	Water supply (potable or industrial)	Water abstraction or mine dewatering	Loss or changes in habitat or species composition

4.6.2 Existing Biological Scenario

- There will not be any adverse impact due to mining operations in this lease since only small production is involved from this lease and there will not be any major polluting source from the mining operations. Besides, all necessary mitigation measures will be implemented.
- There is no perennial water body near the site and there will be no discharge of effluent from the mine.
- In the Quarry area or its proximate areas there is no wetland and the natural flow of water not available.
- There is no rare or endangered species.
- There are no wild animals in the area. In the post mining stage, proper fencing will be carried in the mined out area to prevent fall of animals in the mine pits.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.
- No such significantly important medicinal value species within both the ML areas and its nearby region.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.

4.6.2.1 Impact

- Displacement of existing fauna.
- Loss of vegetation

4.6.2.2 Mitigation measures

To reduce the adverse effects on flora/fauna status that are found in project area due to deposition of dust generating from mining operations, water sprinkling and water spraying systems will be ensured in all dust prone areas to arrest dust generation.

- Education and training etc.
- Logistic support in the form of equipment, Vehicles etc as required by the implementing DFO will be extended.

The objectives of the green belt cover will cover the following:

- Noise abatement
- Reuse of wastewater to the extent possible
- Prevention of soil erosion
- Ecological restoration
- Aesthetic, biological and visual improvement of area due to improved vegetative and plantation covers.
- Green belt around mine, dumps, etc:
 - Tall growing, closely spaced, evergreen trees native to the area
 - Easy, quick early growth and establishment
 - Uniform spreading of crown habit.
 - Timber trees having long gestation period.
 - Trees with high foliage density, leaves with larger leaf area
 - Attractive appearance with both good flowering and fruit bearing.
 - Bird and insect attracting species
 - Suitable green cover with minimal maintenance
- Avenue Trees:
 - Trees with conical canopy and with attractive flowering
 - Trees with medium spreading branches to avoid obstruction to the traffic
 - Trees with branching at 10feet and above.

4.7 Green Belt Development

The green belt plantation programme will be continued till the end of the mining operation in the area. In framing out this programme on a sustainable and scientific base, due consultation and coordination with the forest department will be sought.

An area of 0.06.5 hectare land was earmarked for greenbelt development during first 5 years of mining plan, TAMIN proposed to plant 20 No's of trees per year and Rs. 30,000/- per year will spend for proposed greenbelt development and maintenance.

Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action. The existing plantation will be developed around 7.5m safety zone of the quarry. The soil dumps, are planted to prevent erosion and for stabilization of the soil. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action.

4.7.1 Impacts on Occupational Health due to project operations

Anticipated occupational illness sequel to mining activities involved in the project. Occupational health problems due to dust & noise and Occupational illness by quarry activities are as follows;

- Dust related pneumonia
- Tuberculosis
- Rheumatic arthritis
- Segmental vibration

4.7.1.1 Mitigate Measures for Occupational Health

- Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc.
- Plantation
- Avoid blasting during unfavorable wind & atmospheric conditions.
- Use of personal protective equipment. Compliance with DGMS circulars.
- Emergency response plan that includes installation of emergency response equipment to combat events such as fire.
- All personnel required to handle hazardous materials will be provided with personal protective equipment suitable for the hazardous material being handled.
- On-site first aid facilities will be provided and employees will be extended to the local community in emergencies.

Table 4-20 Mitigation for occupational health and safety

S. No	Activity	Mitigation measures
1	Excavation	Planned excavation, avoid haphazard mining
2	Drilling and blasting	➤ In addition, the operators and other workers should be provided with masks, helmets, gloves and earplugs.
3	Safety zone	<ul style="list-style-type: none"> ➤ Provisions for a buffer zone between the local habitation and the mine lease in the form of a green belt of suitable width. ➤ Restricted entry, use of sirens and cordoning of the lasting area are some of the good practices to avoid accidents.

4	Overburden stabilization	<ul style="list-style-type: none"> ➤ Accidents are known to happen due to overburden collapse. ➤ Therefore, slope stabilization and dump stability are critical issues for safety and environment. Proper measures will be taken care.
5	Worker's health surveillance	<ul style="list-style-type: none"> ➤ Health survey programmes for workers and local community. ➤ Regular training and awareness of employees to be conducted to meet health and safety objectives.

4.7.1.2 Mitigate Measures for Safety Aspects

- To reduce pollution emanation from quarry operations, carry out splitting of sheet rock by diamond wire saw which largely reduces the dust and noise generation.
- Water sprinkling on haul roads and dumping yards, etc.
- Green belt creation wherever possible to arrest dust and reduce noise propagation.
- All staff and workers will be provided with PPE to guard against excess noise levels
- Provision of safety Helmets, goggles, safety boots, ear muffs, gas masks, etc.
- To provide appropriate instruction, training, retraining, vocational training, etc.
- Organization of safety contests and safety campaigns regularly to update knowledge of safe operational procedures, etc.
- Observation and compliance of all precautions, control measures and stipulations on above lines will ensure that in this project, health and safety problems will be minimal.

4.8 Impacts on Social Environment

Since the entire lease area of the project has no habitations or hutments in the core zone area, no rehabilitation or resettlement problems are involved. By adopting various mitigation measures as explained earlier, the environmental scenario in respect of ambient air quality, water quality, Noise levels, water aspects, biological aspects etc. during the operation of the project will be maintained within the statutorily prescribed levels. As such, impact due to the projects will be positive on socio-economic aspects. It will be ensured that the buffer zone of the quarry will be properly preserved environmentally in all respects within sustainable limits through necessary monitoring. The project will be operated with care for minimizing environmental impacts with proper EMP measures for pollution control.

Indirectly scores of people will be benefited by gainful indirect employment opportunities through various service related activities connected with the project operations as shown under.

4.8.1 Corporate Environmental Responsibility

TAMIN Kodakkal site had no Relocation and Rehabilitation. Most villages have benefitted mutually at Kodakkal where the mining industry has provided indirect jobs for labour and villages provide accommodation for the labour and staff. Supportive industries like food supply and essential shops are

economic growth in the villages. The site has provided road access to a few nearby village sites. CER activity will be carried out as per MoEF&CC OM dated 20.10.2020.

Other benefits to Community

- Project related logistical operations.
- Various trading services for consumer goods, spare parts, sundry items, etc.
- Contractual services connected with the project.
- Green belt works in the project.
- Casual labour needs for various activities.

The project will provide ample opportunity to the local people for direct and in-direct employment. The proposed project may create opportunities for indirect employment in the field of vehicle hiring, labours, trading of construction materials, carpenters etc. The major areas which required immediate attention relates to infrastructure support, health & sanitation, Anganwadi services, school education, youth development, income generation activities & veterinary services.

5 ANALYSIS OF ALTERNATIVES

5.1 Alternate Technology

The project is a fresh granite quarry. The technology used for mining is made by TAMIN in house there would not be any changes in the Mining. The mining technology is tried & tested method, and therefore there is no risk of technological failure. In addition to this the TAMIN is being processed to take care of any technological failures.

5.2 Method of mining

5.2.1 Opencast Method

Open cast, semi-mechanized mining with 6m vertical bench with a bench width is 6m with vertical slope. Under the regulation 106(2) (a) of the Metalliferous Mines Regulation 1961 in all open cast working in hard ore body, the benches and sides should be properly benched and sloped. The height of any bench shall not exceed 6m and the width thereof shall not be less than the height. The benches shall be sloped at an angle of more than 45° from the horizontal.

5.3 Alternate Site

The mineral deposits are site specific in nature; hence question of seeking alternate site does not arise. The project site is located at S.F. 1193/1(Part-5) & Part-16, Kodakkal Village, Sholinghur Taluk, Ranipet District, Tamil Nadu state. It is Government Poramboke land the applicant has obtained lease from the Government is enclosed as **Annexure -2**.

5.4 Connectivity

Existing road is available to from quarry ends with SH 61 (Walajh-Sholinghur-Arakonam) at ≈ 0.82 km towards WNW. The nearest railway station is Thalangai Railway station located at ≈ 8.59 Km towards SSE direction. NH 40 (Kurnool-Chittoor-Ranipet) situated at distance of ≈ 17.63 Km (SW).

6 ENVIRONMENTAL MONITORING PROGRAMME

6.1 General

The mitigation measures suggested in **Chapter 4** will be implemented so as to reduce the impact on the environment due to the operations of the project. The monitoring schedules are planned for systematic study of various pollution levels with respect to air and water qualities, noise levels, etc. to ensure that they conform to the standards laid down by Environmental Protection Act and various Central and State Pollution Control Board Limits. The various methodologies and frequency of studies of all environmental quality parameters also conform to norms laid down by MOEF& CC, CPCB and SPCB in this respect.

The Project proponent will be overseeing/reviewing following activities:

- To observe the implementation of environmental control measures.
- To ensure implementation of planned plantation programme with monitoring of survival rate, etc.
- To keep monitoring records properly for submission of periodical returns to statutory authorities and for checking by them.
- To evaluate periodically the performance of existing pollution control equipment and systems for taking prompt action in this respect to rectify the defects.
- Conducting safety audits and programmes to create safety awareness in workers/staff.
- Monitoring of dumps and benches for slope stability, monitoring of OB dumps, laying of check dams, garland drains around the dumps and excavated areas and their regular maintenance for de-silting.
- To study the effects of project activities on the environment.
- To interact and liaise with State and Central Government Departments.
- To take immediate preventive action in case of some unforeseen environmental pollution attributable to the project.
- Imparting training on safety and conduct safety drills to educate employees.
- To ensure that firefighting equipment, etc, are kept in ready-to-use condition.

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

6.2 Monitoring Schedules for Various Environmental Parameters

The proponent shall adopt the following monitoring schedule for environmental parameters. However, based on the need and priority it may be suitably modified / improved. However, since the

proponents are different, monitoring, fulfilling of all the statutory obligations and maintaining records are to be carried out separately by the proponents.

6.2.1 Ambient Air Quality

The following monitoring schedule is given for ambient air quality.

➤ **Parameters**

Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x), Suspended Particulate Matter (SPM), Respirable Particulate Matter (PM_{2.5/10}).

➤ **Frequency of Monitoring**

Once in a year in each location.

➤ **Location**

2 or 3 locations in buffer zone and 1 location in work zone. The environmental standards for Ambient air quality prescribed by CPCB/MOEF/SPCB.

6.2.2 Water Environment

Water quality monitoring at least before and after monsoon from ground water near the lease area and mine pit water sample shall be monitored. General, Physical and chemical parameters, COD, BOD, TSS etc shall be analyzed.

6.2.3 Noise Measurement

Work Zone noise and Ambient Noise level shall be monitored at least once in a year. Noise monitoring at ambient air monitoring locations will be carried out. Besides, vibration studies in the nearby villages shall be carried out, as per necessity and direction of DGMS, etc. The noise level standards as given by CPCB / MOEF given in **Table 6-1** will be enforced in the mine.

Table 6-1 Environment (Protection) Rules 1986

S. No	Area code	Category of area	Limits in dB(A) Leg	
			Day Time	Night Time
1	A	Industrial area	75	70
2	B	Commercial area	65	55
3	C	Residential area	55	45
4	D	Silence Zone	50	40

Note:

- Day time shall mean from 6 a.m. and 10.0 p.m.
- Night time shall mean from 10.0 p.m. and 6 a.m.
- Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.

- Mixed categories of areas may be average as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A “decibel” is a unit in which noise is measured.

“A”, in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is energy mean of the noise level over a specified period.

6.3 Post Project Environmental Monitoring

It is imperative that the Project Authorities set up regular monitoring stations to assess the quality of the neighboring environment of the project. An environmental monitoring programme is important as it provides useful information and helps to:

- Verify the predictions on environmental impacts presented in this study
- Assist in detecting the development of any unwanted environmental situation, and thus, provides opportunities for adopting appropriate control measures, and
- Identify the effectiveness of mitigate measures suggested in the EMP.

Table 6-2 Post Project Environmental Monitoring Program

S. No	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1.	Meteorology	One	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	2 Stations (In downwind)	Twice a week:24 hourly period	PM ₁₀ , PM _{2.5} , SO ₂ , and NO ₂
3.	Noise	2 (two within core area and two in buffer area)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
4	Exhaust from DG set	Stack of DG set	Quarterly	PM ₁₀ , PM _{2.5} , SO ₂ & CO
5	Vehicular Emissions	Parking area	Periodic monitoring of vehicles	Air emission and noise, PCU
6	Soil	Two Locations within the Project Site	Yearly Once	Physico chemical properties, Nutrients, Heavy metals

7	Terrestrial Ecology	Within 10km, around the project	Once in three years	Symptoms of injuries on plants
8	Surface/ Ground water quality	Two Locations Within Project Site	Yearly Once	As per ISO 10500 Standard parameters

6.3.1 Occupational Health and Safety

- Occupational health survey of staff and permanent workers will be undertaken at least once in 3 years to detect early incidence of diseases and for prompt remedial medical follow up in the matter. Audiometric test for the workers will be done at regular interval for workers of the noise prone area. Safety matters also will be reviewed periodically by safety in-charge.
- Occupational health and safety is very closely related to productivity and good employer-employee relationship. The main factors of occupational health in mines are fugitive dust and noise. Safety of employees during blasting operation and maintenance of mining equipment and handling of explosive materials is to be taken care of as per the Mine Regulations, 1961 and Circulars of DGMS. To avoid any adverse effects on the health of workers due to dust, heat, noise and vibration, sufficient measures have been proposed in the EMP. These include
 - Provision of wet drilling /or dust collectors
 - Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets etc.
 - Provision of personnel protection devices for the workers
 - Rotation of workers exposed to high noise areas
 - First-aid facilities

Occupational Health Survey of the employees will be carried out at regular intervals.

6.4 Environmental Monitoring Programme

Table 6-3 Environmental Management Plan

S. No	Salient Items	Position at the end of five years of Mining period
1	Land Reclamation	The pit boundaries shall be safely fenced and used for agricultural purpose when the pit is filled with underground seepage or rain waters
2	Waste Management	The waste materials can be dumped along the north eastern part of the lease area. By adding suitable variety of soil brought from outside and planting trees over the waste dump
3	Afforestation program with precautions for survival and protection of plantation.	As proposed, 20 plants per year were planted during the mining Period along the eastern boundary of lease area and achieved survival rate of 50%.

4	Quality of mine water and any interference with surface waterspruces	Followed the Procedure as proposed in the Mining plan.
5	Measures for dust suppression	Water will be sprinkled for the suppression of air borne dust from mine approach roads, waste dumps on regular intervals using water tankers.

7 ADDITIONAL STUDIES

7.1 Introduction

The additional studies involved in this project will consist of following aspects:

1. Public consultation
2. Risk assessment /Disaster Management Plan
3. Mine closure plan as per GCDR 1999
4. Occupational Health and safety studies have been conducted and a safety plan was prepared.

7.2 Public Consultation

The proposed project is categorized as 'B1' category Schedule 1(a) as per EIA Notification 2006 and its amendments there after. The total area of the quarry is 20.95.5 Ha.

However, the proposed project falls under 'B1' category, Schedule 1(a), Public Hearing is Mandatory. So, EIA report has been prepared as per the obtained ToR vide. Lr No: SEIAA-TN/F.No.9648/SEAC/ToR-1344/2023, dated: 16.02.2023. Draft EIA report will be submitted for Public Hearing (PH) to Ranipet PCB. After PH, the minutes obtained will be incorporated in the EIA report along with action plan by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

After PH, the minutes will be incorporated in the EIA report along with action plan or commitment by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

7.3 Risk Identification & Management

7.3.1 Introduction

Mining and allied activities are associated with several potential hazards both to the employees and the public at large. A worker in a mine should be able to work under conditions that are adequately safe and healthy. At the same time the environmental conditions should be such as not to impair his working efficiency. The various safeguards to be taken to ensure the safety of the mine and that of employees are provided in the Mines Act, 1952. Risk involves the occurrence or potential occurrence of some accidents consisting of an event or sequence of events. The risk assessment study covers the following:

- Identification of potential hazard areas.
- Identification of representative failure cases.
- Visualization of the resulting scenarios in terms of fire (thermal radiation) and explosion.

- Assess the overall damage potential of the identified hazardous events and their impact zones from the accidental scenarios
- Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view
- Furnish specific recommendations on the minimization of the worst accident possibilities.
- Preparation of broad DMP, On-site and Off-site Emergency Plan.
- Occupational Health and Safety Plan.

The complete mining will be carried out under the management control and direction of a qualified mine manager holding a first class manager's certificate of competency. Moreover, mining staff will be sent to refresher courses from time to time to keep them alert. However, following natural/industrial hazards may occur during normal operation:

- Accident due to explosives
- Accident due to heavy mining equipment; and
- In order to take care of above hazard/disasters, the following control measures will be adopted.
- All safety precautions and provisions of the Mine Act, 1952, the MMR 1961 and the Mines Rules, 1955 will be strictly followed during all mining operations
- Entry of unauthorized persons will be prohibited
- Firefighting and first-aid provisions in the mines office complex and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use
- Training and refresher courses for all the employees working in hazardous premises; Under mines rules all employees of mines will have to undergo the training at a regular interval
- Working of mine, as per approved plans and regularly updating the mine plans;
- Cleaning of mine faces will be regularly done
- Handling of explosives, charging and blasting will be carried out by competent persons only.
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines.
- Suppression of dust on the haulage roads
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.
- For any type of above disaster, a rescue team will be formed by training the mining staff with specialized training.

7.3.2 Identification of Hazards in Open Cast Mining

There are various factors, which can cause disaster in the mines. These hazards are as follows:

- Drilling

- Blasting
- Overburden handling
- Heavy Machinery

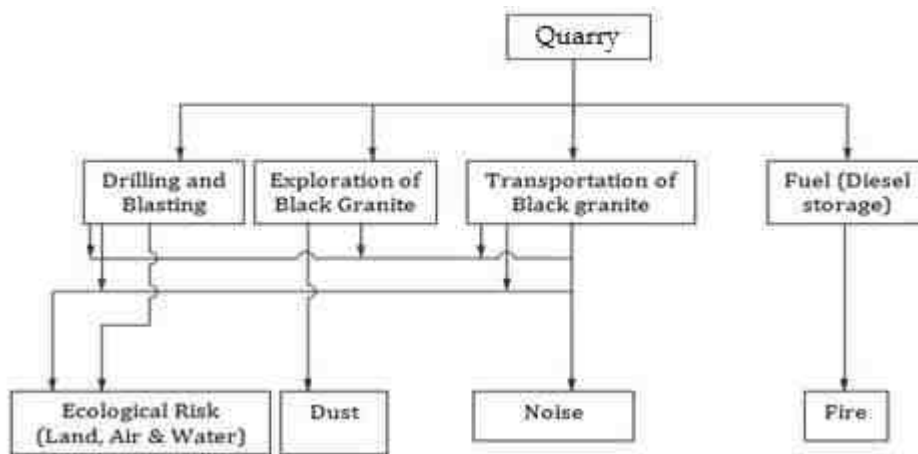


Figure 7-1 Identification of hazards in open-cast mine

7.3.2.1 Drilling

Drilling is an important activity in mining. This activity releases particulate matter into the air and noise in the vicinity of the operation. The particulate matter/dust can be arrested by employing dust extractor, wet or dry type. The usage of standard drill bits also reduces the dust formation. The noise is also arrested by the usage of dust extractors. The compressors which feed the compressor air to the drilling jack hammers can be covered in acoustic enclosures which reduce the dust and noise. The hard strata will be excavated after drilling and blasting. Drilling will be done with jack hammers up to 1.2 to 1.5m depth having a diameter of 30-32 mm.

7.3.2.2 Blasting

Most of the accidents from blasting occur due to the projectiles, as they may sometimes go even beyond the danger zone, mainly due to overcharging of the shot-holes as a result of certain special features of the local ground. Flying rocks are encountered during initial and final blasting operations. Vibrations also lead to displacement of adjoining areas. Dust and noise are also problems commonly encountered during blasting operations.

- The damaging impacts on environment are evident noise, gas, and flyrock and ground vibration.
- The last factor is most important for safety of constructions, buildings and various natural objects in the vicinity of mining area.
- The ground vibration parameters, crucial for safety of endangered objects have a significant correlation with charge weight and distance of blasting.

- This study tried to associate the main vibration parameter, particle velocity with blasting parameters and properties of vibration medium.

7.3.2.3 Precautionary Measures to Avoid Accidents Due to Blasting

- The provisions laid down in the MMR 1961 related to Blasting shall strictly be followed. However, some of the main provisions are written here
- The Wire saw and crack powder will be utilized extensively to reduce the requirement for blasting.
- The blasting will be done under supervision of blaster/mine mate/mine foreman/mine manager
- Shots shall not be fired except during the hours of daylight.
- The holes charged on any particular day shall be fired on the same day.
- Adequate blasting shelters or other protection shall be provided at mines.
- The shot-firer shall give sufficient warning by effective signals over the entire area falling within a radius of danger zone.
- Multi-shot exploder shall be used. A shot-firer will fire maximum 120 Shots.
- During the approach and progress of electrical storm, adequate precautions shall be taken.

7.3.2.4 Overburden Handling

No overburden will be generated in the proposed project and side burden dump may cause landslides. High side burden dump created at the quarry edge may cause sliding of the side burden dump or may cause failure of the pit slope due to excessive loading, thereby causing loss of life and property.

7.3.2.5 Heavy Machinery

Most of the accidents during transport of dumpers, trucks, proclain, ripper dozers and other heavy vehicles are often attributable to mechanical failures and human errors.

7.3.2.6 Precautionary Measures to Prevent Accidents due to Trucks and Dumpers

- All transportation within the main working shall be carried out directly under the supervision and control of the management.
- The vehicles must be maintained in good conditions and checked thoroughly at least once a week by the competent person authorized for the purpose by the Management.
- Road signs shall be provided at each and every turning point especially for the guidance of the drivers.
- To avoid danger while reversing of vehicles especially at the embankment and tipping points, all areas for reversing of lorries should as far as possible be made man free. A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.
- Generally, oversize rocks shall be dealt with in the pit by secondary blasting.

- A Load consisting of large rocks must not be over the edge. This is unsafe and may damage equipment.
- The movement of the dumpers will be governed under the Code of Traffic rule, this is already formulated & implemented.

7.3.2.7 Storage of Explosives

The explosive requirement of the quarry operation is minimal. The blasting requirement will be carried out using contractors approved by the Controller of Explosives. No Explosive storage is envisaged in this quarry.

7.3.2.8 Safety Measures at the quarry

- Adequate care has been taken in deciding the size of the bench for the working pit.
- The benches are properly sloped at an angle of 60 degree to avoid any spillage of benches.
- Adequate drainage system at the top of the pit and also on the benches shall be made to prevent erosion of the benches.
- The quarries will be protected by garland drains around the periphery for storm water drainage.

7.3.3 Disaster Management Plan

The disaster management plans aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills. The objectives of the disaster management plan is to make use of the combined resources of the mining operation and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties
- Safeguard other people
- Minimize damage to property and the environment
- Initially contain and ultimately bring the incident under control
- Identify any dead
- Provide for the needs of relatives
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected area
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency
- In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Emergency Organization (EO)

It is recommended to setup an emergency organization. A senior executive (Mine Manager) who has control over the affairs of the mine would be heading the emergency organization. He would be designated as site controller. As per the general organization chart, in the mines, the Mines Foreman would be designated as the Incident Controller (IC). The incident controller would be reporting to the site controller. Emergency coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services.

Emergency Communication (EC)

Whoever notices an emergency situation such as fire, growth of fire etc. would inform the Mines Foreman. The Mines Foreman would appraise the site controller. Site Controller verifies the situation from the incident controller takes a decision about an impending on site emergency. Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

In order to handle disaster/emergency situations, the following personnel shall deal with the disaster/Emergency

- Mines Manager-site controller
- Mines Forman-incident controller
- Mine mate –Fire controller
- Senior most Driver-Transport coordinator
- Senior most operator- Medical coordinator

7.3.3.1 Emergency Services

This includes the fire-fighting system, first aid center, etc. Alternate sources of power supply for operating fire pumps, communication with local bodies, fire brigade etc. will also be clearly identified. Adequate number of external and internal telephone connections shall be installed.

1. Fire Protection System
2. Off Site Emergency Plan

7.3.3.2 Fire Protection System

The fire protection system for the project maintained will consist of Portable hand appliances of suitable types/capacities for extinguishing small fires in selected mine areas, storages areas such as that of Diesel, Explosives, etc.

7.3.3.3 Off-Site Emergency Plan

The offsite emergency plan defining the various steps to tackle any offsite emergencies, which may affect surrounding areas of the project, has to be prepared after due finalizing discussion in this respect with local Panchayat official, Revenue officials and District Collector. As per this off site plan, in case of any off site emergencies, actions have to be promptly initiated to deal with the situation in consultation with Collector and other revenue officials.

7.3.4 Mine Closure Plan

Land degradation is one of the major adverse impacts of opencast mining in the form of excavated voids and also in the form of waste dumps. As per the petro genetic character, the depth persistence of the black granite body in the area is beyond the workable limits. However, it is very difficult to operate granite dimensional stone mine economically below a depth of 40m by observing the statutory of mine safety rules and regulations. Hence in the proposed mining plan, only 40m depth has been envisaged as 'Workable depth' for safe and economic mining.

However, it is proposed not to back fill the ultimate pit, in as much as quantity of reserves is available below the workable depth of 40m and there is possibility of technology up-gradation in granite mining for greater depths. The site boundaries shall be safely fenced and used as a reservoir after mining activities are over.

There is no proposal for back filling, reclamation and rehabilitation. The quarried pits after the end of the life of lease will be fenced to prevent inherent entry of public and cattle. There is no proposal for back filling, reclamation and re habitation

7.3.4.1 Progressive Mine Closure Plan

The various schedules for mining activities regarding mining of granite block, waste disposal, proposed land use pattern, environmental preservation measures, disaster management plan, etc. have been fully covered in the earlier chapters in this EIA/EMP report.

Concurrent planning for various steps to be adopted for final mine closure, along with regular working schedules and systems of the mine, will facilitate to effect smooth switchover to final mine closure stages ultimately

7.3.4.2 Water Quality Management

The ground water quality in the region indicates neutral range with pH values. Most of the analytical results for ground and surface water showed parameter concentrations well within the permissible limits. Garland drains will be provided all along the periphery of the mining pit and along the toes of the side burden dumps. These drains will be aligned in such a way that all the surface drainage water will be carried away from the mining zone to settling tanks.

The mining pit's catchment water will be coursed to the main sump and used for dust suppression and green belt development & plantation activities.

7.3.4.3 Mines Seepage Water

The experience of mining during past three years suggests a very little, almost negligible seepage of water in the mining pit. It will be collected in a well guarded pond / sump for settling of solids. The treated water will be used for dust suppression on working faces, haul roads and dump surfaces.

7.3.4.4 Air Quality Management

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e., during Pre-Monsoon season (**Mid of Jan 2023 – Mid of April 2023**). PM₁₀, PM_{2.5}, SO₂, NO_x, Pb, NH₃, C₆H₆, C₂₀H₁₂, As, Ni, were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location.

The following precautions have been considered for abatement of air pollution in the black granite mine area:

- Water sprinkling shall be carried out at the active working faces, on all haul-roads and the dump surfaces.
- Regular cleaning and removal of spillage black granite from haul roads and weigh bridge areas.
- Proper and regular maintenance of mining equipments.
- Development of comprehensive green belt around overburden dumps to reduce fugitive dust emissions in order to create clean and healthy environment.

7.3.4.5 Solid waste Management

As is stated earlier, mining will be carried out by opencast semi-mechanized method using conventional mining equipments i.e., hydraulic excavators / shovels and dumpers combination with ancillary mining equipment like compressor, wire cutting machine, generator etc.

The mine waste in the mine includes the over lain unrecoverable boulders / rock fragments and rubbles generated as granite rejects during the production works and the waste fragments generated during development works will be utilized for forming approach road and dumping yard purposes. Adequate space has been identified within the lease applied area for dumping such waste material on barren land covered with soil. The 7.5 m safety distance as well as the defective portion of the deposit may also be used for waste dumping purpose.

7.3.4.6 Stabilization of Dump

As the waste generation in the mine includes hard rock fragments of considerable size and irregular shape with varying angularity, the waste dump will be stable on its own even at higher slopes of the sides. However, suitable variety of soil will be identified and brought from outside and used for

increasing the stability of the sides of the waste dumps and also for planting trees over the dumps in a phased manner.

7.3.4.7 Mine Drainage

The lease applied area is hillock 40m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 20m depth. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the ground water are collected at one point called as sump and dewatered nearby agricultural field with the help of 10HP oil engines.

7.3.4.8 Disposal of Waste

The Mine waste in the mine includes the over burden, side burden, rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation, formation of dumping yard sites etc., During the first five years of Mining Plan period, such waste material are proposed to be dumped along the Southern part of the lease area where it comprises of country rock terrain.

7.3.4.9 Top Soil Management

Topsoil will be properly stacked at earmarked dump site with adequate measures. It will be used for growing plants along the fringes of the site roads and reclamation of external dump and backfilled area. The topsoil stockpiles will be low height and will be grassed to retain fertility. Besides these topsoil stacks there will be temporary stacks near the excavation area and area to be reclaimed which will be made use of for concurrent lying without bringing the topsoil to the soil stack near the OB dump.

7.3.4.10 Disposal of Mining Machinery

Mining operations are planned to be operated using Company owned machinery. The company has its own Excavators, Mining Tippers, compressors; wire saw machine, jack hammers, and other mining equipment. These machines are compliant to the RTO conditions and CPCB conditions. Further, the company also operates a central workshop at Salem, to cater to major repairs/Rectifications of company Equipment.

These machineries are written off and disposed on completion of their normal life as per the set guidelines of the Government and TAMIN Board. The surplus machinery in working order, will be transferred to Company's other projects.

7.3.4.11 Other Infrastructure

Mine office, store room, first-aid room etc, will be provided on semi-permanent structures within the lease applied area.

7.3.4.12 Safety & Security

The water ponds developed in the reclaimed areas shall be properly fenced for safety. The water from these ponds is likely to be potable and shall be used for human & cattle consumption and for agriculture purposes.

7.3.5 Social Impact Assessment R & R Action plan

There will be no Rehabilitation and Resettlement in this proposed project.

8 PROJECT BENEFITS

8.1 Improvements in the physical infrastructure

Providing Smart screen facilities for nearby Govt.School& Solar Pannel (2 No's) in Kodakkal village.

8.2 Improvement in the Social infrastructure

- Improvement in Per Capita Income.
- The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
- It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.

8.3 Employment potential –skilled; semi-skilled and unskilled

- The quarrying activities in this belt will benefit to the local people both directly 30 persons & indirect persons are 20 Nos.
- The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers.

8.4 Other Tangible Benefits

Cultural & economic Development of the nearby villages.



9 ENVIRONMENTAL COST & BENEFIT ANALYSIS

(Not recommended during scoping stage)

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Environmental Management Plan

Environmental Management Plan covers the genesis of pollution, the principal sources of pollution, the nature of pollution, the proposed measures required for meeting the prevailing statutory requirements of air emissions, waste water discharge characteristics, noise levels, land use, socio economics etc for environmental management purpose in connection with the mining and quarrying related activities in the study area.

10.2 Emission Source Identification

The Emission sources are activities related to pits and quarries including, overburden operations, drilling, hauling, loading and unloading stockpiles. The emission sources may be subdivided into six broad categories:

- Emissions of PM and road dust due to HEMM & Mining Tippers.
- Emissions from generators.

10.3 Air Quality Management

Quarrying operations are semi mechanized, but there is involvement of labours too. Dust would be generated during the course of over burden removing, drilling, mining, hauling, handling and transportation of the material. Dust is likely to be generated from emissions of diesel vehicles such as SO₂, NO_x etc.

10.3.1 Measures for dust suppression

Water will be sprinkled for suppression of air borne dust on mine haulage roads and waste dumps on regular intervals by water tankers. Drilling of blast holes of 32 mm dia will be always under wet condition to prevent flying of dust. In the unloading point of Tippers, water will be sprinkled and further the drillers are provided with respirators in accordance with mines regulations.

10.3.2 Emissions from Material Handling

PM emissions occur during the handling and transfer operations of material from one process to another within the facility. Open storage piles of raw material and products are generated at various points throughout the operational area. The environmental control measures, which will be taken and proposed to control the fugitive dust released during the stone quarry production are given below:

- The working faces will be regularly wetted before carrying out the drilling and excavation.

- Dust masks will be provided to the workers especially for the drillers and for the workers working in the loading operations.
- Periodic health checkup for the workers shall be done
- Plantation along approach roads and surrounding the Quarry Lease area.
- Water tankers with spraying arrangement will be used for regular water sprinkling on the haul roads to ensure effective dust suppression.

Haulage

- Haul road will be maintained regularly.
- Speed limits will be prescribed for transport vehicles.
- Water will be sprayed daily on the roads by using water tankers.
- Periodic maintenance of the trucks used for transport shall be done to reduce smoke emissions.
- Over loading of trucks is avoided.

10.4 Noise Pollution Control

In an operational mine major noise sources are operation of mine machineries, equipment & plying vehicles. Noise generation may be for an instant, intermittent or continuous period, with low to high decibels. General noise levels generated at mines are documented as below:

Equipment	Noise Level (dB (A))
Rotary Drills	72-100
Compressor (85 m ³ /min)	50-55
Excavator	75-90
Diesel Tipper	74-109
Diesel Generator	80-94

The management plan for controlling noise pollution is as given below.

- Reducing the drilling operations as far as possible.
- Provision of earmuffs to workers working in high noise prone areas.
- Proper gradient of haul roads to reduce cumulative noise levels.
- Development of green belt all along the boundary of the mining lease area which will act as effective noise barrier.
- Use of Diamond Wire Saw machine and crack powder to reduce noise.
- Restriction of blast hole drilling to only day time hours and usage of sharp drilling bits and delivery of compressed air at optimal pressure during drilling.

- Noise emanating machine such as compressors, diesel generator is enclosed in acoustic enclosure so as to reduce the noise level.

10.5 Water Pollution Control Measures

10.5.1 Surface Water

There are no major streams and rivers, which can get effected by the mining. Hence there will be no major effect on the surface water environment. Surface water ditches or channels will be made to divert all surface drainage for agricultural purposes.

10.5.2 Mine Drainage Water

Mine water will be used in mechanized cutting of the blocks and for wetting purpose. The runoff from the dumps will be channelized and care will be taken.

- Mine water will be used in wet drilling process, dust suppression & green belt development
- The runoff from the dumps will be channelized and care will be taken.

10.6 Land Environment

Landscape will be slightly changed due to open cast quarry. There will be no land subsidence as area is made up of hard rock. Aesthetic environment will not be effected, as the quarry is located in hilly terrain. Soil cover and the weathered material accounts for the Over Burden. Agriculture is seen mainly in the plains far away from the lease area. A few bushes will be cleared to facilitate mining and other related activities and there are no big trees.

- Top soil shall be used in afforestation work, as early as possible.
- A retaining wall and garland drain will be constructed all around to prevent the wash off. Landscape will be changed due to open cast quarry. There will be no land subsidence as area is made up of hard rock. Aesthetic environment will be effected.
- Soil cover and the weathered material accounts for the Over Burden
- Top soil will be removed & stored on the inner boundary of the mining lease area. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks.

10.6.1 Top soil management

Top soil will be removed in advance and stacked separately. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks. Top soil shall be used in afforestation work, as early as possible. A retaining wall and garland drain will be constructed all around to prevent the wash off.

10.7 Solid Waste Management

The solid waste that is likely to be generated during the quarry activity will be stacked along the lease barrier according to their quality and size. The sub Grade material and waste generated will be stored within the lease boundary over areas where there are no granite deposits. All the care will be taken to minimize the waste generation at the source.

- Top Soil recovered will be used in the green belt areas on the Southern side of the lease area.
- Top soil Stored on the inner boundary of the mining lease area. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks.
- The solid waste that is likely to be generated during the quarry activity will be stacked along the lease barrier according to the mining plan.
- All the care will be taken to minimize the waste generation at the source.

10.8 Stabilization of Dumps

The dumps are mainly constituted of quarry waste. It will be afforested properly to stabilize the dumps and preserve soil character. Garland canal also will be dug around the dump.

As the waste generation in the mine includes hard rock fragments of considerable size and irregular shape with varying angularity, the waste dump will be stable on its own even at higher slopes of the sides. However suitable variety of soil will be identified and brought from outside and used for increasing the stability of the sides of the waste dumps and also for planting trees over the dumps in a phased manner.

10.9 Biological Environment

As in any typical Ligneous rocks deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely. No wildlife is found in quarry Lease area. In order to minimize the impacts and to improve up on the existing eco system afforestation plan will be envisaged.

- As in any typical intrusive igneous rocks deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely.
- In order to minimize the impacts and to improve up on the existing eco system afforestation plan will be envisaged.
- No wildlife is found in quarry Lease area.

10.10 Granite Conservation and Development

The mining plan proposed has fully covered the aspects of granite conservation with a future plan to extend the proposed working of the mine to the full depth of the deposit. Extreme care will be taken to ensure proper supervision of quality control of the granite dimensional stone aimed at the recovery of

the maximum saleable quantity / quality of granite dimensional stones suitable for full utilization of the consumers.

10.11 Afforestation Plan

The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain, wind erosion, improve the aesthetics and support the re-creation of bio-diversity.

- Afforestation will be taken up along the lease area.
- In the Scheme of Mining 20 plants per year is proposed to be planted for complying Afforestation program with the arrived survival rate of 50% in the North western portion of the lease area in the phased manner.
- Only Shrubs and bushes are seen in the quarry Lease area.

10.12 Occupational Health & Safety Measures

Granite stone does not contain any toxic elements. Further this being a semi-mechanized mine, production is by semi-mechanized means and waste material handling partly by mechanized way, there shall be marginal impact on air and noise qualities. Therefore, the possibilities of any health hazards are minimal.

- Awareness and planning are keys to prevention of occupational health hazards.
- Conducting air monitoring to measure worker exposures and to ensure that provided controls are adequate for protection of workers.
- Adequate respiratory protection will be provided to the workers.
- Periodic medical examinations for all workers.
- Provide workers with training that includes information about health effects, work practices, and use of protective equipments.

10.13 Socio-Economic Benefits

Granite Quarry project is not going to have any negative impact on the social or cultural life of the villagers in the near vicinity. The quarry activity will provide job opportunities, which will help them to develop economically.

Granite quarry will be done with the vision of leaving a positive impact on socio-economics of people living in the nearby villages. A first-aid centre to meet the basic medical needs of employees will be provided.

10.13.1 Employment potential

Around 30 people directly and 20 people indirectly employed including material suppliers, outside workshops, unit supported industries. Local villagers residing in the nearby villages shall be employed as semi-skilled workers.

10.13.2 Care and Maintenance during Temporary Discontinuance

All the provisions as per the Mines Act 1952 and Rule17 of GC & DR 1999 shall be strictly adhered during temporary discontinuation.

10.13.3 Safety and Security

At the end of quarry operations, the total area excavated will be fenced properly with single opening for workers engaged in closure plan work.

10.14 Budget for Environmental Protection

It is necessary to include the environmental cost as a part of the budgetary cost component. Total of Rs.2,05,000/- allocated for environmental protection activities. Environmental Management cost is given in **Table 10-1**.

Table 10-1 Environmental Management Plan Cost

S. No	Details	Amount (Rs.)
1	Afforestation	30,000/-
2	Water Sprinkling	50,000/-
3	Water Quality Test	25,000/-
4	Air Quality Test	25,000/-
5	Noise / Vibration Test	25,000/-
6	CSR Activities	50,000/-
Total		2,05,000

10.15 Environment Policy of TAMIN

M/s. Tamil Nadu Minerals Ltd believes that good safety, Health & Pollution control practices contribute to individual well-being and organization morale. Our commitment to Safety, Health and Environment stretch beyond statutory obligations and we are committed to manage and continually improve the overall safety, Health and Environmental performance.

We M/s. Tamil Nadu Minerals Ltd are committed to ensure that:

- We develop safe working methods and practices, with as objective of no injuries and accidents at the work place and provide a safe work place for our employees, contractors and other who perform their duties. We shall provide adequate Health care to our employees, and create processes to reduce the adverse effect of the operations on the health of the employees.

- We provide safety appliances and continuous training in safety to our employees and contract workmen to ensure safe production and achieve the target of zero accidents. We are committed to supporting actions aimed at increase in employees' safety outside work hours.
- We protect the environment by control and prevention of pollution and promote green environment.
- We continuously evaluate and improve our conduct and carry out regular audit, analysis and studies to eliminate potential concerns and continuously improve upon our Safety, Health and Environmental standards.
- We communicate our Safety, Health and Environmental Policy to all our employees' contractors and to the public for better understanding and practice.
- Management has knowledge of relevant issues regarding Safety, Health and Environment and provides a foundation for setting objectives and targets. Management shall fulfill its responsibility to inform, educate and motivate employees and others to understand and comply with this policy and applicable laws.
- M/s. Tamil Nadu Minerals Ltd shall use its resources in order to live up to this policy and thereby promote our business.

Besides, the company has formulated well-planned and integrated Environmental policies as shown below:

M/s. Tamil Nadu Minerals Ltd is committed to welfare and development needs of the society around it.

- All rules and conditions prescribed in the Indian Mines Act, Metalliferous Mines Regulation etc., will be adopted to ensure risks-free and safe mining operations. All personal protective devices supplied to workers and staff should be used while they work in the mines and any violation in this respect will be dealt with inflict of warnings first, followed subsequently by punitive punishments including fines and ultimately dismissal, if repeated continuously.
- Any infringement / violation of any rule or unsafe mining operations should be reported to Mines Manager / Mine Foremen / Mine Mate/ Blaster who will take immediate corrective measures for avoiding major disasters. The report will ultimately reach the Board of Directors through upwardly hierarchical communicative channels from the lowest level to superior levels in quick time bound duration.
- The Agent and the Mines Manager should exercise overall control over entire mining and connected operations and all infringements / violations on any count pertaining to unsafe operations, environmental degradation, etc., should be brought to the notice of the Board of Directors. Remedial measures for such violations and deviations should be taken by the Mines Manager to avoid any hazards or disasters in the mine and nearby areas. The persons

responsible for such violations will be punished through appropriate disciplinary penal actions.

- The EC conditions and stipulations will be strictly followed by all supervisory staff of the mine, and will co-ordinate in various issues like prescribed environmental monitoring schedules, vibration monitoring studies during blasting, green belt development, management of dumps etc.
- Penal actions will be taken by the company in cases of continuous negligence resulting in violations deviations in this respect.
- A time schedule of once in 15 days for review of all operational factors as mentioned above is in force, for proper and quick corrective actions. Hierarchical System of the TAMIN is shown in **Figure 10-1**.

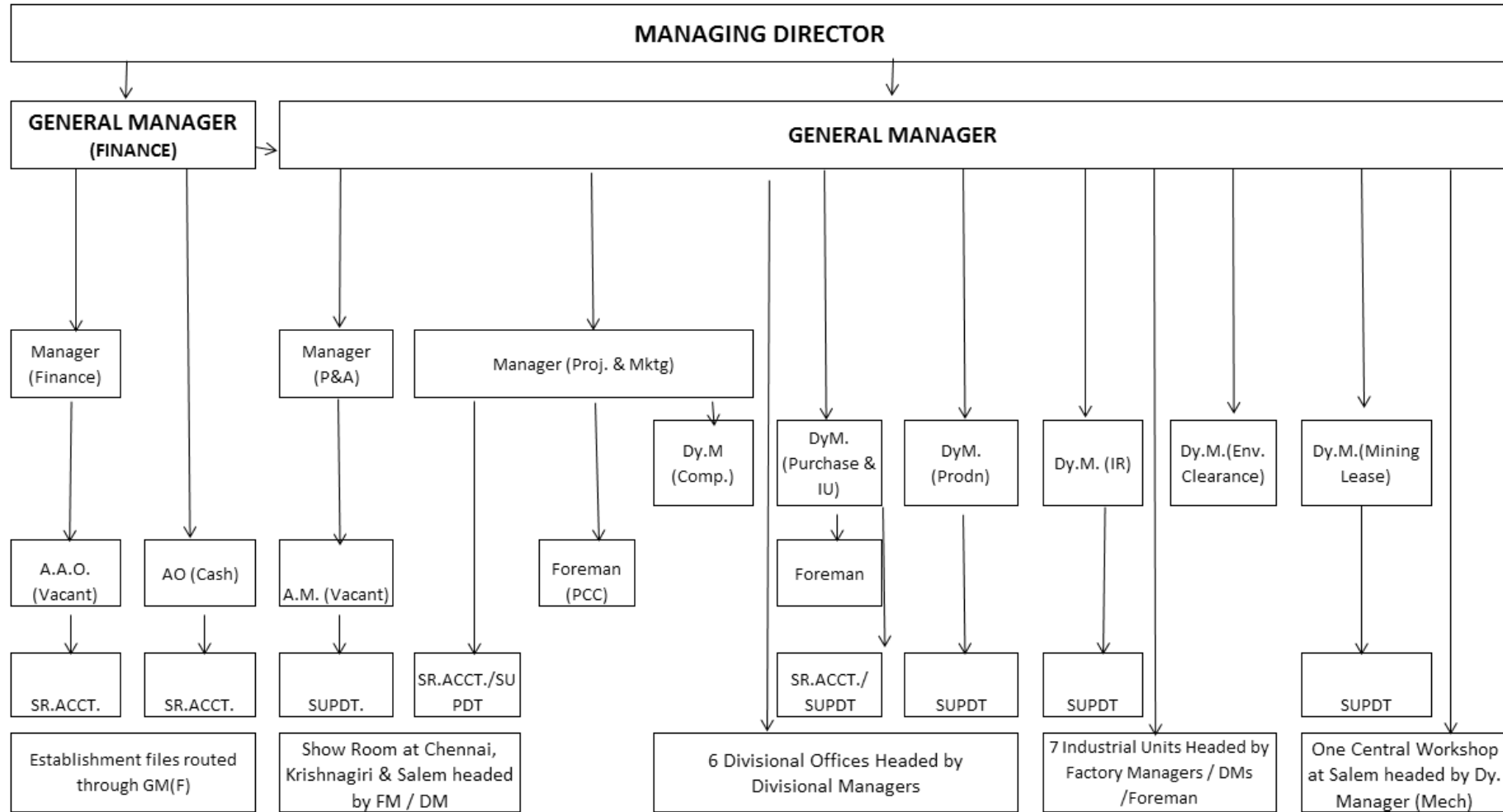


Figure 10-1 Hierarchical System of the TAMIN

11 SUMMARY & CONCLUSION

11.1 Background

The extent area of the quarry is 6.37.5 Haat S.F. 1193/1 (Part-5) over an extent of 14.58.0 Ha and at S.F.No.1193/1 (Part-16) over an extent of 20.95.5 Ha. Lease has been obtained for total extent of **20.95.5 Ha** at Kodakkal Village, Sholinghur Taluk, Ranipet District, Tamil Nadu.TAMIN has been proposed to get a fresh lease for Black Granite (Dolerite) quarry over an extent of 20.95.5 Ha for 20 years lease vide TAMIN's Lr. No. Lr.No.3040/MME.1/2022-1, dated: 02.06.2022. Accordingly, the Government of Tamil Nadu issued the precise area communication letter under Rule, 8-C (3b) of Tamil Nadu Mineral Concession Rules, 1959.

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification dated 14th September 2006 and its subsequent amendments.The EC application was submitted under category B1, schedule 1(a) to TN SEIAA vide File No. 9648/2022. The proposal was appraised during 347th SEAC meeting held on 13.01.2023 ToR was issued vide Lr No. SEIAA-TN/F.No.9648/SEAC/ToR-1344/2023, dated: 16.02.2023 for the preparation of EIA/EMP report. Draft EIA report will be submitted for Public Hearing (PH) to Ranipet PCB. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

TAMIN as part of the compliance from MoEF&CC has appointed M/s Hubert Enviro Care systems (P) Ltd, Chennai as Environmental Consultants who are accredited by National Accreditation Board for Education and Training (NABET), Quality Council of India (QCI), New Delhi.

11.2 Management Commitment

The company is assigning prime importance for environmental protection. The company will comply the environmental laws. TAMIN will maintain well developed Greenbelt. Also all the environmental statutory requirements will be implemented and maintained continually.

11.3 Environmental Sensitive Areas

There are no notified ecologically sensitive areas within 15km from project boundary. The Tamilnadu State / Andhra Pradesh State boundary as per google runs in NW direction at about ≈ 6.66 km from the project boundary. Project does not attract the special conditions and general conditions as per EIA notifications. The detailed Environmental Sensitivity areas within the 15km radius of the project site are given in **Chapter 3, Section 3.4** and **Table 3-1**.

11.4 Black Granite Quarry Reserves

- The estimated Geological Reserves of Black Granite estimated based on the Geological cross sections was $1,86,802\text{m}^3$. By applying the effective Geological recoverable reserves @ 10 %

18,680 m³ & granite waste @90% is 1,68,122 m³. By applying the effective Geological recoverable reserves @ 10 % 18,680m³ & granite waste @90% is 1,68,122 m³.

- The updated Mineable Reserves have been arrived as 1,10,266 m³ and by applying 10% recovery, the updated mineable reserves as 11,027 m³.
- Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406m³ of ROM of saleable and 24,064m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery.

11.5 Summary of the Magnitude of Operation

- The black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & width bench not less than the height. Major machineries are Compressor, Jack hammer, Diamond wire saw machine and excavator and DG set is used in proposed quarry. Tippers and dumpers will be used for transportation
- Proposed Production Capacity is 2,406 m³ per annum.
- The geological cross sections up to the economically average depth of 40m from the ground level and top surface of the granite body works out to 1,86,802 m³
- The mineable reserves have been computed as 1,10,266 m³.
- The effective geological reserves and mineable have been worked out as 18,680 m³ and 11,027 m³ by applying the recovery factor 10%.
- Mineable Reserves have been worked out as 11,027 m³ by applying the recovery factor 10%. The annual peak production per year would be 2,406m³ of ROM of saleable and 11,027m³ of ROM during the first five year of Mining plan period at the rate of 10% recovery.

11.6 Requirements

11.6.1 Land requirement

- The Black granite mine is over an extent of 20.95.5 Ha. The entire area is under possession of TAMIN.
- Lease area located at S. F. No. 1193/1(Part-5) & 1193/1(Part-16) Kodakkal village, Sholinghur Taluk, Ranipet District lies in the latitude of 13°04'37.36450"N to 13°04'55.00967"N and longitude of 79°24'14.80812"E to 79°24'58.45205"E.
- The lease area topography is hilly terrain; site elevation is 170m (max) AMSL. The area is marked in the survey of India Topo sheet No. 57 O/8.
- Mining Lease obtained from Tamil Nadu Government for 20 years vide Lr. No. 3040/MME.1/2022-1, dated: 02.06.22.
- Out of 20.95.5 Hectare of lease area 0.67.50 Ha is considered for mining, waste dump is 1.71.0 Ha, & for Greenbelt 0.06.5 is allocated.

11.6.2 Water Requirement

- The total water requirement is 1.5 KLD Drinking & Domestic purpose-0.5 KLD, Wire Saw cutting -0.3 KLD, Dust suppression -0.3 KLD & for Greenbelt-0.4KLD. The total water requirement will be met from Road tankers.
- Hazardous waste like waste oil will be disposed through TNPCB Authorized dealers.
- Sewage will be disposed through septic tank followed by soak pit. Septic Tank will be cleaned periodically.

11.6.3 Power & Fuel Requirement

- Power requirement will be 60 kVA will be met through 125 kVA DG Set. Diesel consumption will be 200 liters/day.
- Diesel will be brought from nearby diesel pumps. No electricity is required for the project.

11.6.4 Manpower

- Direct manpower will be 30 persons directly and indirectly 20 Nos.

11.6.5 Solid Waste Generation & Management

- Municipal solid waste (8.1 kg/day) will be segregated as Organic will dispose through local municipal bins and inorganic waste (5.4kg/day) will be disposed through TNPCB authorized recyclers.
- Waste diesel Oil will be collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/Recycling.

11.7 Project Cost

- The total capital investment on the project is Rs. 99,97,000/- Lakhs including EMP cost is 2,05,000/-.

11.8 Baseline Study

Project Influence Area (PIA)/Study Area: An area covering 10 km radius from Kodakkal Black granite quarry boundary has been earmarked as study area for baseline studies.

Study Period:

The baseline environmental surveys were carried out during **(Mid of Jan 2023 – Mid of April 2023)** within the study area.

Summary of Baseline Studies:

- Site has an undulating terrain with level 182 - 293m Above MSL.
- The project site falls under Zone- III (Low Risk Zone) as per IS 1893 (Part- I).
- The predominant wind direction is South East during study period.
- Max Temperature: 37°C Min Temperature: 17°C & Avg Temperature: 27.75°C
- Average Relative Humidity: 64.33 %

- Average Wind Speed : 2.86 m/s

Ambient Air Quality

Maximum concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂, CO, Pb, O₃, NH₃, C₆H₆, C₂₀ H₁₂, As & Ni, are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period. The ambient air quality has been monitored at 8 locations for 12 parameters as per NAAQS, 2009 within the study area. The average baseline levels of PM₁₀ (40.32µg/m³- 59.08 µg/m³), PM_{2.5} (15.16µg/m³ -38.28 µg/m³), SO₂ (10.98µg/m³ – 19.51 µg/m³), NO₂ (9.32µg/m³ – 17.02µg/m³), CO (2.43 mg/m³– 5.32 mg/m³), all the parameters are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period.

Noise Environment

Ambient noise levels were monitored using precision noise level meter in and around the project site at 10 km radius at 8 locations during study period.

- In industrial area, day time noise level was about 56.9 dB(A) and 49.6 dB(A) during night time, which is within prescribed limit by MoEF&CC (75 dB(A) Day time & 70 dB(A) Night time).
- In residential area day time noise levels varied from 50.5 dB(A) to 54.8 dB(A) and night time noise levels varied from 41.2 dB(A) to 43.5dB(A) across the sampling stations. The field observations during the study period the ambient noise levels except one Residential area noise is not within the limit prescribed by MoEF&CC (55 dB(A) Day time & 45 dB(A) Night time).

Water Environment

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

Surface water quality

- pH ranges from 6.33 to 7.65.
- Total Dissolved Solids range from 298 mg/l to 711.2 mg/l.
- Total hardness ranges between 202.71 mg/l – 523.12 mg/l.
- The BOD value ranges from 2 mg/l to 8 mg/l
- COD value 17 mg/l to 52 mg/l.

- The concentration of heavy metals like As, Cd, Cr, Pb, Mn, Hg, Ni and Se at all locations are within the limits of IS 2296:1992(Class-C: Drinking water with conventional treatment followed by disinfection)

Ground Water Quality

- The average pH ranges from 6.94-8.27.
- TDS value varied from varied from 560 mg/l to 798 mg/l
- The chloride concentration ranged from 129.1mg/l to 249.1 mg/l
- Sodium range from 76.2 mg/l to 149.3 mg/l
- Potassium concentration range from 4.3to 7.2 mg/l.
- Magnesiumranges from 23.30 to 44.2 mg/l within the permissible limitof the IS 10500: 2012.
- The sulphate content of the ground water of the study area is varied between 51.9 mg/l – 92.8 mg/l meeting the acceptable limit of the IS 10500: 2012.
- It is observed that all the collected ground water samples meets the drinking water standards (IS 10500:2012) and can be used for drinking.

Land Environment

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

- The pH of the soil samples ranged from 7.24 -8.56.
- Conductivity of the soil samples ranged from 194 – 286umhos/cm
- Nitrogen content ranged from 132.7 mg/kg to 179.4 mg/kg
- Phosphorous ranged from 13.8 mg/kg - 27.8 mg/kg
- Potassium content ranges from 225.8 mg/kg - 412.3 mg/kg.

Biological Environment

The floral diversity is grouped into trees, shrubs, climbers and herbs. Similarly, the faunal diversity is grouped into mammals, birds, reptiles and amphibians. There is no extinct flora and fauna species found in the study area.

Flora

It was observed that the flora, which includes herbs, shrubs and trees, were sparsely distributed within study area as per IUCN status Least concern, Not yet assessed species are observed within the study area.

Fauna

Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area.

Socio Economic Environment

In 2011 census, the total population of Vellore district was 3936331. Of this, rural population was 2234344 and urban population was 1701987. In 2001, they were 3477317, 2169319 and 1307998 respectively. Madapalli village in Tirupathur taluk had the highest population of 14,868 and Madakadappa R.F. village in Vaniyambadi taluk recorded the lowest population of 14 in the district. Ambur Reserve Forest Village in Ambur taluk is the largest village with an area of 10656.09 hectares and Ambur Plantation Reserve Forest in Ambur taluk is the smallest village with an area of 2.47 hectares.

The rural literacy was 67.4% in 2001 which has marginally increased to 7.3% in 2011 with 74.7% while the urban literacy in the district was 80.5% in 2001. The urban literacy in the district has seen significant increase in 2011 census compared to 2001 census. In 2011 census, Vellore district has returned 79.2% as literate population; males with 86.5% and females with 71.9%. The total literacy in 2001 was 72.4%; males with 82.4% and females at 62.8%. The detailed information provided in **Chapter 3, Section 3.12.**

11.9 Anticipated Environmental Impacts

Air Environment

The emissions mainly generated from the mining activities are Blasting, Drilling, Scrapping, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling. Fugitive dust control in mine is shown in **Table 11-1.**

Table 11-1 Fugitive dust control in mine

S. No	Activities	Best practices
1	Drilling	➤ Drills should be provided with dust extractors (dry or wet system)
2	Blasting	<ul style="list-style-type: none"> ➤ Water spray before blasting ➤ Water spray on blasted material prior to transportation ➤ Use of controlled blasting technique
3	Transportation of mined material	<ul style="list-style-type: none"> ➤ Covering of the trucks/dumpers to avoid spillage ➤ Compacted haul road ➤ Speed control on vehicles ➤ Development of a green belt of suitable width on both sides of road, which acts as wind break and traps fugitive dust

Noise Environment

- Baseline study showed that the noise levels in both Industrial area and in Residential area are slightly exceeded the limit prescribed by CPCB. The designed equipment with noise levels not exceeding beyond the requirements of Occupational Health and Safety Administration

Standard will be employed.

Land Use

- The quarry is in operations since 1995 and extent of lease area is 20.95.5Ha. Land classifies as a Government land, Mining Lease obtained from Tamil Nadu Government for 20 years vide Lr. No. 3040/MME.1/2022-1, dated: 02.06.22.

Wastewater Management

- Sewage (1.27KLD) will be sent to septic tank followed by soak pit. There is no industrial effluent generation during quarry operation.

Biological Environment

- To reduce the adverse effects on flora/fauna status that are found in project area due to deposition of dust generating from mining operations, water sprinkling and water spraying systems will be ensured in all dust prone areas to arrest dust generation.

Solid/ Hazardous Waste Management

- Municipal Solid Wastes including food waste will be disposed to municipal bin.

Environmental Monitoring Program

- A monitoring schedule with respect to Ambient Air Quality, Water & Wastewater Quality, Noise Quality as per Tamil Nadu State Pollution Control Board (TNPCB), shall be maintained.

11.10 Greenbelt Development

- The green belt plantation programme will be continued till the end of the mining operation in the area. In framing out this programme on a sustainable and scientific base, due consultation and coordination with the forest department will be sought. The plantation will be developed inside the mining lease about 0.06.50Ha, out of 20.95.5Ha. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action.

11.11 Disaster Management Plan

The salient features of Disaster Management Plan include

- Emergency shutdown procedure
- Fire protection system, Emergency safety equipment & Reporting and response to emergency. Emergency Help from nearby industries and tie up with nearby industries

11.12 Corporate Environmental Responsibility

- CER Activity will be implemented for an amount of Rs.1,99,940 (2% of Project Cost) as per

MoEF&CC O.M dated 20th October, 2020 (F.No. 22-65/2017-IA.III). CER fund will be allotted for Public Hearing commitments.

- TAMIN Kodakkal site had no Relocation and Rehabilitation.
- Most villages have benefitted mutually at Kodakkal where the mining industry has provided indirect jobs for labor and villages provide accommodation for the labor and staff. Supportive industries like food supply and essential shops are economic growth in the villages.

11.13 Benefits of the Proposed Project

- The quarrying activities in this belt will benefit to the local people both directly 30 persons & indirect persons are 20 Nos
- Improvement in Per Capita Income.
- The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
- It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.

12 DISCLOSURE OF CONSULTANTS

12.1 The names of the Consultants engaged with their brief resume and nature of Consultancy rendered

Brief Profile of Hubert Enviro Care Systems (P) Limited (HECS)

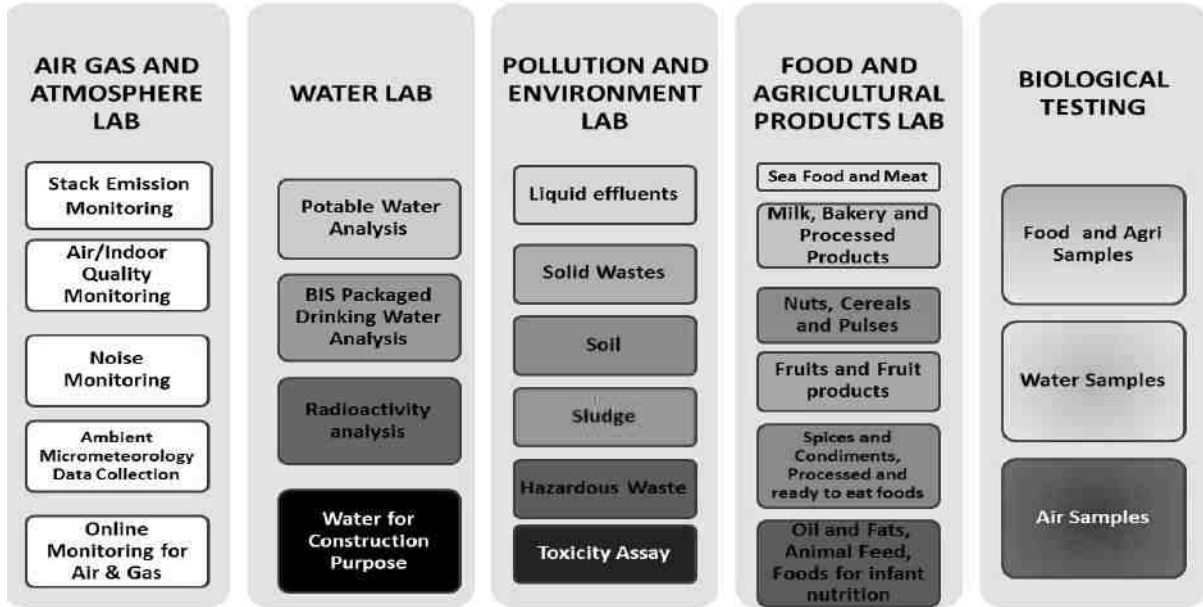
HECS is a total Environmental management company which provides Environmental consultancy services, Analytical testing services, turnkey solutions and Operation-Maintenance services for water and wastewater facilities.

The company provides solutions to several industries like Refineries, Thermal Power Plant, Pharma, R&D Facilities, Electroplating and Manufacturing, IT Parks, Residential Complexes, Mines, Dairies, Food Processing, Textile mills, Breweries, etc.

The company is specialized in executing projects right from concept development, supply, erection, commissioning and operation on turnkey basis. HECS has successfully executed more than 300 environmental engineering projects for various industrial sectors both in India and overseas.

12.2 Consultancy Profile

- HECS is accredited by QCI-NABET
- An approved consultant for carryout EIA studies across India
- India's leading multidisciplinary Environmental Consultancy organization
- HECS- Consultancy division comprises of technical skilled and competent Team of 40 people. The team consists of Three Doctorates & about thirty postgraduates
- HECS has industry specific prominent expert to provide solutions & recommendations
- Serving client more than 25 years & pan India presence in the following sectors:
 - Environmental Clearance
 - Coastal Regulation Zone
 - Risk Assessment, DMP, HAZOP studies
 - Feasibility/ treatability studies
 - Due diligence studies
 - Ground water Clearance
 - DISH, PESO and other statutory approvals
 - Consent to Establish, Consent to Operate
 - Hazardous waste, bio medical waste authorization
 - Other environmental approvals
- Has an in-house laboratory wherein the following activities are being carried out:



12.3 QCI – NABET Accreditation

Consultancy	Hubert Enviro Care Systems Pvt. Ltd., Chennai
NABET Certificate No	NABET/ EIA/ 2224/ SA0190 Valid up to 27/07/2024
MoEF Reg. Lab	F.No. Q-15018/13/2016-CPW

National Accreditation Board for Education & Training (NABET) is a constituent board of the Quality Council of India (QCI). QCI, NABET has accredited HECS for carrying out Category ‘A & Category B’ EIA studies in the following sectors:



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



**National Accreditation Board
for Education and Training**



Certificate of Accreditation

Hubert Enviro Care Systems Pvt. Ltd.,

A-21, (Behind Lions Club School) III Phase, Thiru Vi Ka Industrial Estate, Guindy, Chennai - 600 032.

The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including open cast/ underground mining	1	1 (a) (i)	A
2	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3	River Valley projects	3	1 (c)	A
4	Thermal power plants	4	1 (d)	A
5	Mineral beneficiation	7	2 (b)	A
6	Metallurgical industries (ferrous & nonferrous)- both primary & secondary	8	3 (a)	B
7	Cement plant	9	3 (b)	A
8	Petroleum refining industry	10	4 (a)	A
9	Pesticides industry and pesticide specific intermediates(excluding formulations)	17	5 (b)	A
10	Petro-chemical complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics)	18	5 (c)	A
11	Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes)	20	5 (e)	A
12	Isolated storage & handling of hazardous chemicals (As per threshold planning quantity indicated in column 3 of Schedule 2 & 3 of MSIHC Rules 1989 amended 2000)	28	-	B
13	Synthetic organic chemicals industry	21	5 (f)	A
14	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	31	7 (c)	A
15	Ports, harbours, break waters and dredging	33	7 (e)	A
16	Highways	34	7 (f)	B
17	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
18	Common municipal solid waste management facility (CMSWMF)	37	7 (i)	B
19	Building and construction projects	38	8 (a)	B
20	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated Feb 3, 2023 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/23/2696 dated March 6, 2023. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems Pvt. Ltd, following due process of assessment

Sr. Director, NABET
Dated: March 6, 2023

Certificate No.
NABET/EIA/2224/SA 0190

Valid up to
July 27, 2024

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