DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

SATHANUR BLACK GRANITE QUARRY OVER AN EXTENT OF 8.46.0 HA.

(Schedule 1(a) Mining of Minerals 'B1' category)

Located at

Survey No	: 315, 316 and 317/1
Villages	: Sathanur
Taluk	: Thandarampattu
District	: Tiruvannamalai
State	: Tamil Nadu

By

M/s. Tamil Nadu Minerals Limited

No. 31, Kamarajar Salai, Chepauk, Chennai–600005

EIAConsultant

M/s. EHS360 Labs Private Limited

Ashok Nagar, Chennai

NABETCertificate No. NABET/EIA/22-25/IA 0098_Rev.01 validity 24th June2025

July 2024

PREFACE

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

"Black Granite Quarry over extent of 8.46.0 Ha."

Government Poramboke Land

Located in Sy. No. 315,316 and 317/1, Sathanur Village,

Thandarampattu Taluk, Tiruvannamalai District,

Tamil Nadu, India

For and on behalf of M/s. EHS360 Labs Pvt. Ltd.,

Approved by: Santhosh kumar, A

Signature: A. S

Designation: CEO

Date: 11.07.2024

The report has been prepared in line with the prescribed ToR vide Lr. No. SEIAA-TN/F.No.9647/SEAC/ToR-1350/2022 dated; 16.02.2023 issued by SEIAA-Tamil Nadu. This report has been prepared by M/s EHS360 Labs Private Ltd with all reasonable skill, care, and diligence within the terms of the contract with the project proponent.

Document Control			
Name of the Document	Draft Environmental Impact Assessment report for M/s. Tamil Nadu Minerals Limited, Black Granite Quarry over extent of 8.46.0 Ha located at Located at Sy. No. 315, 316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu, India.		
Document No.	EHSL/EIA-PH/1(a)/031/April/2024	**Issue No:**	01
		Date:	11.07.2024

DISCLAIMER & DECLARATION:

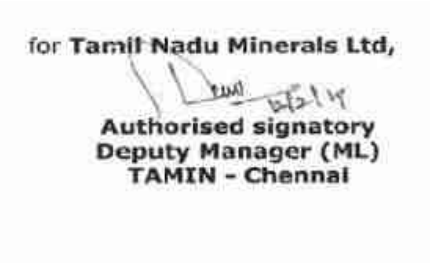
This report has been prepared by M/s. EHS360 Labs Pvt. Ltd. for obtaining Environmental Clearance as per ToR issued by SEIAA-TN. Information provided in this report (unless attributed to references) shall not be copied or used without the written consent of M/s. EHS360 Labs Pvt. Ltd. Compliance to MoEFCC Office Memorandum J-11013/41/2006-IA. II (I) Dated.04.08.2009,The Environmental Impact Assessment & Environmental Management Plan have been prepared with compliance of Terms of Reference as per the Generic Structure and Process described in Annexure-III of EIA Notification 2006.

DECLARATION BY THE PROPONENT

(Compliance to MoEF&CC Office Memorandum J-11013/41/2006-IA. II (I) Dated.04.08.2009)

I, Dr.E.Ganesan, Deputy Manager (Mining Lease) of M/s Tamil Nadu Minerals Limited gives this declaration/ undertaking to the effect that the EIA report preparation has been undertaken in the compliance with Terms of Reference (ToR for the Proposed Black Granite Quarry over an extent of 8.46 Ha Survey no. 315, 316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu, India" and the information and content provided in the report are factually correct..

The Environmental Impact Assessment & Environmental Management Plan have been prepared as per the Generic Structure and Process described in Annexure-3 of EIA Notification 2006.



DECLARATION OF EXPERTS CONTRIBUTING TO THE EIA:

Declaration by Experts Contributing to Draft Environmental Impact Assessment for the ***"M/s. Tamil Nadu Minerals Limited, Black Granite Quarry over extent of 8.46.0 Ha located at Located at Sy. No. 315,316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu, India.".***

I hereby certify that I was a part of the EIA report in the following capacity that developed the above said EIA.

EIA Coordinator

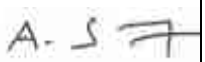
Name: Mr. G. Raja Reddy

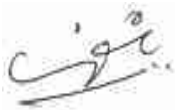
Date: 11.07.2024

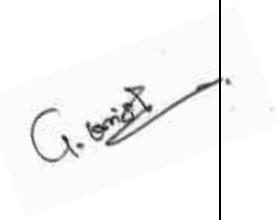
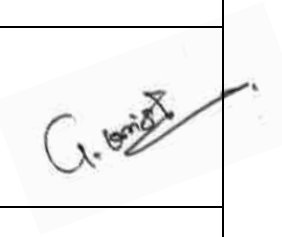
Period of Involvement **:** December 2023 to till date.

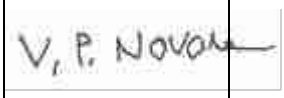
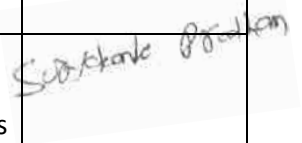
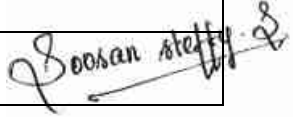
Contact Information **:** M/s. EHS360 Labs Pvt. Ltd.
10/2 - Ground Floor, 50th Street, 7th Avenue,
Ashok Nagar, Chennai - 600083
Phone: 044 45493644:
Email id: santhosh@ehs360labs.com
Website: www.ehs360labs.com

Functional Area Experts (FAEs):

S. No.	FAs	Name of the Expert/s	Involvement (Period &Task)	Signature
1.	AP	Mr. Santhosh kumar A	**Period:** December 2023 to till now **Task:** Selection ofmonitoring locations, Supervision of air quality monitoring, identifiction and assessing quantum of emisssion, Identification of most suitable control device for reducing process emission at source and contribution to EIAdocumentation	
		Tatiparthi Pranay Kumar (FAA)	**Period:** December 2023 to till now **Task:** Site visit and Kick of meeting with client. Assisting with FAE during Selection ofmonitoring locations, Identification of most	

			suitable control device for reducing process emission at source and contribution to EIAdocumentation	
2.	AQ	Ms. TushaliJagwani	**Period:** December 2023 to till now **Task:** Developing meteorological data with collected secondary data, identification of impacts, finalization of mitigation measures and contribution to EIA documentation	
		Monishadevi. B (FAA)	**Period:** December 2023 to till now **Task:**Assistance to FAE during Developing meteorological data with collected secondary data, Preparation of Emission Inventory, AERMOD Modelling for Proposed activities identification of impacts and contribution to EIA documentation	
3.	WP	Mrs. Tatiparthi Rajani	**Period:** December 2023 to till now **Task:**Identification of sampling locations for surface water , Coordination with Lab team during the collection of Sampling and preservation & Ground water samples,Verification of analysis results and Ioniic balance/correlation of parameters. Incorporation of results in the EIA report. Identification of Impacts pollution evaluation of water control management, finalization of mitigation measures and contribution to EIA documentation	
		Tatiparthi Pranay Kumar (FAA)	**Period:** December 2023 to till now **Task:** Assistance to FAE during auditing water use, Identification of Impacts pollution evaluation of water control management and contribution to EIA documentation.	
4.	SHW (SW&HW)	Mrs. Tatiparthi Rajani	**Period:** December 2023 to till now **Task:** Identification of waste generation and suggestion disposal methods, proposed adequate Mitigation measure for management of hazardous waste and contribution to EIA documentation	

		Mr. Krishnan (FAA)	**Period:** December 2023 to till now **Task:** Assistance to FAE during Studying adequacy of Mitigation measure for management of haardous waste and contribution to EIA documentation	
5.	SE	Mrs. Anitha Reddy	**Period:** December 2023 to till now **Task:** Collection ofsecondary and primary from thesurrounding area/villages of the proposed project for Impact identification and mitigation measures for incorporating to EIAdocumentation	
		Srimathi Velu (FAA)	**Period:** December 2023 to till now **Task:** Collection ofsecondary and primary data from thesurrounding area/villages of the proposed project for Impact identification and contributing to the EIAdocumentation	
6.	EB	Mr. G. Raja Reddy	**Period:** December 2023 to till now **Task:** Site visit and conduct of ecological survey, assessment ofthe impacts of proposed project activities on the biological environment and contribution to EIAdocumentation	
		Mr. Krishnan (FAA)	**Period:** December 2023 to till now **Task:** Assisting FAE during Site visit, conduct of ecological survey, and contribution to EIAdocumentation	
7.	HG	Mr. Mallikarjuna Rao	**Period:** December 2023 to till now **Task:** Understanding and representing groundwater conditions, Supervision of groundwater sampling locations, finalization ofsurvey findings, identification of impacts, suggestion of mitigationmeasures and contribution to the EIA documentation.	
8.	GEO	Mr. Mallikarjuna Rao	**Period:** December 2023 to till now **Task:** Geological features & formations, topography & Lithology of the 10 km radius area and lease area	

9.	NV	Mr. Vivek Prabhakar Navare	**Period:** December 2023 to till now **Task:** Site visit and checking of noise sampling results and predict the vibrations due Blasting and identification of Impacts on surrounding structures and analysis of data identification of impacts and proposed mitigation measures, and contribution to EIA documentation	
10.	LU	Mrs. Anitha Reddy	**Period:** December 2023 to till now **Task:**Generation and analysis of datarelated to landuse pattern,development of landuse maps of study area using ArcGIS / related tools, site visit for ground truth survey, finalization of landuse maps contribution to EIA documentation	
		Indhumathi. D (TM)	**Period:** December 2023 to till now **Task:**Assistance to FAE during Generation and analysis of datarelated to landuse pattern,development of landuse maps of study area using ArcGIS / related tools, site visit for ground truth survey, finalization of landuse maps contribution to EIA documentation	
11.	RH	Mr. Suryakanta Pradhan	**Period:** December 2023 to till now **Task:**Identification of hazards and hazardous substance,preparation of impacts & mitigation measures for proposed project	
		Monishadevi B (FAA)	**Period:** December 2023 to till now **Task:** Assesting FAE duringIdentification of hazards and hazardous substance,preparation of impacts & mitigation measures, and contribution to EIA documentation	
12.	SC	Dr. Aparna Chittajallu	**Period:** December 2023 to till now **Task:**Understanding and representingsoll conditions, supervision of soilsampling locations, finalization ofsurvey findings, identification of impacts, suggestion of mitigationmeasures and contribution to the ELA documentation	
		Soosan Steffy (TM)	**Period:** December 2023 to till now	

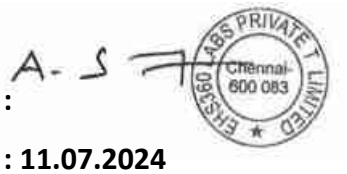
			Task: Assisting to FAE during studies of finalization ofsurvey findings, identification of impacts, suggestion of mitigationmeasures and contribution to the EIA documentation	

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 - Socioeconomics
HG - Hydrology, ground water and water conservation
GEO - Geology
RH - Risk assessment and hazards management
SHW - Solid and hazardous waste management
SC - Soil Conservation

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION/AUTHORIZED PERSON

I, Mr. Santhoshkumar.A hereby, confirm that the above-mentioned experts prepared the Draft EIA/EMP report for "M/s. Tamil Nadu Minerals Limited, Black Granite Quarry over extent of 8.46.0 Ha Located at Sy. No. 315, 316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu, India.".

I hereby certify that I was a part of the EIA in the following capacity that developed the above EIA. I also confirm that the consultant organization shall be fully accountable for any misleading information mentioned in the statement.

Signature	**:** 
Date	**: 11.07.2024**
Name	**:** Mr. Santhosh Kumar. A
Designation	**:** Chief Executive Officer
Name of the EIA Consultant Organization	**:**M/s. EHS360 Labs (P) Ltd, Chennai
NABET Certificate No & validity	**:**NABET/EIA/22-25/IA 0098_Rev No.01 valid up to- June 24th,2025

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Note: Annexure are provided as a separate book

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
CSR	Corporate Social Responsibility
DMP	Disaster Management Plan
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environmental Management Plan
GLC	Ground Level Concentration
GO	Government Order
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
NAAQS	National Ambient Air Quality Standard
NABET	National Accreditation Board for Education and Training
QCI	Quality Council of India
R & D	Research & Development
RA	Risk Assessment
ROM	Run of Mine
SOM	Scheme of Mining
SEIAA	State Environmental Impact Assessment Authority
SEAC	State Expert Appraisal Committee
TDS	Total Dissolved Solids
SEAC	State Expert Appraisal Committee
TOR	Terms of Reference

1 INTRODUCTION

1.1 Project background

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-porphyry), 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,.

The Government of Tamil Nadu has issued the precise area communication letter to furnish the approved Mining plan under Rule, 8-C (3b) of the Tamil Nadu Minor Mineral Concession Rules, 1959 for quarrying Black Granite over an extent of 8.46.0Ha of Government poramboke land in S.F.No. 315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District for a period of 20 years vide Govt.Letter. No.3377/MME.1/2022-1 dated 03.06.2022.

Accordingly, TAMIN submitted the Mining Plan for the subject area and the same was approved by the Commissionerate of Geology and Mining, Chennai vide letter Rc. No. 1033/MM4/2022, dated: 18.08.2022. The mining plan approval letter is enclosed as **Annexure-3**. The mining plan is enclosed as **Annexure-4**.

The production capacity of the quarry proposed during the mining plan period was 44,044m^3, ofROM of Black Granite per annum and 4,404 $m^3$of recoverable production of granite per annum. An open cast semi mechanized mining method will be used for mining.

The quarry lease area generally manifests hilly topography with a height of hill. The altitude of the area is 128 m (Maximum) above MSL. The lease falls in the survey of India Topo sheet 57 L/16 and lies between the GPS coordinates of 12°11'33.84544"N to 12°11’50.52500"N and 78°53'38.87350"E to 78°53'55.09528"E.

1.2 Identification of Project & Project Proponent

1.2.1 Project

The proposed black granite quarry is over an extent of 8.46.0 ha located at S.F.No. 315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State, lies between the latitude of 12°11'33.84544"N to 12°11’50.52500"N and longitude of 78°53'38.87350"E to 78°53'55.09528"E. The area is marked in the survey of India Topo Sheet No. 57 L/16. The black granite

quarrying operation is proposed to be carried out by opencast semi mechanized method by formation of benches. Benches height and width will be 6m x 6m with vertical slope will be followed. The area applied for quarry lease is exhibits hilly terrain; The altitude of the area is 128 m (Maximum) above MSL.

1.2.2 Project Proponent

Tamil Nadu Minerals Limited (TAMIN) (An Undertaking of Government of Tamil Nadu) has been established in the year1978. 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.

1.3 Letter of Intent (LoI) & Mining Plan approval details.

i. The Government of Tamil Nadu had issued the precise area communication letter to furnish the approved Mining Plan under Rule 8-C(3b) of Tami lNadu minor Mineral Concession Rules, 1959 for quarrying of black granites over an extend of 8.46.0 Ha of Government poramboke land in S.F.No. 315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District for a period of 20 years vide Govt. Letter. No.3377/MME. 1/2022-1 dated 03.06.2022. Precise area communication letter is attached as **Annexure-2**.

ii. Subsequently, the Mining Plan was submitted and approved by the Commissionerate of Geology and Mining, Chennai vides letter Rc. No. 1033/MM4/2022, dated: 18.08.2022. Mining Plan approved letter is attached as **Annexure-3.**

1.4 Land Acquisition Status

The entire mine lease area of 8.46.0Ha is Government land which is leased by TAMIN. The quarry the precise area communication letter is enclosed as **Annexure–2**. Details of the project site is given in the **Table 1-1.**

Table 1-1 Land Use Description

District and State	Taluk	Village	S.F. No	Area (Ha)	Land Classification
Tiruvannamalai District, Tamil Nadu State	Thandarampattu	Sathanur	315,316 and 317/1	8.46.0	Government Land

1.5 Purpose and status of the report

The Sathanur Black Granite Quarry is over extent of 8.46.0 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 Online Proposal No. SIA/TN/MIN/409663/2022 Dt.08/12/2022.The proposal was appraised during 347th SEAC meeting held on 13.01.2023 and 592ndSEIAA meeting held on 11.02.2023 and ToR was issued vide Lr No. SEIAA-TN/F.No.9647/SEAC/ToR-1350/2022, dated: 16.02.2023 for the preparation of draft EIA/EMP report. The draft EIA/EMP report will be submitted for Public Hearing (PH). After completion of Public Hearing, the minutes along with action plan of the issues raised during the public hearing will be incorporated in the EIA report. Final EIA report will be submitted to TNSEAC for further appraisal of the project and obtaining Environmental Clearance.

1.6 Brief Description of the Project

1.6.1 Nature of the Project

The Sathanur Black Granite Quarry area is over an extent of 8.46.0 Ha with 44,044 m^3, of ROM of Black Granite per annum and 4,404 m^3 of recoverable production of granite per annum. The lease area is located at SF. No. 315, 316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State. The black granite quarrying operation is proposed to be carried out by opencast semi mechanized method by formation of benches. Benches height and width will be 6m x 6m with vertical slope will be followed.

The Government of Tamil Nadu had issued the precise area communication letter to furnish the approved Mining Plan under Rule 8-C(3b) of Tamil Nadu minor Mineral Concession Rules, 1959 for quarrying of black granites over an extend of 8.46.0 Ha of Government poramboke land in S.F.No. 315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District for a period of 20 years vide Govt. Letter. No.3377/MME. 1/2022-1 dated 03.06.2022. Precise area communication letter (LOI) is enclosed as **Annexure-2**.

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 Online Proposal No. SIA/TN/MIN/409663/2022 Dt.08/12/2022.

1.6.2 Size of the Project

The Sathanur Black Granite Quarry over an extent of 8.46.0 Ha is located at SF.No.315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State.

The proposed production capacity will be 44,044 m^3, of ROM of Black Granite per annum and 4,404 m^3 of recoverable production of granite per annum through Open cast semi mechanized mining method. Estimated mineable reserves are7,75,804 m^3 of ROM and recoverable reserves are77,580m^3 @ 10% recovery rates. Waste generation estimated as 6,98,224 m^3, Over Burden/ Side burden is 3,29,931 m^3 at 1:13 ratio (M^3:M^3). Estimated Black Granite Reserves is given in **Table 1-2.**

Table 1-2 Estimated Black Granite Reserves

S. No	Description	ROM (m^3)	Recovery @ 10% (m^3)	Granite Waste @90% (m^3)
1	Geological Resource	1024350	102435	921915
2	Mineable Reserves	775804	77580	698224
3	During Mining plan	217105	21711	195394

Estimatedlifeofthequarry:

- Mineable RoM :7,75,804 m^3
- Mineable Saleable reserves @10% recovery: 77,580m^3
- Maximum production per year @10% recovery:4,404m^3
- Estimated life of the quarry: 17.6 ~ 18 years

Table 1-3 Production planning for first five years

S. No	Year	ROM (m^3)	Saleable Quantity @10% (m^3)	Granite Rejects(m^3)	Over Burden (m^3)	Side Burden (m^3)
1	First	44044	4404	39640	2800	3225
2	Second	43050	4305	38745	1952	6365
3	Third	43200	4320	38880	5184	3510
4	Fourth	43155	4316	38839	3283	2890
5	Fifth	43656	4366	39290	4098	8946
Total		**217105**	**21711**	**195394**	**17317**	**24936**

1.6.3 Location of the project

The Sathanur Black Granite Quarry area is over an extent of 8.46.0 Ha, the lease area is located at SF.No. 315,316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai 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

BP. No	Latitude	Longitude
1	12°11'35.80"N	78°53'52.48"E
2	12°11'33.85"N	78°53'48.11"E
3	12°11'38.75"N	78°53'48.09"E
4	12°11'40.84"N	78°53'44.83"E
5	12°11'41.84"N	78°53'38.87"E
6	12°11'50.53"N	78°53'38.87"E
7	12°11'49.87"N	78°53'41.69"E
8	12°11'47.83"N	78°53'40.16"E
9	12°11'45.65"N	78°53'44.71"E
10	12°11'43.45"N	78°53'45.17"E
11	12°11'44.04"N	78°53'48.50"E
12	12°11'41.72"N	78°53'48.93"E
13	12°11'41.72"N	78°53'55.10"E
14	12°11'36.50"N	78°53'54.05"E

1.6.4 Connectivity of the Project

The project is situated at ~0.56 km to Sathanur Village towards Northwest direction and ~0.88 km East-northeast of Veeranam Village. The project site has well-established connection facilities. The nearest national highway (NH-179B) is at distance of ~8.55km (N), The nearest State highway (SH-6B) is at ~ 0.54km (N). Tiruvannamalai railway station is located at ~ 20.08km (E).

1.6.5 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 block sand 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 and indirect employment

chisel workers one gang for about 20 personals specifically for dressing of rough granite blocks. This material is well known in the international supermarket of Granite which will fetch a good fetch a good foreign exchange to the nation.

1.6.5.1 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.

1.6.5.2 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.

1.6.5.3 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 slaps etc. Apart from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.6.5.4 Domestic/export markets

As of now there is good demand for this granite blocks in foreign as well as local market. The quarries 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. Parts from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.7 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA, TN, TAMIN has appointed Environmental Consultants 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 B1category as obtained Terms of Reference from SEIAA-TN, was assigned to M/s. EHS360 Labs Pvt. Ltd., Chennai by the project proponent. M/s. EHS360 Labs Pvt. Ltd is accredited by NABET, vide possession of Certificate No. NABET/EIA/2225/IA/0098_Rev.01, valid up to 24.06.2025.

1.8 EIA Cost

EIA Studiesincluding Baseline undertaken by EHSL for an amount of INR Rs.1,34,400/-

1.9 Scope of the Study

The scope of the work mentioned includes an assessment study of the proposed 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 negativethat, themining 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 14thSeptember 2006 and subsequent amendments. The basic structure of the report will be as under:

Structure of Environmental Impact Assessment Report:

Chapter No	Description of Content
Chapter 1	**Introduction** Give the brief outline of the project as details of need of the EIA report, project proponent, nature and size of the project, location of the project, and need of project, scope of EIA study and applicable environmental regulations and standards
Chapter 2	**Project Description** The chapter gives details about the type and capacity of the project, need of the project, project location, layout & area break-up, details of product, raw materials, manufacturing process and technology description, details of machineries and equipment, resource requirements, details on aspects of the project causing environmental impacts and mitigation measures incorporated to meet the standards.
Chapter 3	**Description of the Environment**

	The chapter describes the study area, study period, methodology and components selected for baseline studies, baseline status for ambient air, water, soil, socioeconomic, land use and meteorology of the study area within 10km radius.
Chapter 4	**Anticipated Environmental Impacts and Mitigation Measures** In this chapter, the anticipated environmental impacts due to proposed project activities are identified, analyzed, and assessed and thereafter the mitigation measures for the adverse impacts are proposed. The significance of impacts is determined. This chapter is prepared based on Chapter-2 & Chapter-3 by correlating the activities under proposed project and their impacts on receiving environmental attributes.
Chapter 5	**Analysis of Alternatives (Technology/site)** The chapter describes the alternative sites and the proposed factors for locating at the mentioned location. This would also describe the alternative technologies if any for manufacturing proposed products.
Chapter 6	**Environmental Monitoring Programme** The chapter proposes the post project monitoring plan and the budgetary provisions for the various environmental components.
Chapter 7	**Additional Studies** This chapter would highlight any additional studies required for the proposed project i.e Public Consultation. Risk Assessment, Disaster Management Plan, and R&R Studies and any additional recommended during the Scope stage/ToR.
Chapter 8	**Project Benefits** Highlights the direct and indirect benefits on the physical infrastructure and social infrastructure due to proposed projects.
Chapter 9	Environmental Cost Benefit Analysisis notrecommended during scoping stage for this project
Chapter 10	**Environmental Management Plan** The chapter proposes the Environmental Management Plan highlighting the mitigation measures and roles and responsibilities of the management. This would include specific time frames for completion, resources required and specific responsibility.
Chapter 11	**Summary and Conclusion** Summarize the entire report and conclude the summary of the EIA report.
Chapter 12	**Disclosure of Consultants Engaged** Provides the brief profile of the EIA consultant organization and EIA project team for the current study.

1.9.1 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 10km radius from the project.

1.9.2 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.

1.9.3 Applicable Regulatory Framework

The EIA process followed for this EIA report 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 &marking out 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.

1.9.4 Legal Completability

The establishment and functioningofthe miningindustrywillbegovernedbythefollowing environmental acts/regulationsbesidesthe local zoningandlanduse lawsoftheStates.

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: 2000
5. The Environment (Protection) Act, 1986 (EPA)
6. The Wildlife (Protection) Act, 1972 as amended.
7. The Forest (Conservation) Act, 1980 as amended.

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).
11. Contract Labor Regulation and Abolition Act 1970
12. The Motor Vehicles Act – 1989
13. PESO – Explosives and handling of Hazardous Material: 1934.

1.9.5 Terms of Reference Compliance

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

S. No	Terms of Reference	Compliance
1.	The proponent is requested to carry out a survey and enumerate on the structures located within 50m, 100m, 150m, 200m, 250m, 300m and 500m from the boundary of the mine lease area.	The structures are located within 50m, 100m, 150m, 200m, 250m, 300m and 500m from the boundary of the mine lease area is provided in **Chapter 2,Table 2-3.** Structures' Photographs are provided in**Figure 2-10** There are no sensitive structures are located within the 500m radius from the project site other than Pump houses and Brick Manufacturing units.
2.	The proponent shall discuss the funds for mitigation measures to be included in the EMP.	The CER Fund will be allocated after Public Hearing on specific requirements
3.	The proponent shall adhere to the bench height - 5m as stated in the approved mining plan.	Noted and will be followed in accordance with MMR, 1961.
4.	The proponent shall submit an affidavit on participation in the Anna University Star rating system.	The PP will be submitted affidavit on participation in the Anna University Star rating system during Final EIA submission.
5.	The PP shall study the implications of Reserve Forest in mining area.	The nearest Forest is Ponnaiyar RF is located at 1.16km (SSE). Mining activities will not show major implications on Reserve Forests; However, proper mitigation measures will be implemented to control the Dust Generation, Control blasting methods and regular dust control methods will be followed to avoid the impacts due to mining actions on nearby Reserve Forests. The proposed Mitigation Measures provided in **Chapter 4.**
6.	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing	The PP will be conducted the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping &

S. No	Terms of Reference	Compliance
	the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Necessary data and documentation in this regard may be provided.	open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD so as to assess the impacts on the wells due to mining activity and is provided during the Final EIA Submission.
7.	The PP shall provide individual notice regarding the Public Hearing to the nearby house owners located in the vicinity of the project site.	The PP will provide individual notice regarding the Public Hearing to the nearby house owners located in the vicinity of the project site. The evidence will be provided during Final EIA report.
8.	In the case of proposed lease in an existing (or old) quarry where the benches are non-existent (or) partially formed critical of the bench geometry approved in the Mining Plan, the Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the realignment of the 'highwall' benches to ensure slope stability in the proposed quarry lease which shall be vetted by the concerned Asst. Director of Geology and Mining, during the time of appraisal for obtaining the EC.	Not applicable. Since it is a Greenfield project.
9.	Details of Green belt & fencing shall be included in the EIA Report.	The PP will be provided the green belt & fencing before operations of the quarry.
10.	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidence. • If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall	Not Applicable. It is a fresh quarry proposed by the M/s. Tamil Nadu Minerals Ltd, (An undertaking of Government of Tamil Nadu).

S. No	Terms of Reference	Compliance
	furnish the following details from AD/DD, mines, • What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? • Quantity of minerals mined out. • Highest production achieved in any one year. • Detail of approved depth of mining. • Detail of approved depth of mining. • Actual depth of the mining achieved earlier. • Name of the person already mined in that leases area. • If EC and CTO already obtained, the copy of the same shall be submitted. • Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	
11.	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corner coordinates of the mine lease area are provided in **Chapter 1, Table 1-4.** Topo map is provided in **Chapter 3 Figure 3-2.**The land use and other ecological features of the study area (core and buffer zone) are provided in **Figure 3-6.**
12.	The PP shall carry out Drone video survey covering the cluster, green belt, fencing etc.,	The PP will be provided the Drone Video survey covering the cluster, Greenbelt and fencing during the Final EIA submission.
13.	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	The PP will furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan during the Final EIA Submission.

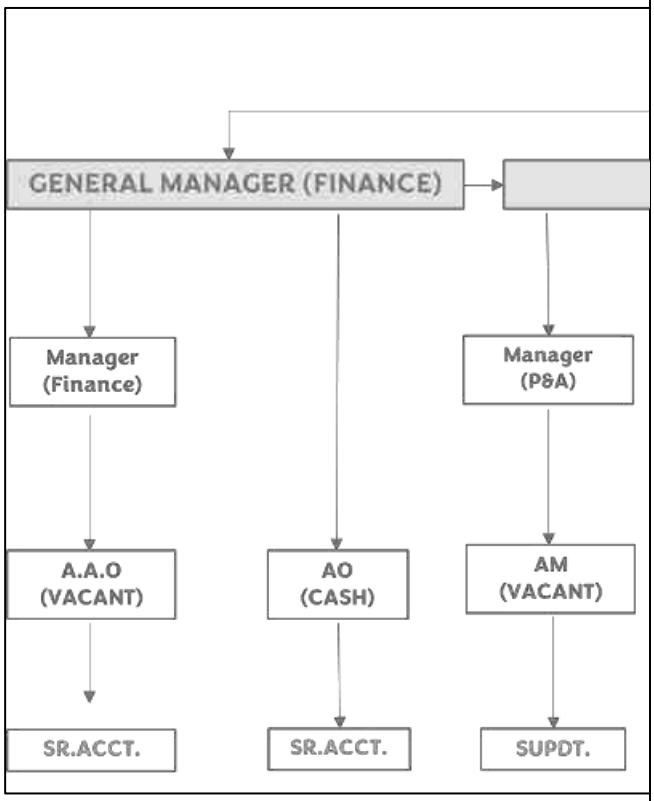
<table>
<tr><th>S. No</th><th>Terms of Reference</th><th>Compliance</th></tr>
<tr><td>14.</td><td>The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.</td><td>The details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications is provided in Chapter 2 Section 2.7.
The anticipated impacts of the mining operations on the surrounding environment and the remedial measures are provided in Chapter 4.</td></tr>
<tr><td>15.</td><td>The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act' 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.</td><td>The proposed Organization chart indicating the appointment of various statutory officials and other competent persons are provided in Chapter 10,
 

Figure 10-1.</td></tr>
<tr><td>16.</td><td>The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.</td><td>
<table>
<tr><th>S. No</th><th>Description of Section</th><th>Section</th><th>Parameters</th></tr>
<tr><td>1</td><td>Meteorology</td><td>Section 3.5.2</td><td>Temperature, Relative Humidity, Rainfall, Wind Speed & Direction</td></tr>
<tr><td>2</td><td>Ambient Air Quality</td><td>Section 3.5.4</td><td>As per NAAQS, 2009 as per ToR</td></tr>
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<tr><th>S. No</th><th>Terms of Reference</th><th>Compliance</th></tr>
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<table>
<tr><td>3</td><td>Ambient Noise Levels</td><td>Section 3.6</td><td>Day equivalent noise levels, Night equivalent noise levels (As per CPCB Standards)</td></tr>
<tr><td>4</td><td>Water Quality</td><td>Surface water – Section 3.7.2
Ground water – Section 3.7.3</td><td>Ground Water – IS 10500:2012
Surface Water – IS 2296 (Class – A)</td></tr>
<tr><td>5</td><td>Soil Quality</td><td>Section 3.8</td><td>ICAR (Indian Council of Agricultural research)</td></tr>
<tr><td>6</td><td>Ecology</td><td>Section 3.9</td><td>Flora and Fauna</td></tr>
<tr><td>7</td><td>Social Economic Status</td><td>Section 3.10</td><td>Socio Economic Profile of Study area (Population Profile, Employment and Livelihood, Education and Literacy, etc.,)</td></tr>
</table>
</td></tr>
<tr><td>17.</td><td>The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations s in the mind.</td><td>The Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts is provided in Chapter4.The Environment Management plan is preparedand provided in the Chapter 10.</td></tr>
<tr><td>18.</td><td>Rainwater harvesting management with recharging details along with water</td><td>The total water requirement is 1.5KLD, Balance during the non-monsoon is provided in Chapter 4, Section 4.3.1 and Figure 4-5.</td></tr>
</table>

S. No	Terms of Reference	Compliance
	balance (both monsoon & non-monsoon) be submitted.	The monsoon water requirement is only drinking water is about 0.5 KLD. Rainwater will be stored in a pond in the lease area and will be used for mining activities including greenbelt. Rainwater harvesting management details are provided in **Chapter 4, Section 4.3.2.3.**
19.	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. The 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.	Complied The Information/data presented in **Chapter 3 Figure 3-5.** Topo map is provided in **Chapter 3 Figure 3-2.** The land use and other ecological features of the study area (core and buffer zone) is provided in **Figure 3-6.**
20.	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	The total waste to be generated during the five years of Mining Plan period will be around 2,37,647m^3. This waste will be dumped on the south side of the lease area with dimensions of 368m x 32m x 20m. The Land breakup is provided in **Chapter 2** & **Table 2-12.**
21.	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable.
22.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of	Water conservation measures proposed to be adopted in the Project as Rainwater storage ponds/tanks & Storage cum recharge ponds in possible areas.

S. No	Terms of Reference	Compliance
	rainwater harvesting proposed in the Project, if any, should be provided.	
23.	Impact on local transport infrastructure due to the Project should be indicated.	The metallic Road located to the adjacent to the project site. The road will be damaged due to Heavy vehicle movement with materials; However, the PP will be maintained the roads with proper dust suppression measures and regular repairs. The average saleable production will be about 18.35 m^3 per day, which is about 54 Tons/ day (bulk density of 2.8 Tones/m^3 or 3 Tonne per cubic meter). Considering an average carrying capacity of truck as 10 Tons, the number of truck trips will be about 2 trips per day. Further, considering an operating hours of 8 hours per day, about 1-2 trips will be flying on the nearby village road subject market condition.
24.	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Few trees are available in the lease area and 300m buffer zone. Most small bushes and shrubs are available. List of Tress located within the 300 m from the boundary of the mine lease area are provided in **Chapter 2, Table 2-4.** Photographs of Tress located within the 300 m from the boundary of the mine lease area are provided in **Figure 2-11**
25.	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Noted. The details of Mine Closure Plan are provided in **Chapter 7, Section 7.1.4** of the EIA report.
26.	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.	Noted. The Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions will be provided during the Final EIA Submission.

S. No	Terms of Reference	Compliance
27.	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	Noted will be followed the same by the proponent.
28.	The PP shall produce/display the EIA report, Executive summery and other related information with respect to public hearing in Tamil Language also.	Noted will be followed the same
29.	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Noted.
30.	The purpose of green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-lin consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Proposed Greenbelt details are provided in **Chapter 2 Section 2.16.8** **Table** 2-22.It is proposed to plant 100 trees (Neem/Pungam) in 5 years.
31.	Taller/one year old Saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	Noted, Greenbelt / Plantation will be carried out to enhance the vegetative growth and aesthetic in the safety zone area. The 7.5m safety distance along the lease boundary has been identified to be utilized for afforestation. About 100 trees will be planted in and around the lease area in 5 years. Proposed Trees are Neem, Pungam etc., details are proposed in **Chapter 2 Section 2.16.8.**

S. No	Terms of Reference	Compliance
32.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	A Disaster management Plan is provided in **Chapter 7, Section 7.1.3.**
33.	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	Risk Identification and Management details are provided in the **Chapter 7Section 7.1.2.**
34.	The 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.	Complied. The details are provided in **Chapter 6, Section 6.3.1 and Table 6-1.**
35.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The Impacts on public health including employes due to project related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures is provided in **Chapter 4, Section 4.10**
36.	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence on 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.	The Socio-economic studies are provided in **Chapter 3Section 3.9.** The socio-economic significance and influence/impact and mitigation measures details are provided in **Chapter 4, Section 4.9**
37.	Details of litigation pending against the project, if any, with direction /order	No of litigation pending against the project.

S. No	Terms of Reference	Compliance
	passed by any Court of Law against the Project should be given.	
38.	The 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.	Benefits of the Project is provided in in EIA report **Chapter 8.**
39.	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	Not applicable, since it is a Greenfield project
40	The PP shall prepare the EMP for the entire life of mine and furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	The PP will be provided the sworn affidavit stating to abide the EMP for the entire life of mine is provided during the Final EIA
41.	Concealing any information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted
ANNEXURE 'B' **Cluster Management Committee**		
1.	Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry.	The Cluster Management Committee will be formed which include all the proponents in the cluster as members including the existing as well as proposed quarry and do all the works as directed in the EC letter while commencement of quarry operation after obtaining EC
2.	The members must coordinate among themselves for the effective implementation of EMP as committed	Noted.

S. No	Terms of Reference	Compliance
	including Green Belt Development, Water sprinkling, tree plantation, blasting etc.,	
3.	The List of members of the committee formed shall be submitted to AD/Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines.	Noted.
4.	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul roads by the individual quarry in the form of route map and network.	Noted.
5.	The committee shall deliberate on risk management plan pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan.	Noted.
6.	The Cluster Management Committee shall form an Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised shall be given in detail.	Noted & will be complied.
7.	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	Noted & will be complied.
8.	The committee shall furnish the Emergency Management plan within the cluster.	Noted & will be complied.
9.	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	Noted & will be complied.

S. No	Terms of Reference	Compliance
10.	The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety.	Noted & will be complied.
11.	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents.	Noted & will be complied.
Impact study of mining		
12	A detailed study shall be carried out about impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following.	TAMIN will engage reputed research institutions to carry out regular monitoring and survey and submitted during the Post EC Compliance report for the entire mine lease period.
	a) Soil health & soil biological, physical land chemical features.	
	b) Climate change leading to Droughts, Floods etc.	
	c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local people.	
	d) Possibilities of water contamination and impact on aquatic ecosystem health.	
	e) Agriculture, Forestry & Traditional practices.	
	f) Hydrothermal/Geothermal effect due to destruction in the Environment.	
	g) Bio-geochemical processes and its footprints including environmental stress.	
	h) Sediment geochemistry in the surface streams.	
Agriculture &Agro-Biodiversity		
13.	Impact on surrounding agricultural fields around the proposed mining Area.	No. of trees detail are provided in **Chapter 2** and **Table 2-4**.
14.	Impact on soil flora & vegetation around the project site.	

S. No	Terms of Reference	Compliance
15.	Details of type of vegetations including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetations all along the boundary of the proposed mining area shall committed mentioned in EMP.	
16.	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	The Impact on surrounding agricultural fields, soil flora & vegetation, no. of trees & shrubs are provided in **Chapter 4.**
17.	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	The entire mine lease area of 8.46.0 Ha is Government land which is leased by TAMIN. The quarry the precise area communication letter is enclosed as **Annexure–2.** The land is barren land and deposited with granite minerals. There is no requirement of restoration of ecosystem. However, TAMIN proposed not to back fill the ultimate pit. In as much as good quality of reserves is available below the workable depth of 31m and there is possibility of technology of up gradation in granite mining for greater depths in course of time for safe mining at economic cost beyond 31m depth. The pit boundaries will be fenced and used for agricultural purposes when the pit is filled with underground seepage or rainwater
18.	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture, and livestock.	TAMIN Proposed 7.5m safety distance for patta& private Lands and 10km for Govt poramboke lands and 50m distance will be maintained for roads. ▸ **North:** SF.No. 306, 308, 314, 317/2 Pattalands 7.5m safety distance ▸ **South:** SF.No.318 & 319 Private lands 7.5 safety distance provided. ▸ **East:** Veeranam village 7.5m and 10m safety distance provided. ▸ **West:** 304/4 Govt Poramboke land as well as a Tar/Metallic Road is passing, 50m safety distance id provided
Forests		

S. No	Terms of Reference	Compliance
19.	The project proponent shall detail study on impact of mining on Reserve forests free ranging wildlife.	The entire mine lease area of 8.46.0 Ha is Government land which is leased by TAMIN. The quarry the precise area communication letter is enclosed as **Annexure–2.** There is no forest land is involved in the lease area.
20.	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	Complied. ▶ There are no National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wildlife migratory routes in core and buffer zones within the 1km radius of the project. ▶ No wildlife is found in the quarry Lease area. To minimize the impacts and to improve up on the existing eco system Afforestation plan will be envisaged with native plants. There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area (Buffer zone). There is no rare or endangered species in the core zone and Buffer zone of the study area.
21.	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Complied. Standing trees and the existing trees are provided in **Chapter 2**, **Table 2-4** within 300m radius. TAMIN Mining activities will not disturb the any existing plant. However regular dust suppression will be maintained in and around the mining area and additional plants will be provided under afforestation program with native species.
22.	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	Complied. The Environmental Impact Assessment covers Reserve Forests in nearby project sites. There is no

S. No	Terms of Reference	Compliance
		National Parks, Corridors and Wildlife pathways, near project site.
Water Environment		
23.	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. 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, covering the entire mine lease period.	The number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) with depth of wells and water availabilityis provided in **Chapter 2, Table 2-5.** Hydro-geological study is carried out and submitted during the Final EIA Submission.
24.	Erosion Control measures.	Erosion Control measures are provided in **Chapter 4 Section 4.3.2.**1 under surface water pollution control measures.
25.	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Waterbodies/ Rivers, & any ecological fragile areas.	Complied. The details are provided in **Chapter 4, Section 4.3.**
26.	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.	There is no major fish habitats and the food chain in the water body and Reservoir in nearby project site.
27.	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	Complied. The study details are provided in **Chapter 4, Section 4.2**
28.	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible landform changes visual and aesthetic impacts.	There is no aquatic plants and animals in water bodies and landscape and there are no damages to nearby caves, heritage site, and archaeological sites possible landform changes visual and aesthetic impacts since there are no nearby caves, heritage sites, and archaeological sites within the core area other than Prehistoric Site is located at ~10.69km (SW).

S. No	Terms of Reference	Compliance
		Sathanur Dam is located at distance of ~3.28km (W) which may have aquatic plants. There is no impact by the project activities.
29.	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components, and microbial components.	Complied. The soil physical, chemical components of soil health details are provided in **Chapter 3, Section 3.9**
30.	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	There are no major wetlands, water bodies, rivers streams, lakes in nearby project site.
Energy		
31.	The measures taken to control Noise, Air, Water, Dust Control, and steps adopted to efficiently utilize the Energy shall be furnished.	Complied. The proposed black granite quarry will be operated with the Open Cast Semi Mechanized method. Drilling and blasting and excavation are carried out through diesel drive machinery. The methodology of mining is provided in provided in **Chapter 2.**
Climate Change		
32.	The Environmental Impact Assessment shall study in detail the carbon emission and suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	The emission like PM10, PM2.5, NOX and SO2 are major pollution contribution to the atmosphere by the mining activities. It was observed that the maximum ground level concentration observed due to mining activities and traffic movement without control measures for PM10, PM2.5 and NOx are 3.08 µg/m^3, 1.06 µg/m^3 and 16.1 µg/m^3 respectively. The highest concentration levels identified at the project site only. So, it can be concluded that even during operation of quarry the impact envisaged is moderate.
33.	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution, and above soil & below soil carbon stock.	Study impact on climate change, temperature rise, pollution, and above soil & below soil carbon stock will be provided during Final EIA Submission.
Mine Closure Plan		
34.	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Complied. The details are provided in **Chapter 7, Section 7.1.4**
EMP		

S. No	Terms of Reference	Compliance
35.	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued.	Complied. The Environment Management Plan along with adaptation, mitigation & remedial strategies are provided in **Chapter 10.**
36.	The Environmental Impact Assessment should hold detailed study on EMP with budget for green belt development and mine closure plan including disaster management plan.	Complied. EMP with budget for green belt development and mine closure plan including disaster management plan is provided in **Chapter 10.**
Risk Assessment		
37.	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Complied. The Environment Management Plan along with adaptation, mitigation & remedial strategies are provided in **Chapter 7, Section 7.1.2.**
Disaster Management Plan		
38.	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Complied. A disaster management plan and disaster mitigation measure are provided in **Chapter 7 Section 7.1.3.**
Others		
39.	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.	The PP will furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc during Final EIA Submission.
40.	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns	The concerns raised during the public consultation and all the activities proposed will be included in the Environment Management Plan after public Hearing.

S. No	Terms of Reference	Compliance
	raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	
41.	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic &microplastics on aquatic environment and freshwater systems due to activities, contemplated during mining may be investigated and reported.	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. Organic waste from domestic activities will be disposed through Municipal bin including food waste and Inorganic waste will be disposed through TNPCB authorized recyclers. Strict guidelines will be put in place to manage solid waste generation during the operational phase of the development.
	STANDARD TERMS OF REFERENCE	
1.	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.	Not applicable. Since it is a Fresh Quarry.
2.	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The proposed black granite area is categorized as Government poramboke land located at S.F. No. 315, 316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District. TAMIN has obtained a Precise area communication letter for a period of 20 years vide Govt. Letter. No.3377/MME. 1/2022-1 dated 03.06.2022. Precise area communication letter is attached as **Annexure-2.**
3.	All documents including approved mine plan, EIA and Public Hearing should be	All documents including approved mine plan, EIA and Public Hearing should be compatible with one

S. No	Terms of Reference	Compliance
	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.	another in terms of the mine lease area, production levels, waste generation and its management, mining technology in the name of TAMIN only
4.	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/topo sheet, topographic sheet, geomorphology, and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corners co-ordinates of the mine lease area is given in **Chapter 1** and **Section 1.6.3, Table 1-4**, Topo map in **Figure 2-9.**Geology and Geomorphology of the area is provided in **Chapter 3Section 3.4.6, 3.4.7**, **Figure 3-8&Figure 3-9.**
5.	Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of landforms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Topo map with existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics are prepared in 1:50000 scale and is given as **Figure 3-2.** Geomorphology pattern of the study area is shown in **Chapter 33.4.7**, **Figure 3-7 & Figure 3-9**. Drainage map is shown as **Figure 3-10.**
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	It is a fresh quarry. Government has issued Precise area communication letter for 20 years vide Lr.No. 3377/MME. 1/2022-1 dated 03.06.2022. Precise area communication letter is enclosed as **Annexure-2** Mining Plan was submitted and approved by Commissionerate of Geology and Mining; Chennai vide letter Rc. No. 1033/MM4/2022, dated: 18.08.2022 is enclosed as **Annexure-3.** The production details are provided in **Chapter 1 Section 1.6.2.**
7.	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures	Environmental Policy of TAMIN is given in **Chapter 10 Section 10.11.**

S. No	Terms of Reference	Compliance
	to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance 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 shareholders or stakeholders at large, may also be detailed in the EIA Report.	
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 also be provided.	It is a Black Granite quarry and open cast Mining methodology will be followed. The workable depth of mining will be 31m from the top of the hill. Mining methodology is provided in **Chapter 2** and **Section 2.9 andSection 2.10.** Safeguard measures are provided in **Chapter-4**, **Section 4.10.**
9.	The study area will comprise of 10 km 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.	10 Km radius from the project periphery area is considered as study area. The baseline study details are furnished in **Chapter 3**. The production and waste generation from quarry activitiesis estimated at 1:9 ratio details are provided in **Chapter 2 Section 2.7**.
10.	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.	The environmental sensitive areas covering an aerial distance of 15km from the project boundary is given **Chapter 3. Section 3.2 and Table 3-1.** Land use of the study area is provided in **Figure 3-6** and **Table 3-3** with delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements, and other ecological features.

S. No	Terms of Reference	Compliance
11.	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.	It is a governmentporambokeland lease obtained lease for 20 years by the TAMIN. No habitation in the lease area, no R&R issues are involved in the proposed project. Over burden, Side burden and granite rejects (2,37,647 m^3) will be dumped on the southwest side of lease area with dimensions of 368m x 32m x 20m.
12.	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, 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.	Not applicable. No forest land is not involved in the lease area.
13.	Status 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.	Not applicable since, no forest land is involved in the lease 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.	Not applicable. No scheduled tribes and other traditional forest dwellers are observed in the study area since, the proposed project land is a non-forest government poramboke land.
15.	The vegetation in the RF/PF areas in the study area, with necessary details, should be given.	The list of Reserve forests available within the 15km radius is provided in **Chapter 3** and **Section 3.3, Table 3-1and** Figure 3-3.

S. No	Terms of Reference	Compliance
16.	A study shall be 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 submitted.	Baseline Biological survey was carried out to assess the ecology of the study area. The floral diversity is grouped into trees, shrubs, climbers, and herbs. Similarly, the faunal diversity is grouped into mammals, birds, reptiles, and amphibians. There are no extinct flora and fauna species found in the study area. This area hosts common animals. Indian Dogs, Jungle and Domestic cat, Rhesus macaque, Domestic Cows, Buffaloes, Bullocks, and Goat etc. are found amongst mammals. There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area (Buffer zone). There is no rare or endangered species in the core zone and Buffer zone of the study area. The mitigation measure is provided in **Chapter 4, Section 4.7.**
17.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10 km 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.	No Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves are available within 15Km of mine lease area. The detailed Environmental Sensitivity areas within the 15km radius of the project site are given in **Chapter 3, Section 3.3** and **Table 3-1 & Figure 3-3.**
18.	A detailed biological study of the study area [core zone and buffer zone (10 km	Detailed Biological Study of the Study Area [core zone and buffer zone (10 km radius of the periphery of the

S. No	Terms of Reference	Compliance
	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 field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-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 for implementing the same should be made as part of the project cost.	mine lease)] was carried out and list of Flora & Fauna is detailed is given in **Chapter 3, Section 3.9.**
19.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also 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.	Not applicable, Since the proposed project area is not falls under Critically Polluted or 'Aravali Range'.
20.	Similarly, for Coastal Projects, a CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HIL, CRZ area, location of the mine lease with respect to 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).	Not applicable since proposed lease does not fall under CRZ area.

S. No	Terms of Reference	Compliance
21.	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, familywise, should be undertaken to assess their requirements, and action programmes prepared and 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.	Not applicable. The lease area is classified as Government Poramboke land. TAMIN has obtained the Precise area communication letter is obtained from Govt. of Tamil Nadu for 20 years. There is no Rehabilitation and Resettlement is involved. Precise area communication letter is enclosed as **Annexure-2.**
22.	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] 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 date-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 500 m of the mine lease in the pre-	One season **(Mid December 2023 –Mid March 2024**) the primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna, Site- specific meteorological data collected and the detail are furnished in **Chapter-3.** 1. Meteorology **Section3.5.2** Temperature, Relative Humidity, Rainfall, Wind Speed & Direction 2. Ambient Air Quality **Section 3.5.4.** As per NAAQS, 2009 3. Ambient Noise Levels **Section3.6** Day equivalent noise levels, Night equivalent noise levels (As per CPCB Standards) 4. Water Quality Surface water – **Section 3.7.2** Ground water – **Section 3.7.3** Ground Water –IS 10500:2012 Surface Water -IS 2296 (Class – A)

S. No	Terms of Reference	Compliance
	dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	5. Soil Quality **Section 3.8** ICAR (Indian Council of Agricultural research) 6. Ecology **Section 3.9** Flora and Fauna Social Economic Status **Section 3.10** (Socio Economic Profile of Study area (Population Profile, Employment and Livelihood, Education and Literacy, etc.,)
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 direction may also be indicated on the map.	AERMOD Air quality modeling has been carried out to predict the air quality during the operation of proposed project activities impacts within the 10km radius of the project site for PM10, PM2.5 and Nox details area. The details are provided in **Chapter 4, Section 4.2.4.** The maximum ground level concentration observed due to mining activities and traffic movement through Air Modelling for PM10, PM2.5, and NOx are 3.08 µg/m^3, 1.06 µg/$m^3$and 16.1 µg/m^3 respectively. The details are given in **Chapter 4, Section 4.2.3** Predominant wind direction Southeast Windrose diagram is shown as **Figure 4-1.**
24.	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.	The water requirement for the project is addressed in **Chapter 2 Section 2.11.2** and **Table 2-16.**
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	No ground water withdrawal to meet the water requirement. The total water requirement is sourced from Vendor or village panchayat.

S. No	Terms of Reference	Compliance
26.	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.	Water conservation measures are proposed in **Chapter 4** and **Section 4.3.** Rainwater harvesting detailed are provided in **Chapter 3 Section 4.3.2.3**.
27.	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.	Impacts on water environment & water conservation measures are proposed in **Chapter 4, Section 4.3**.
28.	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 the 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 also be obtained and copy furnished.	The proposed depth of mining is 31m from the top of the hill. Mining activities will not intersect with ground water table as the proposed depth of mining will be 18 m from the top of hill and 13 m below ground level. Ground water table is available at 15m as per the Mining plan. The PP will provide the Hydro Geological Study report during Final EIA Submission
29.	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.	Not Applicable. There are no streams, or seasonal streams passing through the projectarea since it is hilly terrain. However, TAMIN provided all safety measures for nearby water bodies are provided in **Chapter 4, Section 4.3.**
30.	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A	Site Elevation: 128 m (Max), the proposed Depth of Mining is 31m as per the approved Mining Plan. Ground water table is available at 15m as per the Mining plan.

S. No	Terms of Reference	Compliance
	schematic diagram may also be provided for the same.	Site Salient features are given in **Chapter 2 Table 2-2.**
31.	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. A 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 green belt 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.	About 0.06.5 Ha of area is proposed for Green Belt development. It 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** 2-22**.**
32.	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. Arrangements 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.	There is no impact on the local transport infrastructure due to the project since The average saleable production will be about 18.35 m^3 per day, which is about 54 Tons/ day (bulk density of 2.8 Tones/m^3 or 3 Tonne per cubic meter). Considering an average carrying capacity of truck as 10 Tons, the number of truck trips will be about 2 trips per day. Further, considering an operating hours of 8 hours per day, about 1-2 trips will be flying on the nearby village road subject market condition. Impacts and mitigation measures on transportation is given in **Chapter 4 Section 4.11.1**
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Sanitation facilities are provided to mine's workers in temporary structures and an area of 0.01.0 Ha of land is allocated for infrastructure within the lease area.

S. No	Terms of Reference	Compliance
		The area breakup details are given in **Chapter-2**, **Section 2.11.1 Table 2-15**.
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.	Conceptual post mining land use and Reclamation and restoration sectional plates are enclosed as **Annexure-5.**The plans and with adequate number of sections are provided in **Figure 2-13 to Figure 2-20.**
35.	The 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.	Occupational Health impacts & preventive measures detailed given in **Chapter 4** and **Section 4.10** The EMP details are given as a separately as **Chapter 10** along with EMP Cost details are provide in **Section 10.14Table 10-1.**
36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Occupational Health impacts & preventive measures detailed given in **Chapter 4** and **Section 4.10** The EMP details are given as a separately as **Chapter 10** along with EMP Cost details are provide in **Section 10.14.**
37.	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.	Impacts and measures are addressed in **Chapter 4** and **Section 4.5** and **Section 4.9**.
38.	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	The EMP details are given as a separately as **Chapter 10.**.

S. No	Terms of Reference	Compliance
	other impacts specific to the proposed Project.	
39.	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project	The draft EIA is prepared as per obtained ToR and will be submitted for public hearing to TNPCB. After completing public hearing and obtaining minutes the point wise proponent compliance will be enclosed in the Final EIA.
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.	There is no litigation pending against the project.
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.	The project Cost is addressed in **Chapter 2** and **Section 2.8 Table 2-13.**
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster Management Plan is given in **Chapter 7** and **Section 7.1.2.**
43.	The 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.	Project benefits are given in **Chapter 8.**
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.	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.	Yes, sources for all tables are addressed.
d)	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original	All the analysis/testing reports of Water, Soil, Air, Noise etc. are conducted by MoEF&CC & NABL accredited laboratories. The disclosure of consultant is given in **Chapter 12.**

S. No	Terms of Reference	Compliance
	analysis/testing reports should be available during appraisal of the Project.	
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 only.
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 will be prepared as per prescribed format issued by SEAC
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 generic structure prescribed in **Appendix–III** of EIA Notification 2006 and covered all ToR Compliance.
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 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.	Noted.
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 conditions stipulated in the Environment Clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not Applicable, as it is a new project.
j)	The EIA report should also include (i) surface plan of the area indicating	All the Sectional Plates are enclosed as **Annexure- 5.**

S. No	Terms of Reference	Compliance
	contours of main topography 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 adjoining area.	
In addition to the above, the following shall be furnished: - **The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:**		
1.	Project name and location (Village, District, State, Industrial Estate (if applicable).	Noted and followed the same
2.	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.	Noted and followed the same
3.	Measures for mitigating the impact on the environment and mode of discharge or disposal.	Noted and followed the same
4.	Capital cost of the project, estimated time of completion.	Noted and followed the same
5.	The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.	Noted and followed the same
6.	A detailed study of the lithology of the mining lease area shall be furnished.	Noted and followed the same
7.	Details of village map, "A" register and FMB sketch shall be furnished.	Noted and followed the same
8.	Detailed mining closure plan for the proposed project approved by the Geology of Mining department shall be submitted along with EIA report.	Noted and followed the same
9.	Obtain a letter/certificate from the Assistant 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	Noted and followed the same

S. No	Terms of Reference	Compliance
	the same shall be furnished in the EIA report.	
10.	EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.	Noted and followed the same
11.	Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.	Noted and followed the same
12.	The EIA study report shall include the surrounding mining activity, if any.	Noted and followed the same
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.	Noted and followed the same
14.	A study on the geological resources available shall be carried out and reported.	Noted and followed the same
15.	A specific study on agriculture & livelihood shall be carried out and reported.	Noted and followed the same
16.	Impact of soil erosion, soil physical chemical and biological property changes may be assumed.	Noted and followed the same
17.	Site selected for the project - Nature of land Agricultural (single/double crop), barren, Govt./ private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km other industries, forest, eco-sensitive zones, accessibility, (note in case of industrial estate this information may not be necessary).	Noted and followed the same
18.	Baseline environmental data air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-	Noted and followed the same

S. No	Terms of Reference	Compliance
	economic condition of the nearby population.	
19.	Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.	Noted and followed the same
20.	Likely impact of the project on air, water, land, flora-fauna and nearby population.	Noted and followed the same
21.	Emergency preparedness plan in case of natural or in plant emergencies	Noted and followed the same
22.	Issues raised during public hearing (if applicable) and response given	Noted and followed the same
23.	CER plan with proposed expenditure.	Noted and followed the same
24.	Occupational Health Measures.	Noted and followed the same
25.	Post project monitoring plan.	Noted and followed the same
26.	The project proponent shall carry out detailed hydro geological study through intuitions/NABET Accredited agencies.	Noted and followed the same
27.	A detailed report on the green belt development already undertaken is to be furnished and also submit the proposal for green belt activities.	Noted and followed the same
28.	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines.	Noted and followed the same
29.	A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.	Noted and followed the same
30.	Reserve funds should be earmarked for proper closure plan.	Noted and followed the same
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 one time use and throw away plastics irrespective of thickness with	Noted and followed the same

S. No	Terms of Reference	Compliance
	effect from 01.01.2019 under Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan.	
Besides the above, the below mentioned general points should also be followed: -		
a.	A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.	Noted and followed the same
b.	All documents may be properly referenced with index, page numbers and continuous page numbering.	Noted and followed the same
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 followed the same
d.	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 (1) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.	Noted and followed the same
e.	The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard circular no F. No.J-11013/77/2004-IA-II(1) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31 December 2010 & 30th September 2011 posted on the Ministry's website	EIA Report is prepared by NABET accredited Consultant, The Consultancy Laboratory is being certified by MoEF&CC& NABL accredited. The disclosure of consultant is given in **Chapter 12**.

S. No	Terms of Reference	Compliance
	http://www.moef.nic.in/ may be referred.	
	• After preparing the EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above-mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.	Noted.
	• The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.	Noted and followed the same
	• The TORs with public hearing prescribed shall be valid for a period of three years from the date of issue, for submission of the EIA/EMP report as per OMNo.J- 11013/41/2006-IA-II(I) (part) dated 29th August 2017.	Noted and followed the same

2 PROJECT DESCRIPTION

2.1 Type of Project including interlinked and interdependent projects

The black granite quarrying operation is proposed to be carried out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & 6m width with vertical slop. The quarry lease area generally manifests hilly topography with a height of hill. The altitude of the area is 128 m (Maximum) above MSL. Total estimated Geological reserves are 10,24,350 m^3. Total Mineable Reserves are estimated as 7,75,804m^3. Maximum production of 44,044 m^3 of ROM of Black Granite and 4,404 m^3 of recoverable production of granite per annum. Summary of quarry reserves is given in **Table 2-1**.

The extent of the Quarry lease area is 8.46.0 Ha. The Quarry is located at Sathanur village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State. Quarry lease area falls in the survey of India Toposheet no 57 L/16 and lies between the GPS coordinates of 12°11'33.84544"N to 12°11’50.52500"N and 78°53'38.87350"E to 78°53'55.09528"E.

Table 2-1 Summaryof ProjectReserves

S. No	Description	Quantity (m^3)
Geological Reserves:		
1	Geological Reserves (ROM)	1024350
2	Geological Reserves (at 10% Recovery)	102435
Mineable Reserves:		
1	Mineable Reserves (ROM)	775804
2	Mineable Reserves (at 10% Recovery)	77580
3	Maximum RoM per year	44044
4	Maximum production per year (at 10%)	4404

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 seasonal agriculture and many 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 and indirect employment chisel workers one gang for about 20 personals specifically for dressing of rough granite blocks. This material is well known in the international supermarket of Granite which will fetch a good fetch a good foreign exchange to the nation.

2.3 Location of the Quarry

The quarry is located at SF.No.315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu. Quarry lease area falls in the survey of India Topo sheet 57 L/16 and lies between the latitude 12°11'33.84544"N to 12°11’50.52500"N and longitude 78°53'38.87350"E to 78°53'55.09528"E. The topography of the area is hilly. The altitude of the area is 128 m (Maximum) above MSL.

The boundary coordinates of the site are shown in **Table 1-4**. The project location map is given in **Figure 2-1**. Google image of the lease area is shown in **Figure 2-2**. 500m radius Google imagery of the lease area is shown in **Figure 2-3**. Google Imagery of 1, 5 & 10km radius of the lease area is shown in **Figure 2-4, Figure 2-5 & Figure 2-6** respectively. Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image is shown in **Figure 2-7**. Topo map of the study is shown in **Figure 2-9**. Salient Features within 15km radius of the project boundary is given in **Table 2-2**. Project Summary is provided **Table 2-1**

.

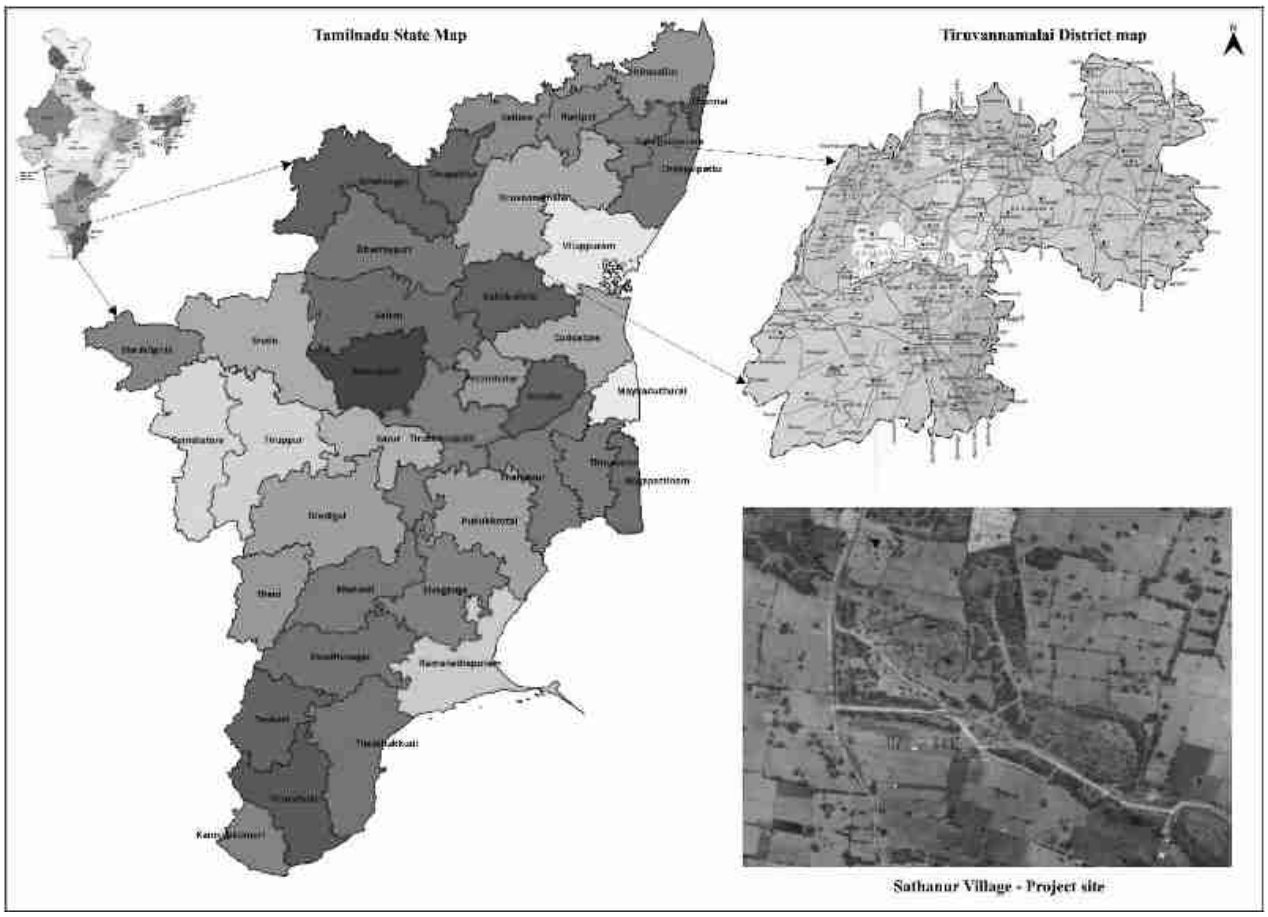


Figure 2-1 Project site Location map.

Figure 2-2 Googleimage oftheleasearea

Figure 2-3 500m radius google imagery map of the lease area.

Figure 2-4 1km radius google imagery map of the lease area.

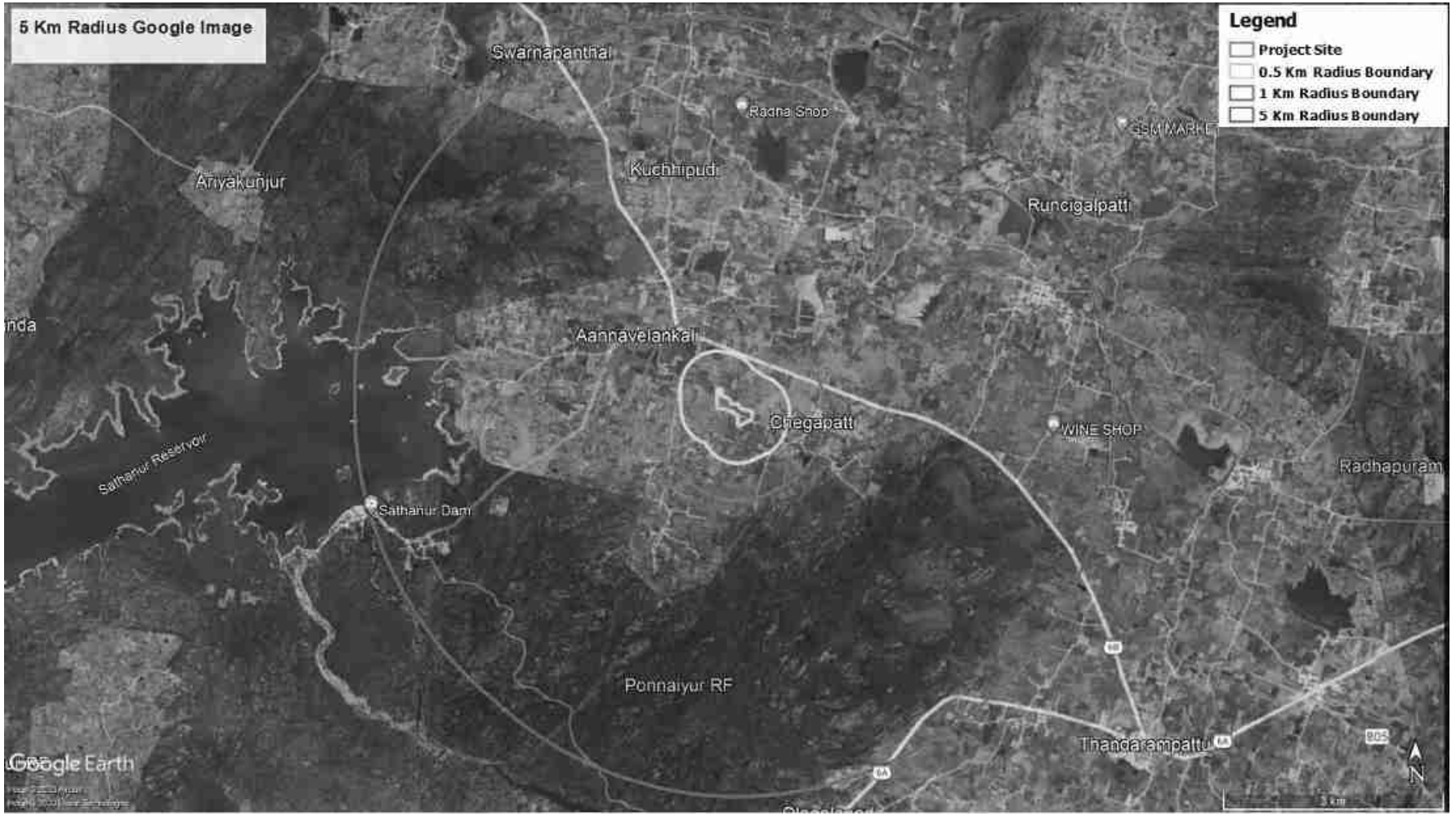


Figure 2-5 5km radius google imagery map of the lease area.

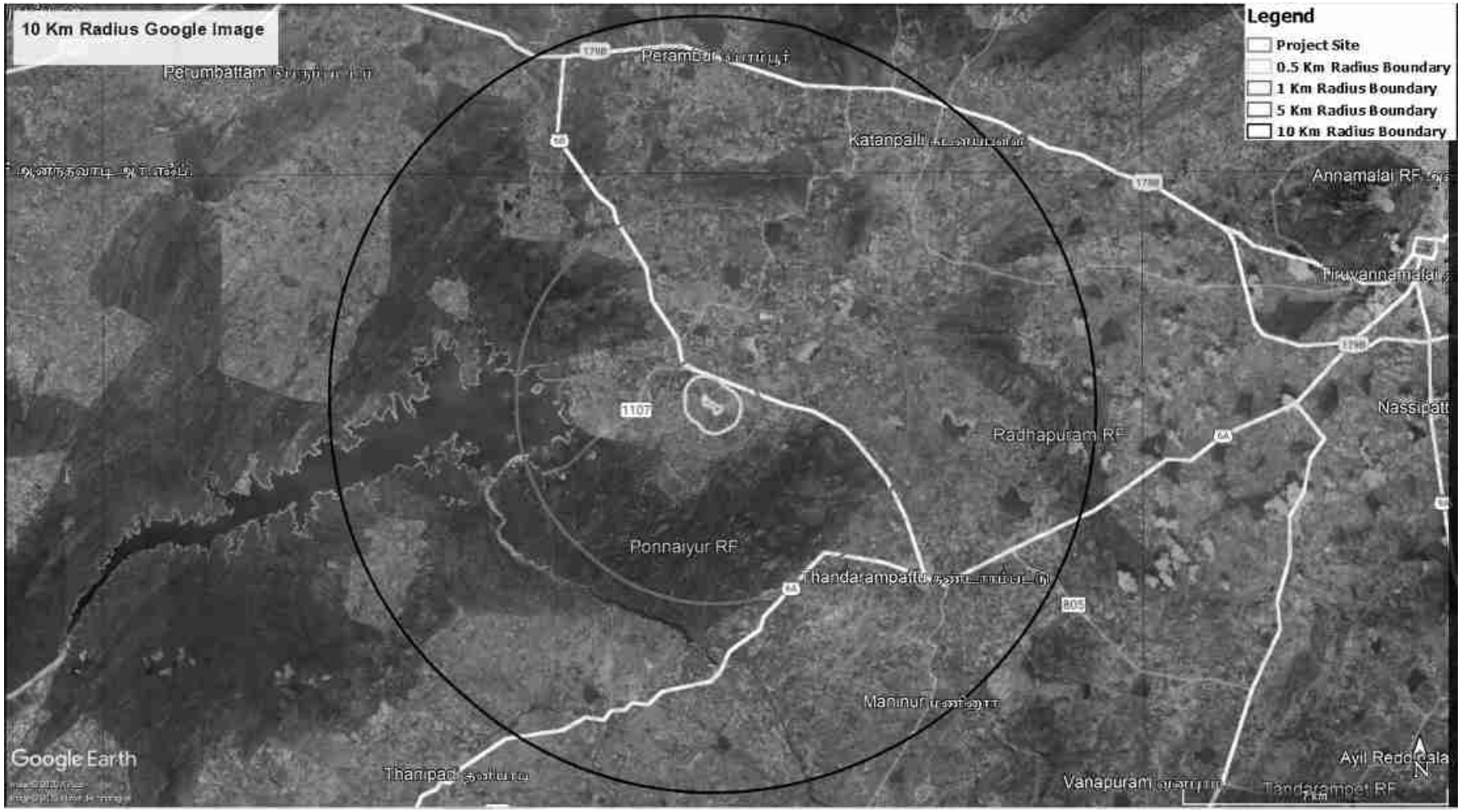


Figure 2-6 10 km radius google imagery map of the lease area.

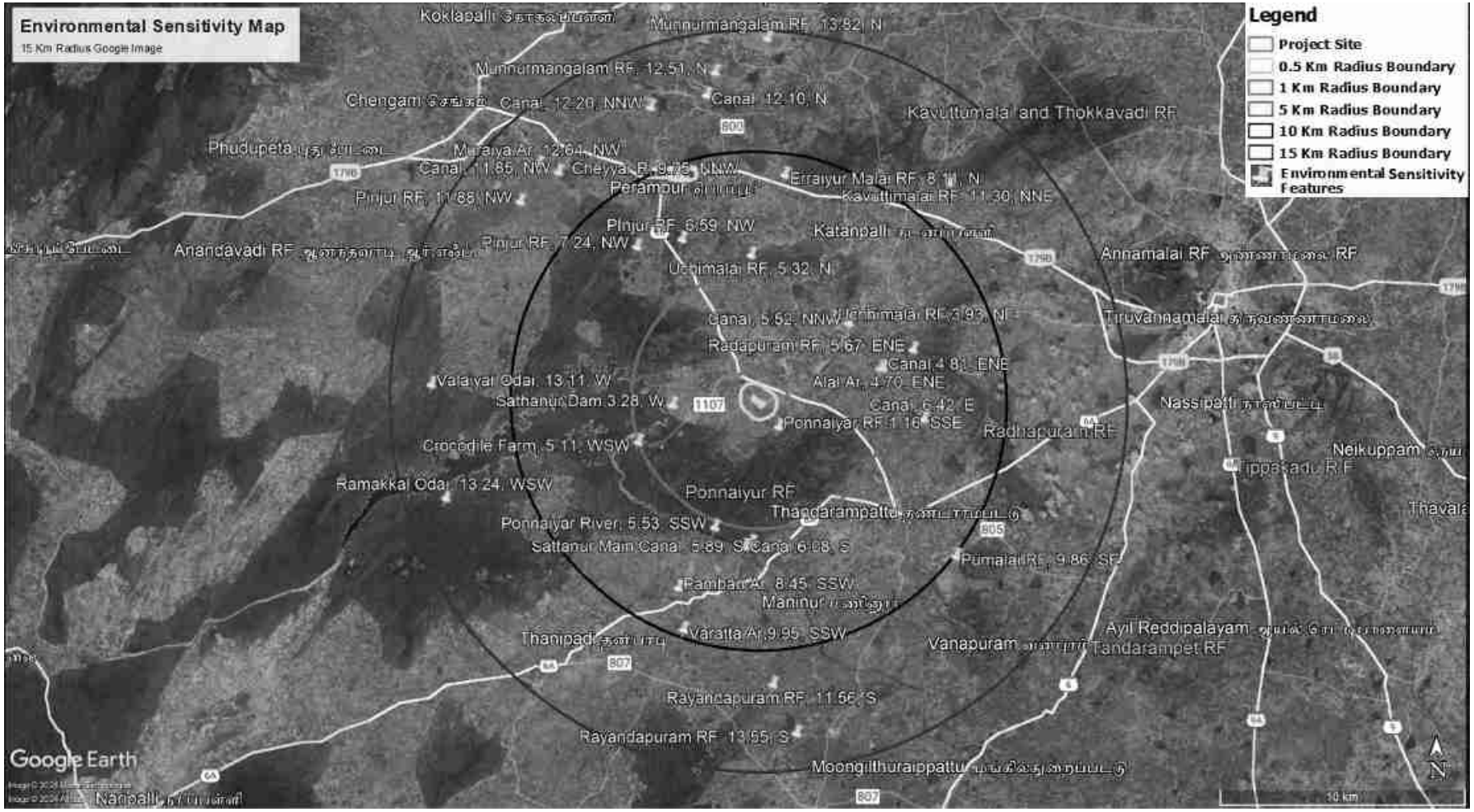


Figure 2-7 Environmental Sensitivity map of the study area.

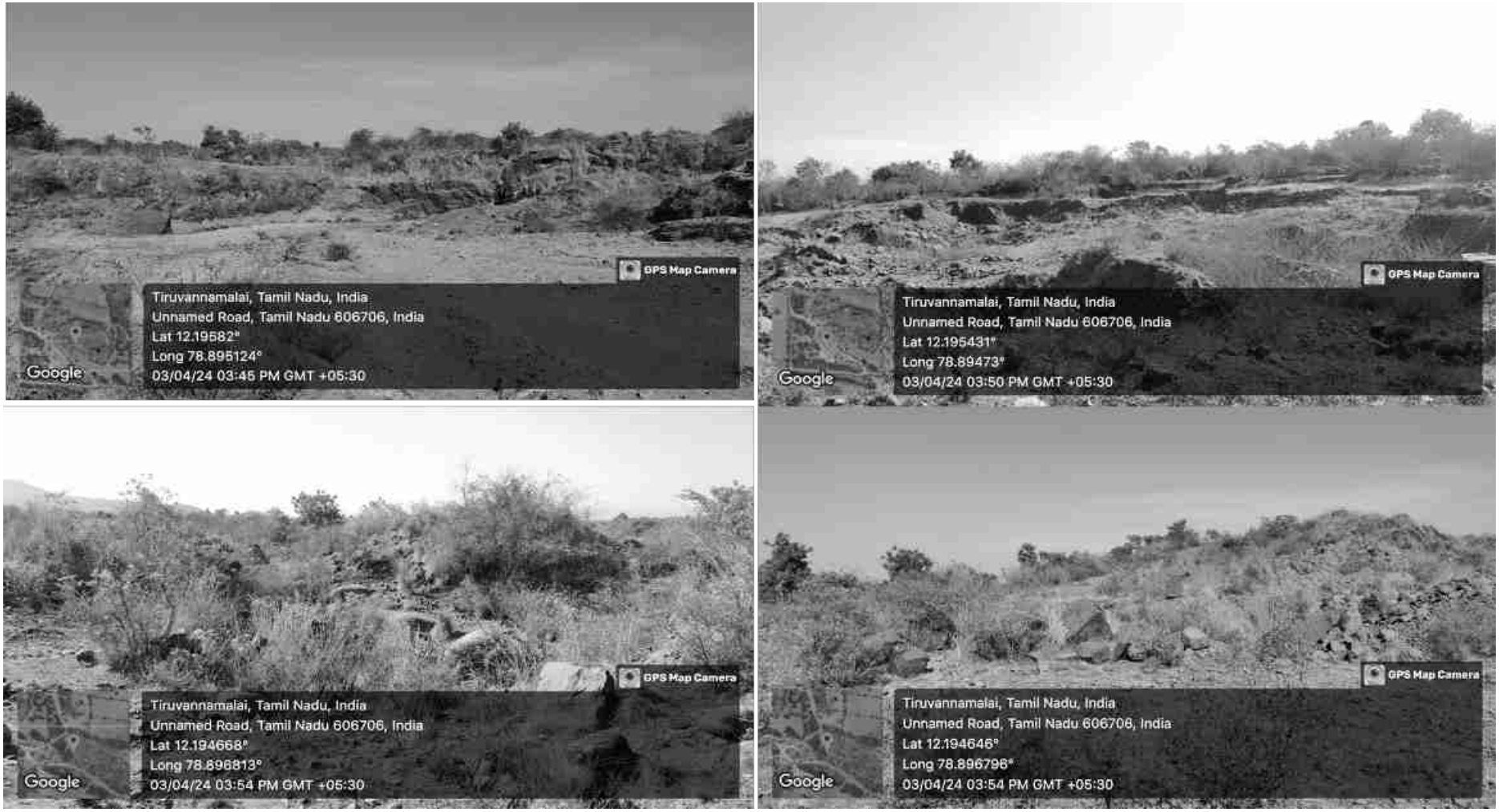


Figure 2-8 Project Site photographs.

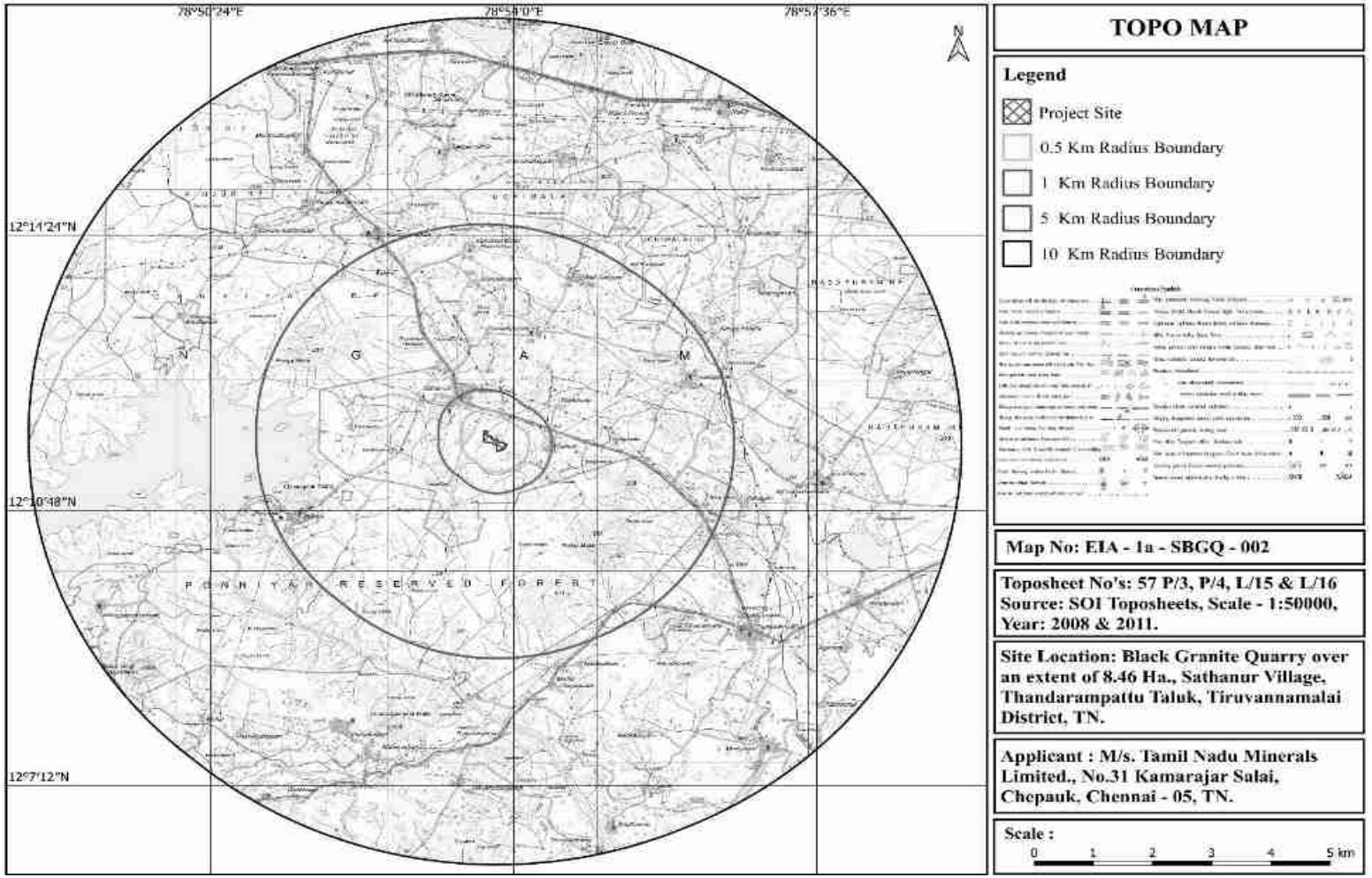


Figure 2-9 Top map of the study area

Table 2-2Salient Features within 15km radius of the lease area

<table>
<tr><th>S. No</th><th>Particulars</th><th colspan="4">Details</th></tr>
<tr><td>1</td><td>Latitude & Longitude</td><td colspan="4">12°11'41.61"N, 78°53'46.41"E</td></tr>
<tr><td>2</td><td>Site Elevation above MSL (m)</td><td colspan="4">128m (Maximum) AMSL.</td></tr>
<tr><td>3</td><td>Topography</td><td colspan="4">Hilly terrain</td></tr>
<tr><td>4</td><td>Lease area Topo Sheet details</td><td colspan="4">57 L/16</td></tr>
<tr><td>5</td><td>Land classification</td><td colspan="4">Non-Forest, Government Land</td></tr>
<tr><td>6</td><td>Nearest highway</td><td colspan="4">SH-6B (Thandrampet - Kottakulam Road) ~ 0.54 Km(N)
NH-179B (Near Harur, NH-32 (Bangalore Highway)) ~ 8.55km (N)</td></tr>
<tr><td>7</td><td>Nearest Railway station</td><td colspan="4">Tiruvannamalai R. S ~ 20.08 km (E)</td></tr>
<tr><td>8</td><td>Nearest Airport</td><td colspan="4">Visakhapatnam International Airport ~ 35.5 Km (S)</td></tr>
<tr><td>9</td><td>Nearest Town / City</td><td colspan="4">Chennai Int. Airport ~ 161.01 Km (NE)</td></tr>
<tr><td>10</td><td>Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests</td><td colspan="4"><table>
<tr><th>S. No</th><th>Name of the Waterbody</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Sathanur Dam</td><td>3.28</td><td>W</td></tr>
<tr><td>2</td><td>Lake near Kil Vanakambadi</td><td>5.39</td><td>E</td></tr>
<tr><td>3</td><td>Taradapattu</td><td>3.9</td><td>NE</td></tr>
<tr><td>4</td><td>Lake near Naykkanur</td><td>1.27</td><td>NE</td></tr>
<tr><td>5</td><td>Lake near Sattannur</td><td>1.34</td><td>N</td></tr>
<tr><td>6</td><td>Lake near Mallikapuram</td><td>0.79</td><td>WNW</td></tr>
<tr><td>7</td><td>Lake near Site</td><td>0.54</td><td>SSE</td></tr>
<tr><td>8</td><td>Lake near Melkarippur</td><td>4.16</td><td>NNE</td></tr>
<tr><td>9</td><td>Lake near Govindapuram</td><td>2.92</td><td>N</td></tr>
<tr><td>10</td><td>Lake near Melpennathur</td><td>5.87</td><td>NNW</td></tr>
<tr><td>11</td><td>Lake near Sorappanandal</td><td>10.79</td><td>NW</td></tr>
<tr><td>12</td><td>Lake near Eraiyur</td><td>9.08</td><td>N</td></tr>
<tr><td>13</td><td>Lake near Ammapalaiyam</td><td>9.83</td><td>NNW</td></tr>
<tr><td>14</td><td>Lake near Nedungavadi</td><td>6.99</td><td>NE</td></tr>
<tr><td>15</td><td>Lake near Asuvangasuranai</td><td>10.16</td><td>ENE</td></tr>
<tr><td>16</td><td>Lake near Perumbakkam</td><td>9.97</td><td>E</td></tr>
<tr><td>17</td><td>Samudram Tank</td><td>14.15</td><td>E</td></tr>
<tr><td>18</td><td>Lake near Melserumbakkam</td><td>10.96</td><td>E</td></tr>
<tr><td>19</td><td>Lake near Kilserupakkam</td><td>13.04</td><td>E</td></tr>
<tr><td>20</td><td>Lake near Kilvanakkambadi</td><td>7.52</td><td>ESE</td></tr>
<tr><td>21</td><td>Lake near Gudalur</td><td>12.1</td><td>ESE</td></tr>
<tr><td>22</td><td>Lake near Mudiyanur</td><td>8.26</td><td>SE</td></tr>
<tr><td>23</td><td>Lake near Rayantapuraml</td><td>11.75</td><td>SSE</td></tr>
<tr><td>24</td><td>Lake near Kallenta</td><td>12.56</td><td>S</td></tr>
<tr><td>25</td><td>Lake near Tiruvadattanur</td><td>8.44</td><td>S</td></tr>
<tr><td>26</td><td>Lake near Pudurnattam</td><td>7.94</td><td>SSW</td></tr>
<tr><td>27</td><td>Lake near Tandarampattu</td><td>6.21</td><td>SE</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>28</td><td>Lake near Taradapattu</td><td>2.26</td><td>ENE</td></tr>
<tr><td>29</td><td>Lake near Site</td><td>0.66</td><td>N</td></tr>
<tr><td>30</td><td>Lake near Peyyalampattu</td><td>10.9</td><td>NW</td></tr>
<tr><td>31</td><td>Lake near kottakulam</td><td>11.2</td><td>NNW</td></tr>
<tr><td>32</td><td>Lake near Muttanur</td><td>12.08</td><td>NNW</td></tr>
<tr><td>33</td><td>Lake near Melmudiyanur</td><td>11.57</td><td>N</td></tr>
<tr><td>34</td><td>Lake near Padi Agraharam</td><td>14.23</td><td>N</td></tr>
<tr><td>35</td><td>Lake near Torappadi</td><td>12.41</td><td>N</td></tr>
<tr><td>36</td><td>Lake near Pinjur</td><td>12.46</td><td>WNW</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Reserve Forests</td><td>
<table>
<tr><th>S. No</th><th>Name</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Ponnaiyar RF</td><td>1.16</td><td>SSE</td></tr>
<tr><td>2</td><td>Rayandapuram RF</td><td>11.56</td><td>S</td></tr>
<tr><td>3</td><td>Rayandapuram RF</td><td>13.55</td><td>S</td></tr>
<tr><td>4</td><td>Pumalai RF</td><td>9.86</td><td>SE</td></tr>
<tr><td>5</td><td>Radapuram RF</td><td>5.67</td><td>ENE</td></tr>
<tr><td>6</td><td>Uchhimalai RF</td><td>3.93</td><td>NE</td></tr>
<tr><td>7</td><td>Uchimalai RF</td><td>5.32</td><td>N</td></tr>
<tr><td>8</td><td>Kavuttimalai RF</td><td>11.3</td><td>NNE</td></tr>
<tr><td>9</td><td>Erraiyur Malai RF</td><td>8.11</td><td>N</td></tr>
<tr><td>10</td><td>PInjur RF</td><td>6.59</td><td>NW</td></tr>
<tr><td>11</td><td>Pinjur RF</td><td>7.24</td><td>NW</td></tr>
<tr><td>12</td><td>Pinjur RF</td><td>11.88</td><td>NW</td></tr>
<tr><td>13</td><td>Munnurmangalam RF</td><td>12.51</td><td>N</td></tr>
<tr><td>14</td><td>Munnurmangalam RF</td><td>13.82</td><td>N</td></tr>
</table>
</td></tr>
<tr><td>12</td><td>Seismic Zone</td><td>Zone-III (Moderate Risk Zone)</td></tr>
<tr><td>13</td><td>Defense Installations</td><td>Nil within 15 km radius</td></tr>
<tr><td>14</td><td>Interstate Boundary</td><td>Nil within 15 km radius</td></tr>
<tr><td>15</td><td>HACA Regions</td><td>Nil within 15 km radius</td></tr>
</table>

Table 2-3 The structures are located within 50m, 100m, 150m, 200m, 250m, 300m and 500m from the boundary of the mine lease area.

S. No	Zone	Name of the Structures	Distance and Direction
1	0-50m	Brick Manufacturing units	30.25m (S)
		HT Lines	50m (S)
		Metallic Road	Adjacent to the site (W)
		Pump House	7.7m (N)
2	50m-100m	-	-
3	100m -150m	Pump House	114m(SW)
		Pump House	104.7m (SSE),113m(S)
4	150m - 200m	Nil	Nil
5	200m - 250m	Nil	Nil
6	250m - 300m	Nil	Nil
7	300m - 500m	Lake	544m (SSE)

Figure 2-10 Photographs of the Structures within the 500m radius of the project.

Table 2-4 List of Tress located within the 300 m from the boundary of the mine lease area.

S. No	Scientific Name	Common Name	Age (Yrs)	Diameter (cm)	Nos
1.	*Arecaceae*	Palm Tree	3-5	15-20	15
2.	*Pongamia pinnata*	Pungam Tree	2-3	15-18	10
3.	*Tamarindus indica*	Tamarind Tree	3-4	35-45	5
4.	*Cocos nucifera*	Coconut Tree	5-6	15-20	30
5.	*Tectona grandis*	Teak Tree	2-3	10-15	5
6.	*Azadirachta indica*	Neem Tree	3-4	10-25	20
7.	*Acacia nilotica*	Karuvelam Tree	2-3	10-15	50
8.	*Phyllanthus emblica*	Star Gooseberry	2-3	10-15	5
				Total	**140**

Figure 2-11 Photographs of Tress located within the 300 m from the boundary of the mine lease area.

Table 2-5 List of Water Bodies located within the 300 m from the boundary of the mine lease area.

S. No	Description	Distance (~ m)	Direction	Depth of Well (ft)	Water Depth (ft)
1.	Open Well	214.22	NW	40	38 (2ft)
2.	Open Well	135.22	NW	30	28 (2ft)
3.	Open Well	164.33	N	20	Dry
4.	Open Well	79.02	N	30	25 (5ft)
5.	Open Well	304.57	N	20	18
6.	Bore Well	255.72	N	450	220
7.	Open Well	279.37	N	15	Dry
8.	Open Well	238.0	N	20	17(3ft)
9.	Open Well	212.55	N	25	23(2ft)
10.	Open Well	11.37	N	50	27 (23ft)
11.	Open Well	93.29	E	30	25 (5ft)
12.	Bore Well	135.26	S	600	110

13.	Open Well	151.35	S	35	Dry
14.	Open Well	268.92	S	25	23 (2ft)
15.	Open Well	199.23	S	30	27 (3ft)
16.	Open Well	254.33	S	22	Dry

Figure 2-12 Photographs of Water Bodies located within the 300 m from the boundary of the mine lease area

Table 2-6Project summary

S. No	Particulars	Details
1.	Project Location	SF.No. 315,316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State.
2.	Land classification	Government Land
3.	Extent of lease area (Ha.)	8.46.0
4.	Quarry Lease	Govt. Letter. No.3377/MME. 1/2022-1 dated 03.06.2022
5.	Lease Period	20 years
6.	Estimated Geological Reserves (ROM) M^3	1024350
7.	Estimated Mineable Reserves (ROM) M^3	775804
8.	Black Granite production per annum M^3	RoM 44044 with 10% recovery
9.	Depth of Mining	31m above ground level (from Top of the hill)
10.	Method of Mining	Open cast semi mechanized method
11.	Water Requirement (KLD)	1.5
12.	Source of Water	Venders and village Panchayat
13.	Power requirement (kVA)	60
14.	Power Backup (DG set) kVA	1* 125
15.	Fuel requirements (Lts/Day)	200
16.	Direct Manpower (Nos)	30
17.	Indirect Manpower (Nos)	20
18.	Municipal Solid Waste Generation (kg/day)	13.5
19.	Waste Oil generation (Lts/Year)	3.0
20.	Project Cost in Lakhs	99.97

2.4 Nearest Human Settlement

The details of nearest human settlement from the project Site are provided below in **Table 2-7**.

Table 2-7 Nearest Human Settlement

S. No	Name of the villages	Distance (~km) &Direction	Population (Census2011)
1	Thandarampattu	5.90 (SSE)	8034
2	Sathanur	0.56(NW)	4964
3	Tharadapattu	3.60(ENE)	4086

2.5 Details of alternate sites considered.

There are no alternative sites examined. Since quarry reserves are site specific.

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. Proposed production capacity is 44,044 m^3, of ROM of Black Granite and 4,404 m^3 of recoverable production of granite per annum.

The total quantity of reserves has been computed on the geological cross sections up to the economically average depth of 31m from the top of the hill and top surface of the granite body works out to 1024350 m^3 and the mineable reserves has been computed as 775804 m^3. The effective geological reserves and mineable have been worked out as 102435 m^3 and 77580 m^3 by applying the recovery factor 10%. The Land Use break up summarized as**Table 2-8**.

Table 2-8 Land use details of the quarry area

S. No	Description	Present Area (Ha.)	Area to be required at the present Mining Plan Period (Ha.)	Area at the end of life of quarry (Ha.)
1	Area under Quarry (Existing pit area - 1.65Ha.	1.65.0	1.70.0	5.10.5
2	Waste Dump	0.58.0	1.18.0	2.47.0
3	Infrastructure	-	0.01.0	0.01.0
4	Tar Road	0.00.5	-	0.00.5
5	Village Road	0.05.5	-	0.05.5
6	Mine Approach Road	0.10.5	-	0.01.0
7	Afforestation (0.23.5 Ha above the Waste Dump)	-	0.06.5	-
8	Un-utilized Area	6.06.5	3.11.0	0.80.5
	Total	**8.46.0**	**6.06.5**	**8.46.0**

2.7 Granite Reserves

The Estimated Geological reserves of black granite estimated based on the Geological cross sections was 1024350 m^3. By applying the 10% recovery, the updated geological effective reserves as 102435 m^3. The estimated mineable reserves have arrived as 775804 m^3 and by applying 10% recovery, the updated mineable reserves as 77580 m^3. The reserves during the Mining period are 217105 m^3 and the recovery of reserves at 10% is 21711 m^3. Granite Quarry Reserves is given in**Table 2-9.**

Estimation of Geological Reserves and Mineable Reserves at present availability is given in **Table 2-10**. Mineable Reserve are given in Table 2-11**.**Year wiseProductiondetailsare given in **Table 2-12.**SurfacePlan of the Quarry is given in**Figure 2-13.** Geological plan of the quarry is shown in **Figure 2-14.** Cross sectionof the quarry is shown in **Figure 2-15**. Year wise production plan is shown

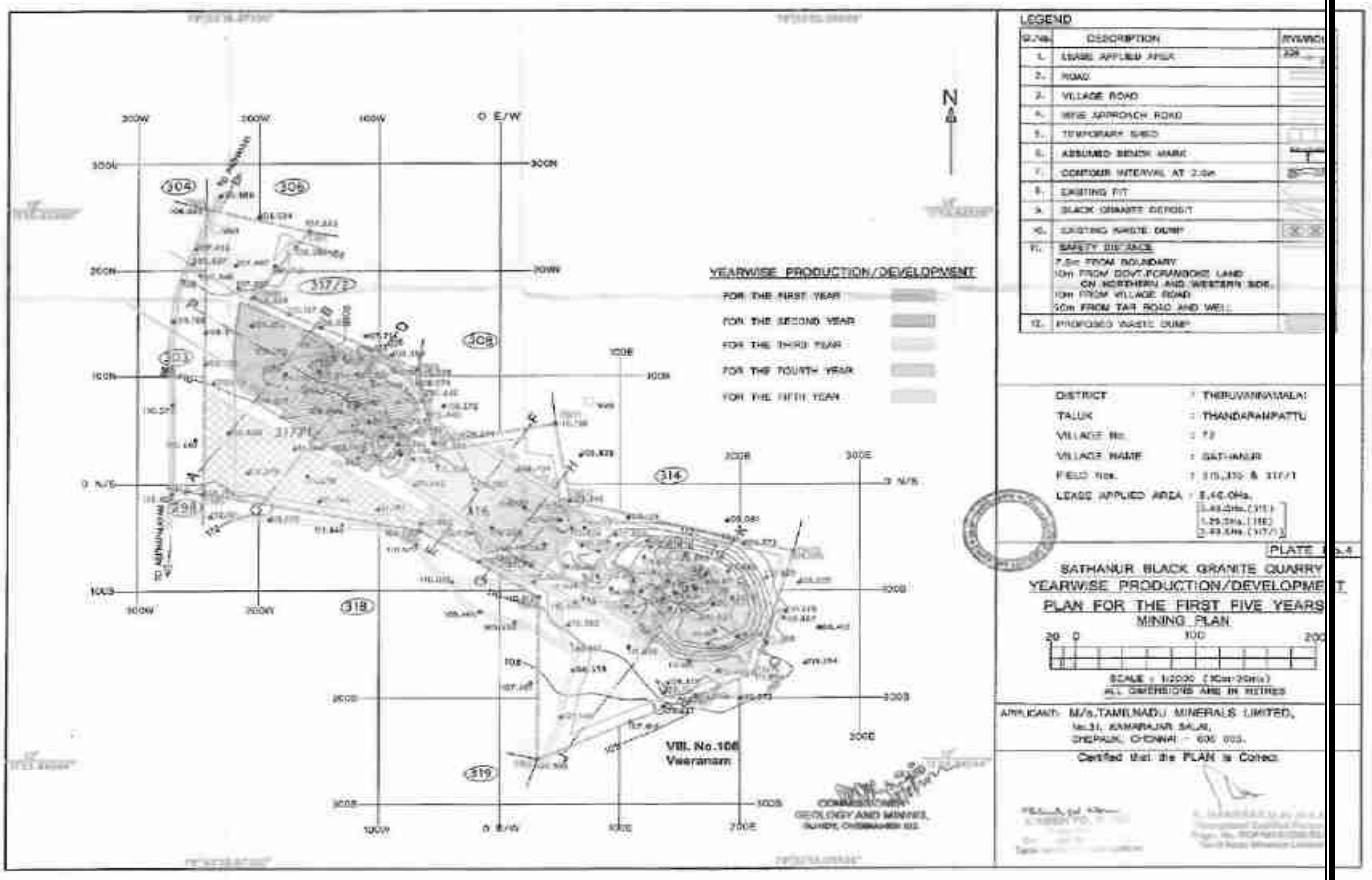


Figure 2-16**.** Year wise production / Development Sections for the First Five years

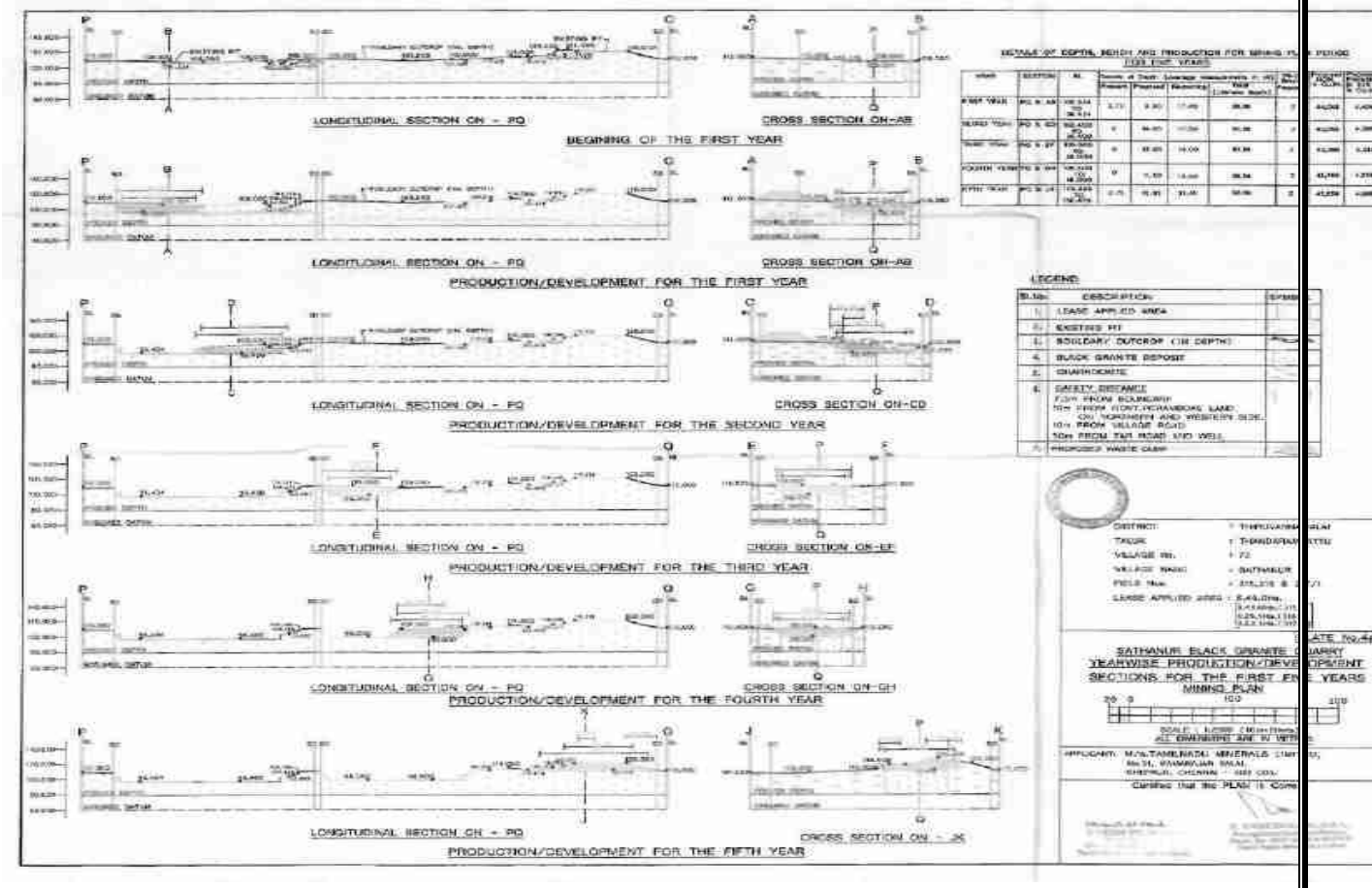


Figure 2-17**.** Land use and afforestation of the quarry is shown **Figure 2-18**. Conceptual Plan of the quarry area is shown as **Figure 2-19**. Mine Conceptual Section is shown as **Figure 2-20.** Environment Plan is shown as **Figure 2-21.** Progressive Quarry Closure Plan is shown as **Figure 2-22.**

Table 2-9 Granite Quarry Reserves

S. No	Description	Quantity(M^3)
Geological Reserves:		
1	Geological Reserves (ROM)	1024350
2	Geological Reserves (at 10% Recovery)	102435
Mineable Reserves:		
1	Mineable Reserves (ROM)	775804
2	Mineable Reserves (at 10% Recovery)	77580
3	Maximum RoM per year	44044
4	Maximum production per year (at 10%)	4404

2.7.1 Present Estimation

The details of estimation of Geological Reserves and estimation of Mineable Reserves as per present ground reality has been furnished with reference to the Geological Plan & Sections and Conceptual Plan & Sections as shown in Plate No.3 and Plate No.6 respectively.

Table 2-10 Estimation of Geological Reserves and Mineable Reserves at present

Section	Measurements (m)			ROM (M^3)	Effective Reserves @ 10%(M^3)	Granite waste@ 90%(M^3)
	Length	Width	Depth			
PQ-AB	130.0	60.0	39.0	304200	30420	273780
PQ-CD	100.0	60.0	30.0	180000	18000	162000
PQ-EF	100.0	60.0	30.0	180000	18000	162000
PQ-GH	100.0	60.0	24.6	147600	14760	132840
PQ-JK	130.0	60.0	27.25	212550	21255	191295
Total				**1024350**	**102435**	**921915**

2.7.2 Geological Reserves

Total Geological Reserves :10,24,350 m^3

Total Recoverable Reserves @10% :1,02,435 m^3

Granite Waste @90% : 9,21,915 m^3

Topsoil : Nil

Granite: Granite Waste Ratio

Granite Waste @90% : 9,21,915 m^3

Total Recoverable Reserves @10% : 1,02,435 m^3

Granite: Waste Ratio : 1:9

2.7.3 Mineable Reserve

Table 2-11 Mineable Reserve

Bench	Measurements			ROM (m^3)	Saleable Reserves @10% (m^3)	Granite waste @90% (m^3)
	Length	Width	Depth			
I Bench	13.5	21.0	6.0	1701	170	1531
II Bench	65.0	55.0	6.0	21450	2145	19305
III Bench	107.5	60.0	6.0	38700	3870	34830
IV Bench	112.5	60.0	6.0	40500	4050	36450
V Bench	106.5	60.0	6.0	38340	3834	34506
VI Bench	100.5	60.0	6.0	36180	3618	32562
VII Bench	94.5	60.0	6.0	34020	3402	30618
VIII Bench	88.5	60.0	5.3	28143	2814	25329
Total				**239034**	**23903**	**215131**
Sections PQ-CD						
III Bench	27.60	60.0	1.0	1656	165.6	1490
IV Bench	100.0	60.0	6.0	36000	3600	32400
V Bench	100.0	56.0	6.0	33600	3360	30240
VI Bench	100.0	50.0	6.0	30000	3000	27000
VII Bench	100.0	38.0	6.0	22800	2280	20520
VIII Bench	100.0	38.0	5.3	20140	2014	18126
Total				**144196**	**14419.6**	**129776**
Section PQ-EF						
III Bench	65.5	60.0	0.5	1965	196	1769
IV Bench	100.0	60.0	6.0	36000	3600	32400
V Bench	96.5	60.0	6.0	34740	3474	31266
VI Bench	90.5	60.0	6.0	32580	3258	29322
VII Bench	84.5	60.0	6.0	30420	3042	27378
VIII Bench	78.5	54.0	5.3	22267	2247	20220
Total				**158172**	**15817**	**142355**
Section PQ-EF						
III Bench	15.0	15.0	1.0	225	22.5	202
Section PQ & Plan						

IV Bench	64.0	55.0	0.6	2112	211	1901
V Bench	85.5	60.0	6.0	30780	3078	27702
VI Bench	79.5	60.0	6.0	28620	2862	25758
VII Bench	73.5	60.0	6.0	26460	2646	23814
VIII Bench	67.5	54.0	5.3	19319	1931	17387
Total				**107516**	**10751.5**	**96764**
Section PQ & JK						
IV Bench	100.0	60.0	4.0	24000	2400	21600
V Bench	94.0	60.0	6.0	33840	3384	30456
VI Bench	88.0	54.0	6.0	28512	2851	25661
VII Bench	82.0	48.0	6.0	23616	2362	21254
VIII Bench	76.0	42.0	5.3	16918	1692	15226
Total				**126886**	**12689**	**114197**
Grand Total				**775804**	**77580**	**698224**

Total Mineable Reserves : 775804 m^3
Total Recoverable Reserves @10% : 77580 m^3
Granite Waste @90% : 698224 m^3
Topsoil : Nil
Over/Side Burden : 329931 m^3

Granite: Waste Ratio

Total Waste : 1028155 m^3
Total Recoverable Reserves @10% : 77580 m^3
: 1028155 m^3/77580 m^3
Granite: Waste Ratio : 1:13

Table 2-12 Year wiseProductiondetails

S. No	Year	ROM (m^3)	Recovery @10% (m^3)	Granite Waste (m^3)	Over Burden/ Side Burden (m^3)
1	First Year	44044	4404	39640	6025
2	Second Year	43050	4305	38745	8317
3	Third Year	43200	4320	38880	8694
4	Fourth Year	43155	4316	38839	6173
5	Fifth Year	43656	4366	39290	13044
Total		**217105**	**21711**	**195394**	**42253**

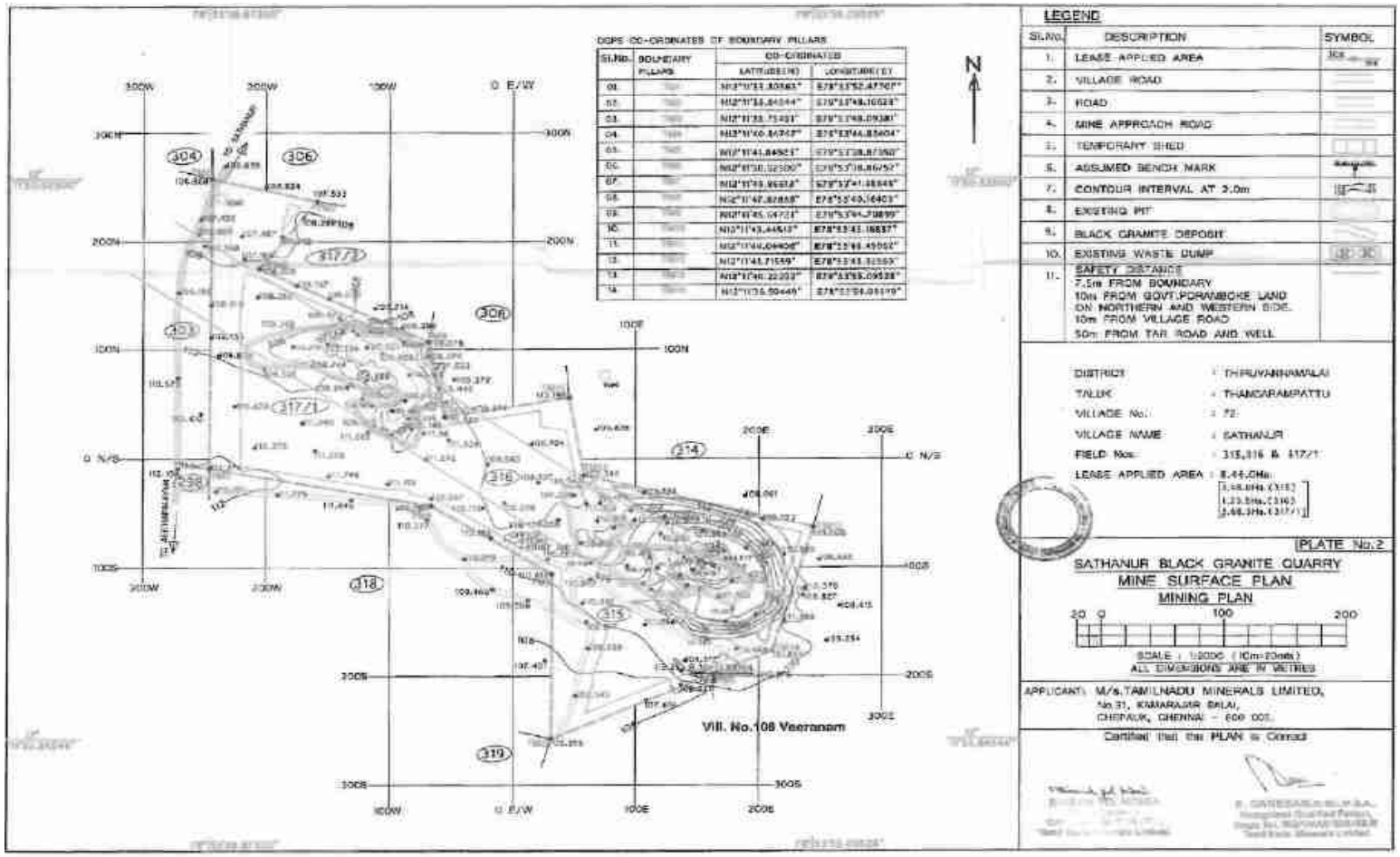


Figure 2-13Surface Plan of the Quarry

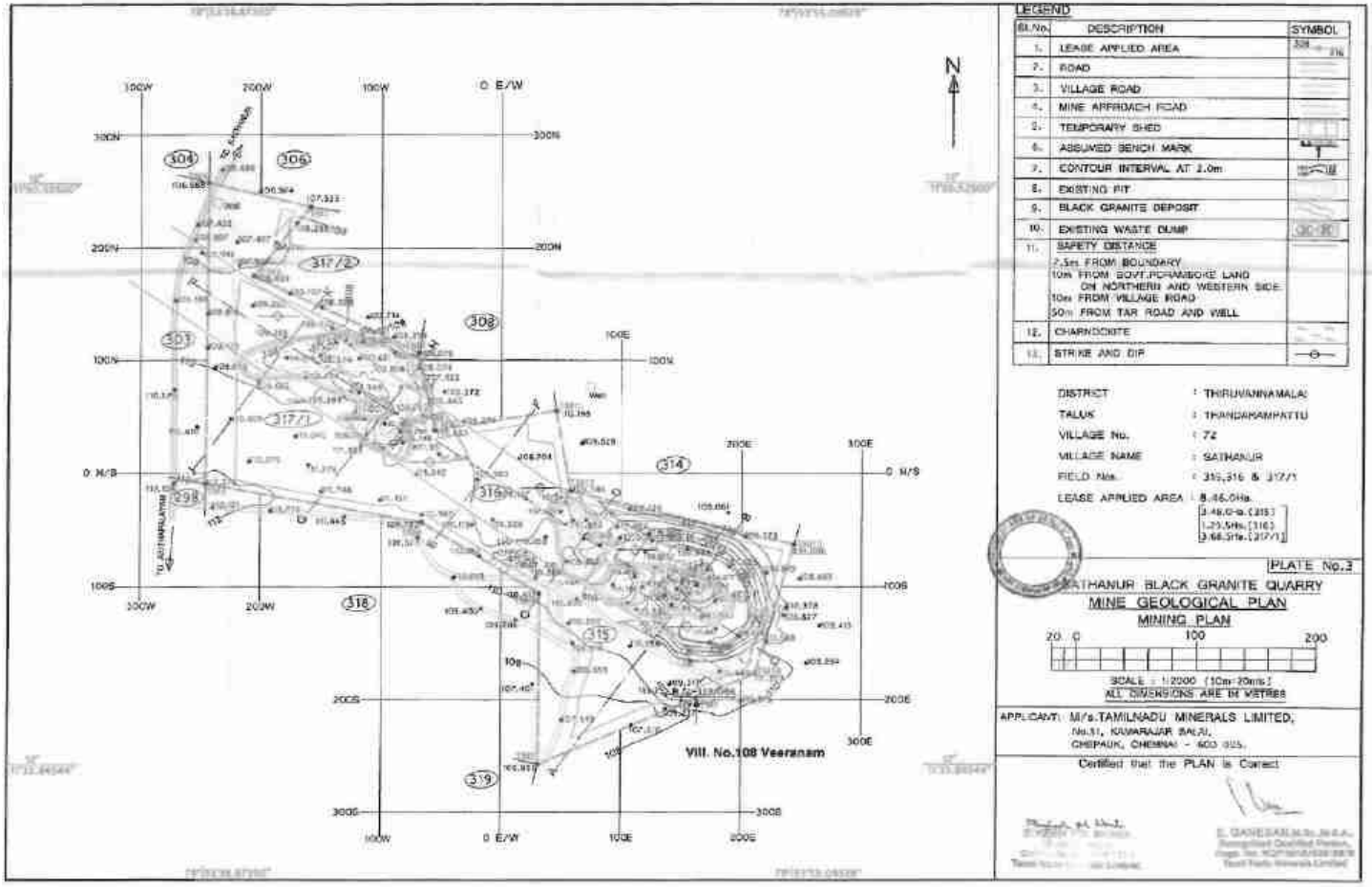


Figure 2-14Geological plan of the quarry.

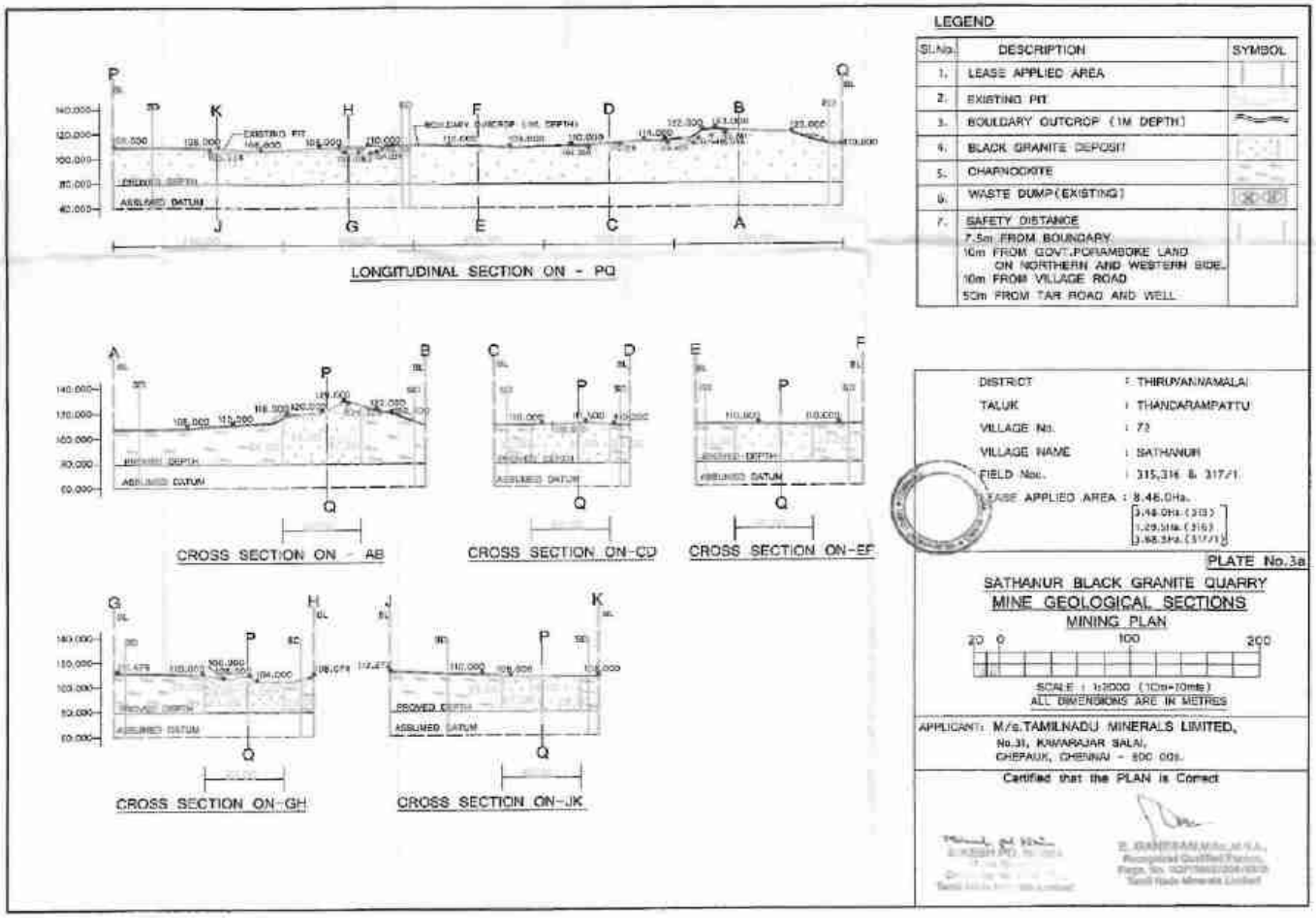


Figure 2-15Cross section of the quarry.

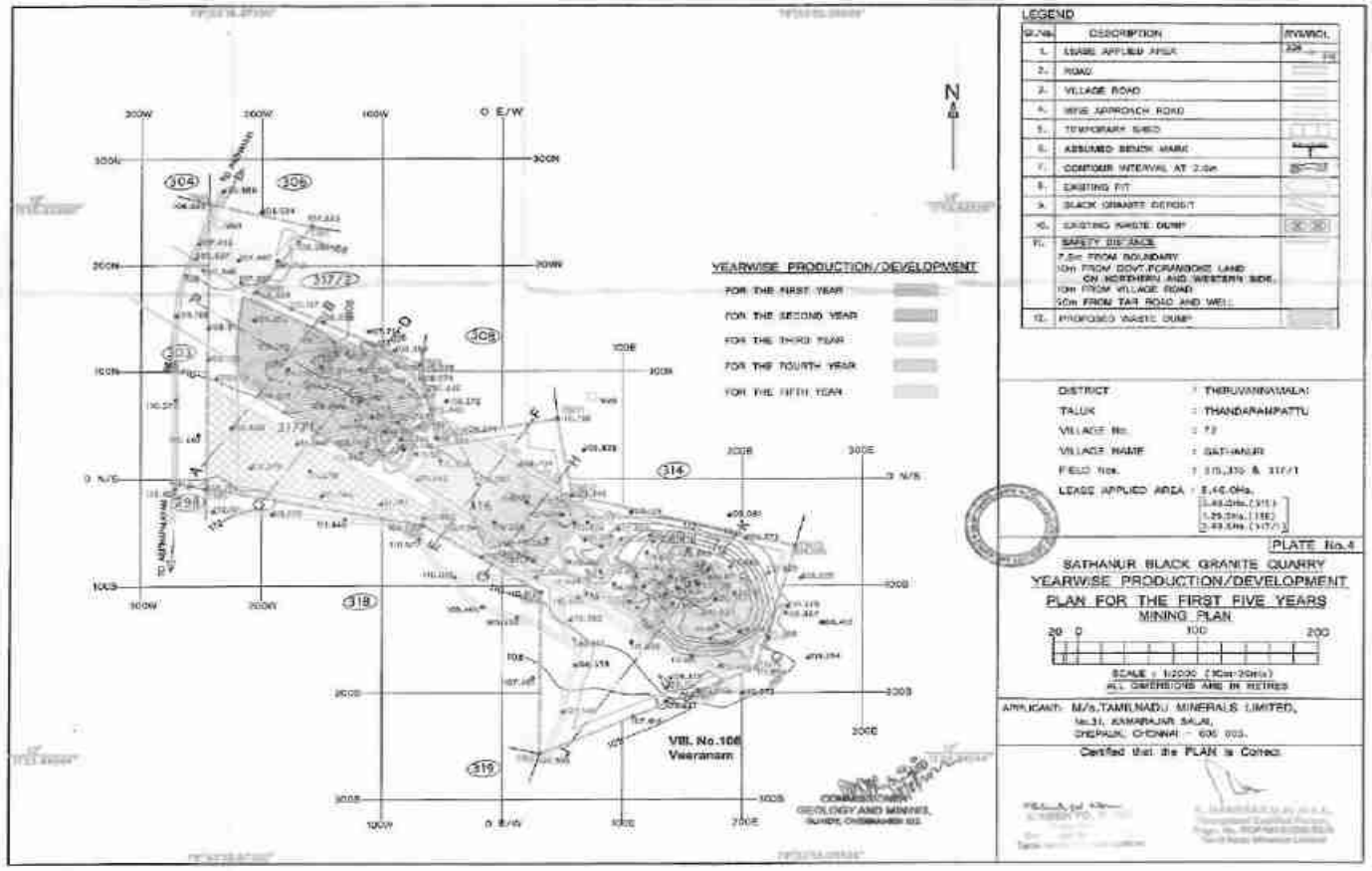


Figure 2-16Year wise production / Development Plan for the First Five years.

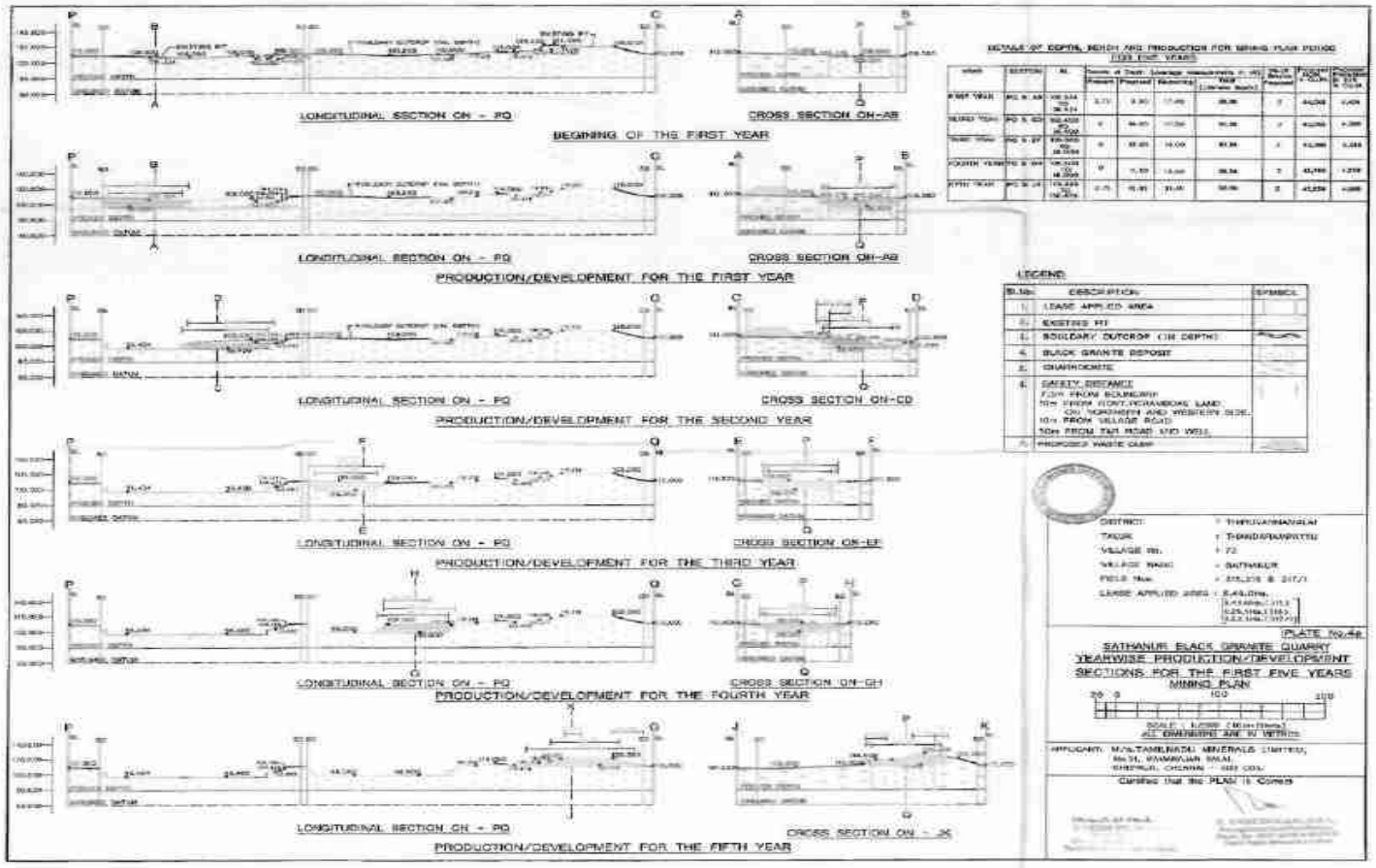


Figure 2-17Year wise production / Development Sections for the First Five years

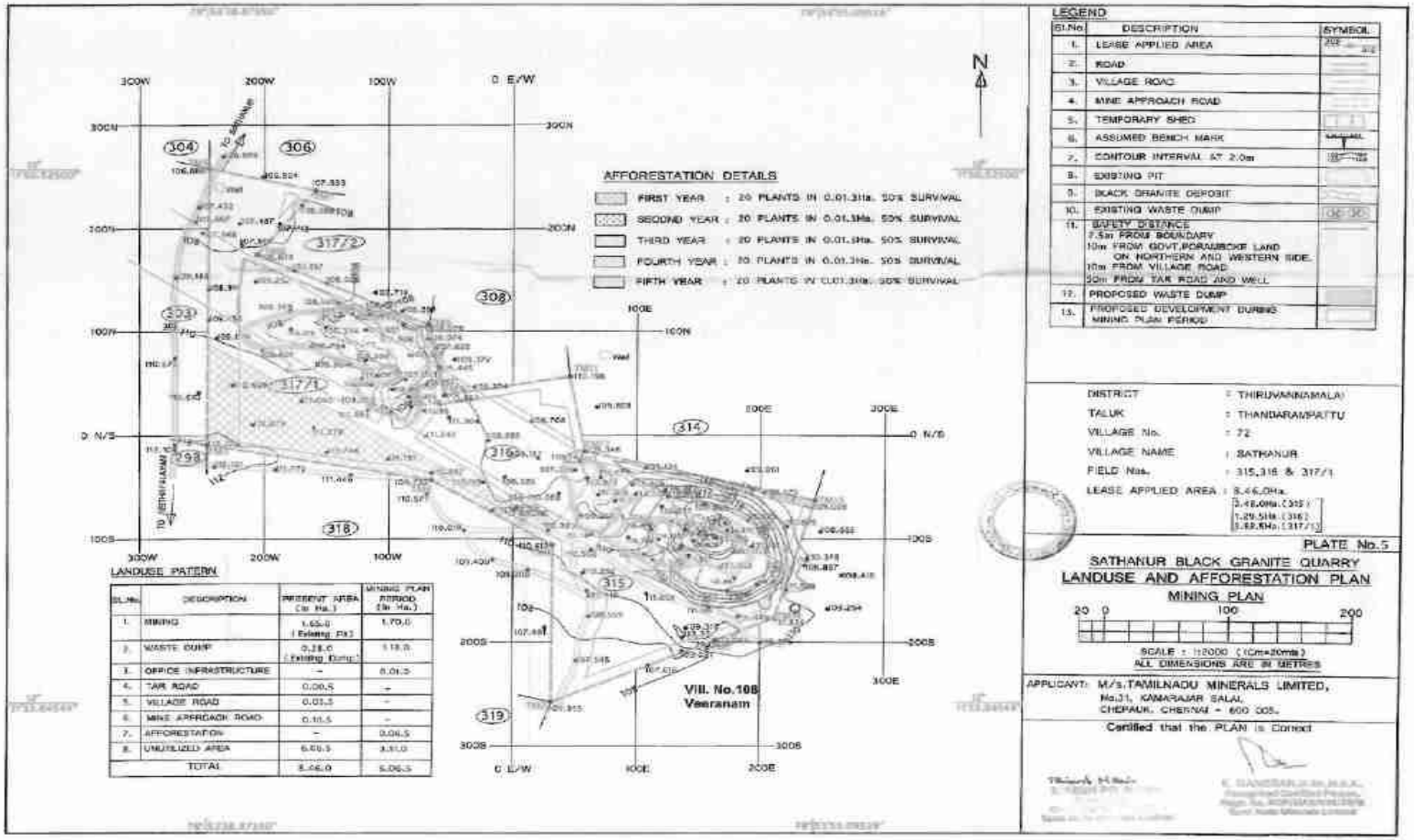


Figure 2-18Land use and Afforestation Plan

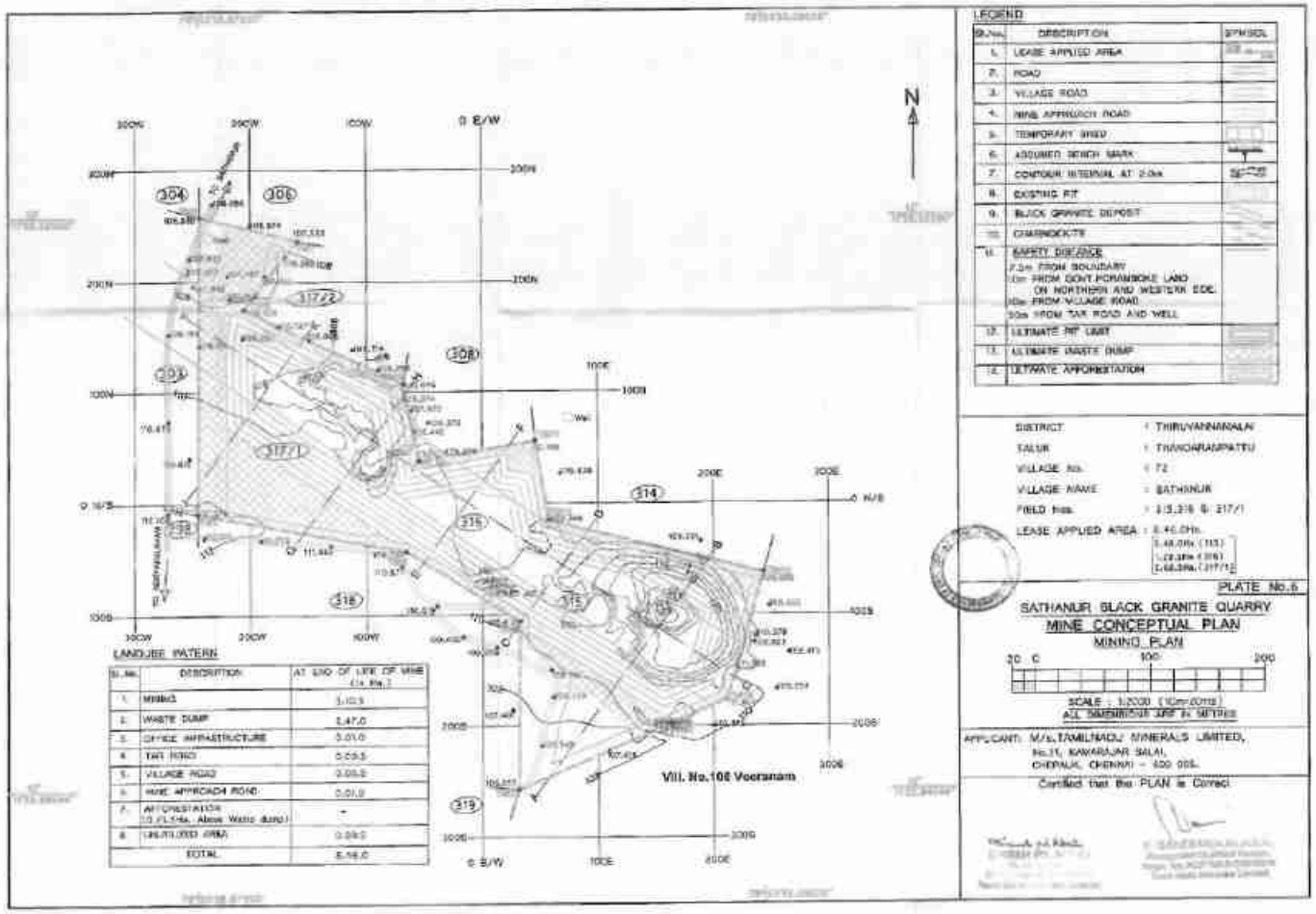


Figure 2-19Mine Conceptual Plan

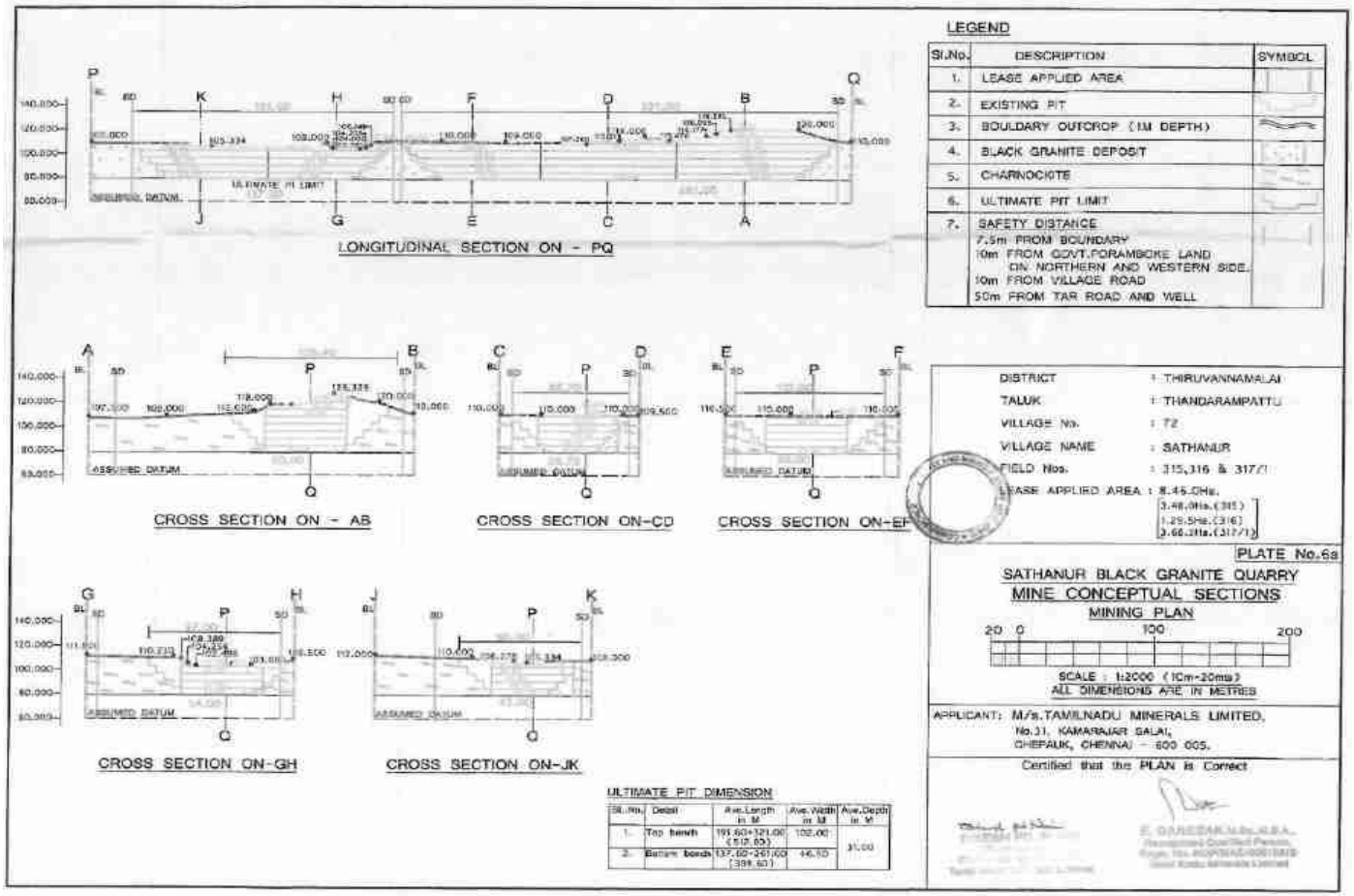


Figure 2-20Mine Conceptual Section

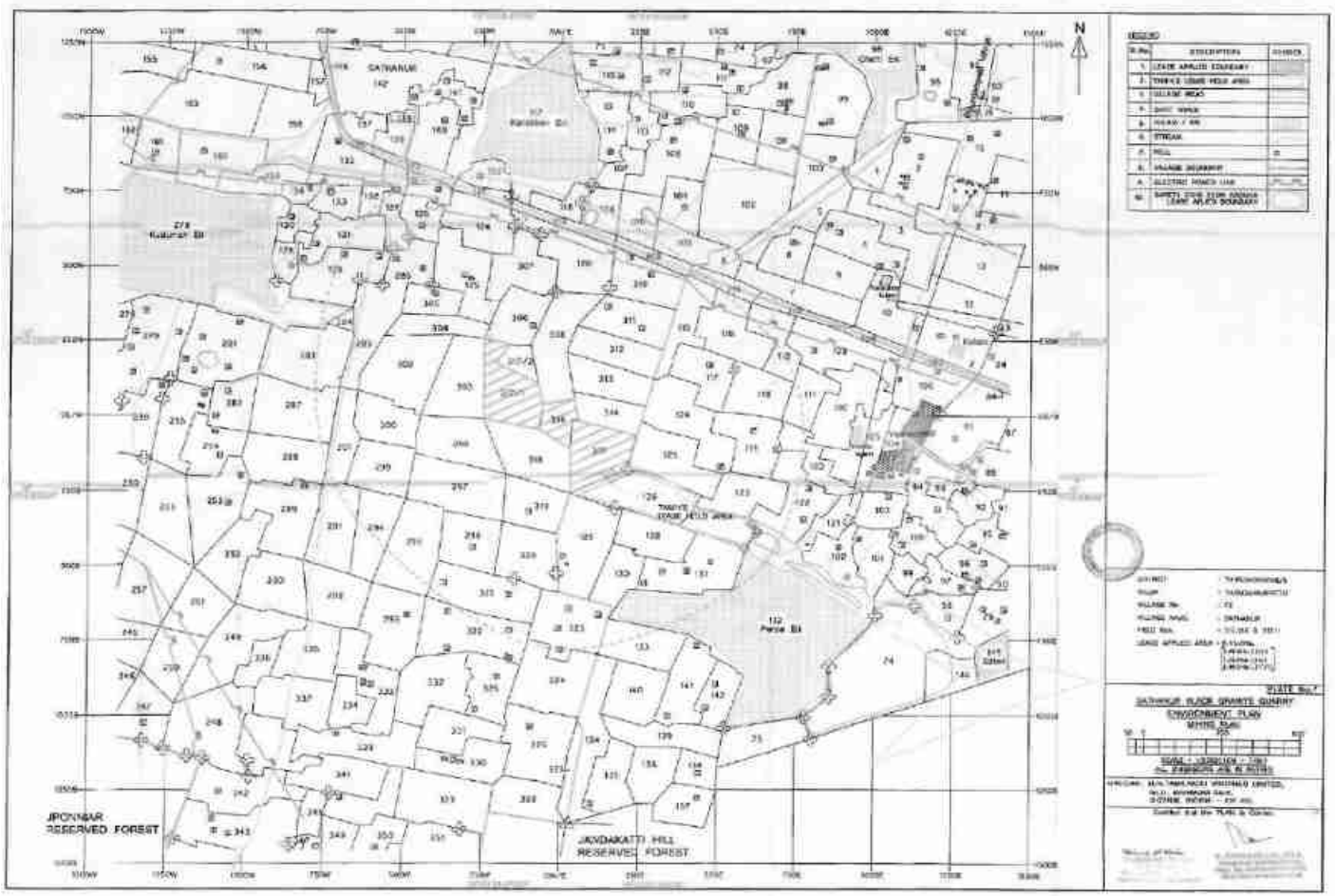


Figure 2-21Environment Plan

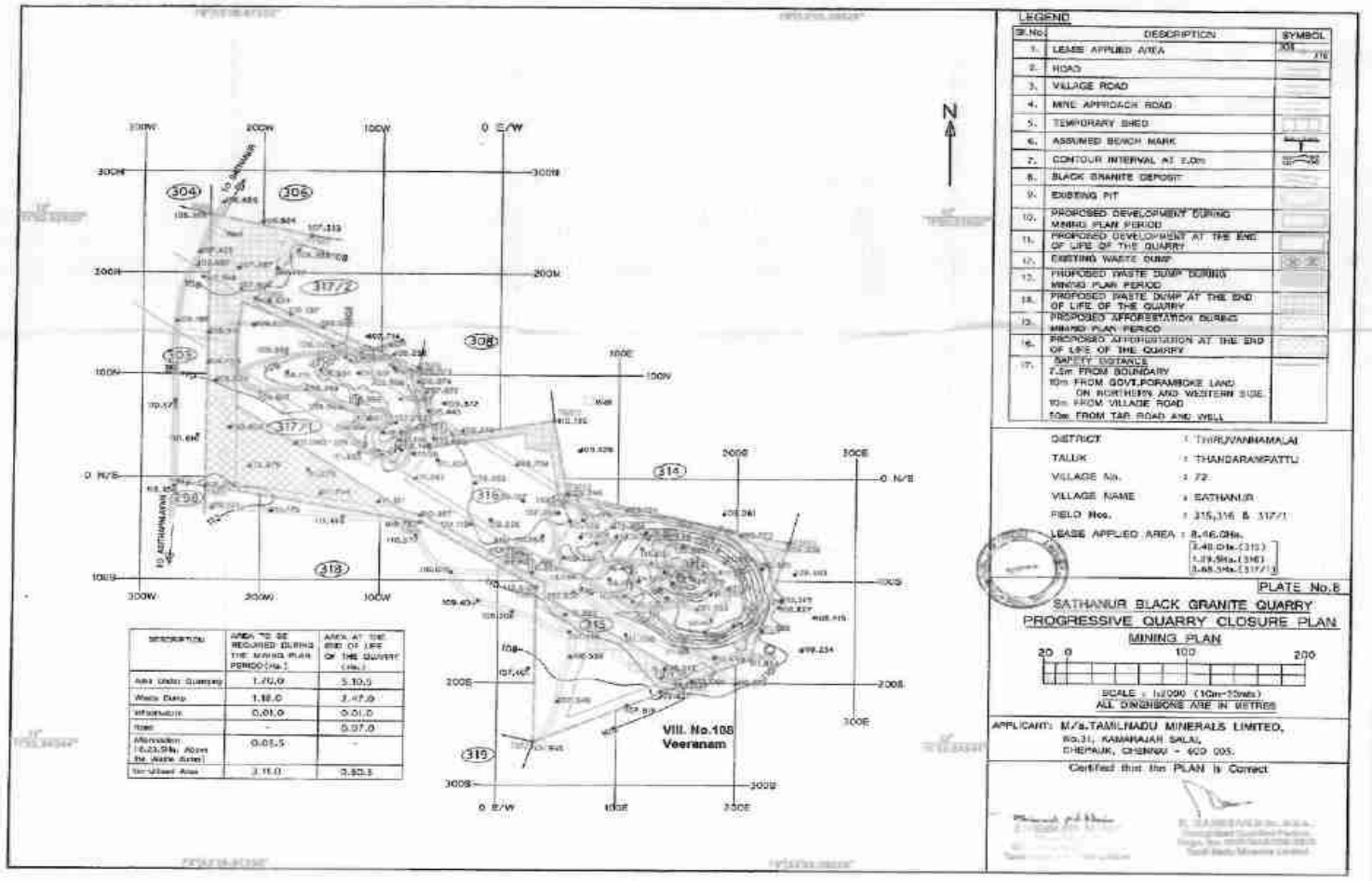


Figure 2-22Progressive Quarry Closure Plan

2.8 Project Cost

The project cost is summarized in **Table 2-13.**

Table 2-13 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)**

2.9 Technology & Process Description

2.9.1 Technology

The primary step of mining of minerals is the removal of the deposits from the ground. Once the minerals / ore are removed, an additional preparation process is required to isolate the valuable minerals from their waste gangue minerals. There are two basic methods 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 **Figure 2-23.**

Figure 2-23 SchematicDiagramofMiningProcess

2.9.1.1 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 must be maintained. The slope angle of such benches and sides should not exceed 60° from 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 given below:

1) Recovery of the granite mineral should be as undamaged rectangular dimensional blocks. In the attempt to form the benches and sides with the above statutory parameters haphazard blasting may be involved. In which case, the commercial granite body may get damaged due to generation of blasting cracks.

2) In the exercise of forming the benches with 60° slope within the granite deposit, the portion confined between vertical and 60° as well as its complimentary part in the extricated block will become mineral waste while shaping into rectangular blocks.

3) The granite industry needs blocks as huge as a few cubic meters in volume with measurements up to 3mx2mx2m. Production of such huge blocks with a moving bench of 6m height is not possible. Productions of such huge blocks in turn increase the recovery and reduce the mineral waste during dressing. Blocks of smaller size of certain varieties of granite are not marketable now-a-days.

4) Formation of too many benches with less height and the width equal to the height may lead to large volume of mineral locked up.

Hence to avoid mineral locked-up 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 6m width with vertical faces. Such a provision for relaxation of the Regulation has been provided within regulation 106(2). 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 back fill the pit in as much as good quantities of reserves are underlining 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 to minimize the lead from the pit to the dressing yard and stock yard. A mine office, storeroom, first-aid room and workers rest shelter will be provided within the lease area where mining is not proposed due to technical reasons and quality consideration.

2.10 Process Description

2.10.1Mining

An open cast semi mechanized mining with a 6m vertical bench with a bench width of 6m has been proposed. The safety distance of 7.5m inner boundary of all along the boundaries of the lease area as well as the distance of 10m from the adjacent Government lands and Village Road and the distance of 50m from the Tar Road and well will be provided and maintained during the entire period of lease.

Under regulation 106(2) (a) of the Metalliferous Mines Regulations, 1961, in all open cast workings in hard ore body, the benches and sides should be properly benched and sloped. The bench height should not exceed 6m and the bench width should not be less than the bench height. The slope of the benches should not exceed 60° from horizontal.

As far as the mining of granite dimensional stones is concerned, observance of the provisions of the Regulation 106(2) (a) as above is seldom possible due to various inherent petrogenetic and mining difficulties.

Hence it is proposed to obtain relaxation to the provisions of the above regulation from the Chief Inspector of Mines, for which necessary provision is available within Regulation 106 (2) (a).

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

1) Splitting of rock mass of considerable volume from the parent sheet rock carefully avoiding any kind of damage in the form of cracks adopting the following methods:

    a) Diamond wire cutting along the horizontal as well as two parallel to strike and dip direction and the third vertical face will be a free liberated by conventional serial blasting.
    b) Separation of the horizontal (bottom) and the vertical (length side) planes by serial blasting simultaneously along the above two planes by using 32mm dia. blast holes charged with mild explosive like gun powder or detonating. The process continued aiming at the liberation of huge volume of the granite body from the parent sheet rock is called 'Primary Cutting'.
2) The 'Secondary Splitting' into required size involves long hole drilling up to the bottom of the separated block along the required planes for which mostly rock breaking powder or expansion mortar is used for splitting. It is chemically called 'Calcium Hydroxide' Ca $(OH)_2$.
3) Removing the defective portions and dressing into the useful dimensional blocks are done manually using feather and wedges and chiseling respectively by the labourers who are skilled in this work.

The defect free rectangular shaped dimensional stones as acceptable consumers are produced by the method described above, which is constantly supervised by experienced Mining Geologist and Mining Engineer.

The waste materials generated during mining activity includes the rock fragments of different angularity formed during the removal of naturally defective and uneconomical portions of the deposits and the working waste formed during dressing of the extricated blocks. During the first five years of the Mining Plan period such waste materials are proposed to be dumped along the South side of the lease area where it comprises of country rock terrain.

2.10.2Blasting

The blasting parameters in the mining of Granite dimensional stone 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 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 to both the extricated part and the parent rock body.

The portion to be extricated from the parent rock body is freed in all planes by adopting different methods. Only mild explosives such as gun powder, detonating cord, ordinary

detonators etc. will be used to produce granite blocks. The blast holes of 32mm dia. are drilled up to the bottom of the horizontal plane all along the required vertical planes without deviation.

Conventional 32mm día. 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 a few cm above the required horizontal plane. Sub-grade drilling is not necessary since the splitting will be affected up to a further distance of few cm from the drill hole on blasting. Since the splitting will be affected up to a further distance a few cm from the drill hole on blasting. Such sub grade drilling may affect the underlying granite deposit.

Heavy, 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 production and development of the Black granite will be purchased from the authorized explosives dealer who has got a valid license to undertake blasting work to contract basis under License LE3 as Explosive Rules 2008. The blasting will be carried out under the direct supervision of our Statutory Mining Personal of TAMIN as approved by the DGMS under MMR, 1961.

The secondary splitting into required size involves long hole drilling up to the bottom of the separated block along the required planes for which mostly rock breaking powder is used for splitting. It is chemically called 'Calcium Hydroxide Ca $(OH)_2$.

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 Diamond wire saw machine in this mine.

2.10.3Loading & Transportation

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

2.10.4Exploration

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

a) Occurrence of the Black Granite stone in economically viable quality and quantity has been established by geological mapping and visual examination by Mining Geologists experienced in granite mining which have been proved by actual mining practice.

b) The depth persistence of the granite stone is proved beyond the workable limits of 31 m from the petrogenetic character of the granite body as well as from the actual mining practice. Considering the deposit with sheet rock formation of 31m depth persistence from the surface level has been taken as 'economically workable' depth to include all the three categories of mineral reserves viz, proved, probable and possible reserves.

c) The recovery of the saleable granite stones has been established as 10% from the visual exploration and from the data available by actual mining practices during the past mining in TAMIN's nearby lease area.

d) If any drilling program is carried out in the granite formations, there are defects like cracks and fractures that will be generated and developed during drilling time. Hence, having established all the data necessary for economic exploitation in this area, no definite program for future exploration has been drawn up. The mining activities during the first five years with deep cuts may render additional data as may be required for future planning.

2.10.5Storage 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.

2.10.6Mine Drainage

The lease applied area is a small hillock 18m height with slope towards North and South sides. Though the area receives scanty rainfall, the ground water level is at 15m depth from ground level. The production faces are operated at shallow depths. During the rainy season 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.

2.10.7Disposal of Waste

The waste generated during the mining operation is a side burden, granite rejects and the non-recoverable / un-sized boulders and rubbles etc and their accommodation are easier. The area for disposal of waste rock will be identified in South side of the lease area. The unsold blocks are kept within the boundary on the country rock area.

The total waste to be generated during the five years of Mining Plan period will be around 2,37,647m^3. These wastes will be proposed to dump on the south side of lease area with dimensions of 368m x 32mx 20.0m+

2.10.8Topsoil 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.

2.10.9Stabilization of Dump

The total waste to be generated during the five years of Mining Plan period will be around 2,37,647m³. These wastes will be proposed to dump on the south side of lease area with dimensions of 368m x 32m x 20.0m

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 brought from outside, the same is spread out over and sides of the waste dumps and for tree sapling will be carried out for increasing the stability and to prevent erosion during the rainy season.

2.11 Requirements

2.11.1Land Requirement and Land Use Planning

Quarry Land details are shown in **Table 2-14** and Land use pattern is provided in **Table 2-15.**

Table 2-14 Quarry Land details

District and State	Taluk	Village	S.F. No	Area (Ha)	Land Classification
Tiruvannamalai, Tamil Nadu	Thandarampattu	Sathanur	315,316 and 317/1	8.46.0	Government land

Table 2-15 Land Use Pattern of the lease area

S. No	Description	Present Area (Ha.)	Area to be required at the present Mining Plan Period (Ha.)	Area at the end of life of quarry (Ha.)
1	Area under Quarry (Existing pit area -1.65Ha.	1.65.0	1.70.0	5.10.5
2	Waste Dump	0.58.0	1.18.0	2.47.0
3	Infrastructure	-	0.01.0	0.01.0
4	Tar Road	0.00.5	-	0.00.5
5	Village Road	0.05.5	-	0.05.5
6	Mine Approach Road	0.10.5	-	0.01.0
7	Afforestation (0.23.5 Ha above the Waste Dump)	-	0.06.5	-

8	Un-utilized Area	6.06.5	3.11.0	0.80.5
	Total	**8.46.0**	**6.06.5**	**8.46.0**

2.11.2 Water Requirement

The total water requirement is 1.5 KLD. The total water requirement will be met from vendors or Village panchayat. 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. The water requirement details are given in **Table 2-16.**

Table 2-16Water 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 2-17.**

Table 2-17 Power Requirements

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

2.11.4List of Equipment

The list of Equipment is given in **Table 2-18.**

Table 2-18 Lists of Machineries

S. No	Purpose	Machinery	Numbers	Capacity	Make	Motive Power
1	Drilling	Jack Hammer (32mm dia)	6	1.2 to 6 m	Atlas Copco	Compressed Air
		Compressor	2	400 psi	Atlas Copco	Diesel Drive
		Tractor Mounted Air Compressor	1	-	-	Diesel Drive
		Diamond Wire Saw	1	30 m^3/day	Optima	Diesel Generator
		DG	1	125 KVA	Powerica	Diesel
2	Loading	Excavator	1	3000 LC	TATA Hitachi	Diesel Drive
3	Transport	Dumpers	2	25 Tons	Ashok Leyland	Diesel Drive

2.11.5 Manpower Requirement

Table 2-19 Manpower Details

S. No	Description	No of persons (Direct) (No.)
A)	**Technical / Mining Personnel**	
1	Geologist/ Agent (M.Sc. Degree Qualification)	1
2	Mine Manager (Holder of Manager Certificate of Competency under MMR, 1961)	1
3	Mining Mate cum Blaster	1
4	Machinery operators	6
5	Diesel Mechanic	1
B)	**Workers**	
1	Skilled	1
2	Semi - Skilled	9
3	Un-Skilled	10
Total		**30**

Indirect manpower is 20Nos.

2.11.6 Solid Waste Management

The municipal solid waste generation and management details are given in **Table 2-20.**

Table 2-20 Municipal Solid Waste generation & Management

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

As per CPHEEOg uidelines: MSW per capita/day=0.45

2.11.7Hazardous waste Management

The type of hazardous waste and the quantity generated are detailed in **Table 2-21.**

Table 2-21 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

Mine office, storeroom, first-aid room etc, will be provided on semi- permanent structure within the lease area.

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 quarry operation will be carried out during the general shift only. Limited Scale of activities entails only the negligible power requirement and the same is met from TNEB or from solar light.

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 2-24.** 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 asnecessary clearances from relevant Authority.

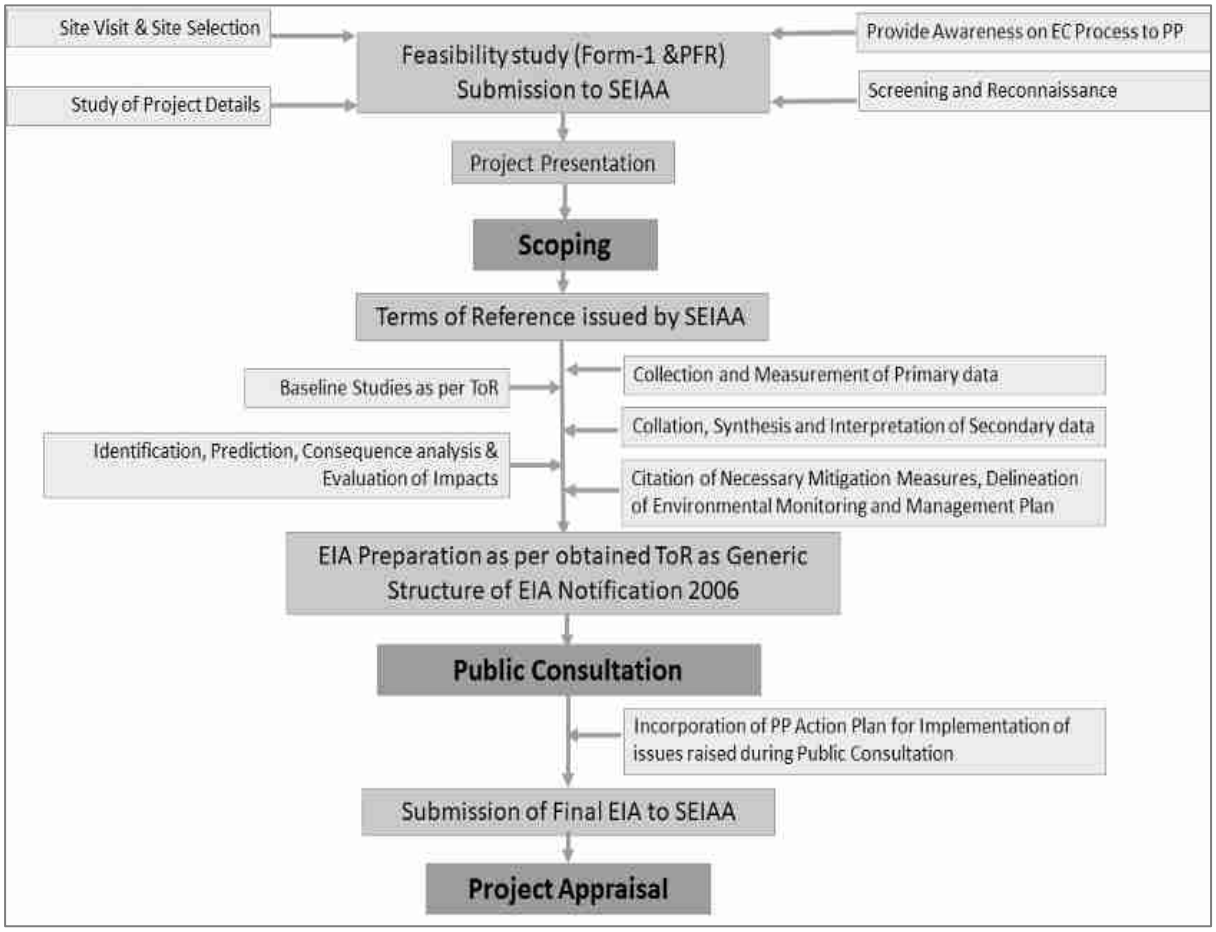


Figure 2-24 Feasibility & Environmental Assessment Process

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.

2.16.1Land Environment

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

2.16.1.1 Discharges on Land-Impact

Domestic:

Domestic wastewater is being disposed into septic tank followed by soak pit.

Mitigation Measures

- The mine waste in the mine includes the topsoil/rock fragments and rubble 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 air pollution due to wind erosion if they are not properly rehabilitated. Topsoil and over burden will be generated from the mining project which will be stacked separately at the designated areas.

2.16.1.2 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.

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 is being 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 NOx, SO_2 and Hydrocarbons. The sources of pollutants from the mining activity include:

- Operation of Heavy Earth Moving Machinery (HEMM)whichmostlyrunondiesel.
- Loading/unloadingoperations.
- 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 existing quarry, the following sources, or activities from the point sources, which emit Suspended Particulate Matter (SPM).

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.

Conventional 32mm 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 depth few cm above the required horizontal planes. Sub grading drilling is not followed since the splitting will be affected up to a further distance of cm from the drill hole, because sub grade drilling may affect the underlaying granite deposit.

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 SO_2, NOx 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 SO_2, NOx and Hydrocarbons due to consumption of fuel (diesel) by dumper while unloading the material.

2.16.3.5 LineSources

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 in the mine lease area. The traffic on the haul roads is likely to contribute towards an 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.

The average saleable production will be about 18.35 m3 per day, which is about 54 Tons/ day (bulk density of 2.8 Tones/m3 or 3 Tonne per cubic meter). Considering an average carrying capacity of truck as 10 Tons, the number of truck trips will be about 2 trips per day. Further, considering an operating hours of 8 hours per day, about 1-2 trips will be flying on the nearby village road subject market condition.

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 pits, 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. The 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 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 filters / mask to workers working at highly dust prone and affected areas.
- Provisionofgreenbeltby vegetationfortrappingdust.
- Greenbelt development along the haul roads, dump sand along the boundaries of the lease area.
- The utmost care will be taken to prevent spillage of sand and stone from the trucks.
- Covered tarpaul in for transport of materials.

2.16.4 Noise & Vibration Environment

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

- Drilling and Blasting
- Excavation of the material
- Loading & unloading of minerals.
- Transportation vehicles

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. Occupational hazard is envisaged if proper personal protective equipment is not provided to the operator and workers.

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 columns with little stemming column, improper burden, loose material or pebbles near the holes and long water column in the hole.

TAMIN will be followed shallow holes of 32mm dia are drilled and conventional low explosives such as gun powder, ordinary detonators etc are used for the splitting of hard rock mass. Hence, ground vibration and noise pollution will be minimal and restricted to within the mine workings. The blasting will be taken up at appointed times only and with sufficient caution to the public. 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, flying rock, air blast, noise, dust, and fumes are the deleterious effects of.

Impact

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

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

Mitigation Measures

- The major noise generating equipment like Compressors, DG sets, Excavator, & 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 or during change of shifts.
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce the 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 for the staff exposed to noise risks.
- Acoustic silencers will be provided in equipment wherever necessary.
- Use of personal protective Equipment's/devices such as earmuffs, 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 the operational phase of the project.
- Low vibration generating machines/equipment will be selected to meet international standards and foundations will be designed to minimize vibrations and secure 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 a quarry is 1.5 KLD. The total water requirement is met from vendors and Village Panchayat; Domestic sewage is being 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 lifeline 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, it is apparent 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 is being met by vendors and Village Panchayat. The lease applied area is a hillock with a height of 18m. Though the area receives scanty average rainfall of 985mm per annum during both Southwest and Northeast monsoons. Though the area receives scanty rainfall, the ground water level is at 15m depth. 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 10 HP oil engines.

Mitigation Measures

The following measures are proposed as a part of development to improve the ground water scenario and 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 waste 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 of in an unauthorized manner, it will impact soil quality, groundwater, and air quality.

2.16.7.2 Solid Waste Management

Strict guidelines will be put in place to manage 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 2-25.**

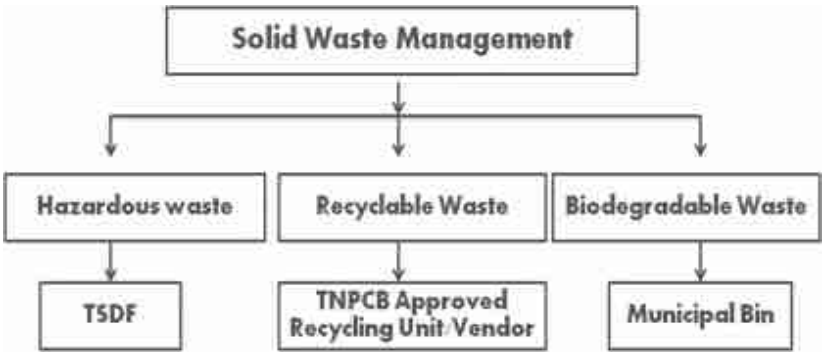


Figure 2-25 Waste Management Concepts

2.16.8Afforestation

The safety distance along the eastern side of the lease area has been identified to be utilized for afforestation. Native species will be planted in phased manner as given in**Table 2-22.**

Table 2-22 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
First	20	Neem/Pungam	130	50%	10
Second	20	Neem/Pungam	130	50%	10
Third	20	Neem/Pungam	130	50%	10
Fourth	20	Neem/Pungam	130	50%	10
Fifth	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 a 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 environmental components, as identified in and around the "Proposed project of **Black Granite Quarry** over an extent of 8.46 Ha in S.F. No. 315, 316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State by **M/s Tamil Nadu Minerals Limited**. The primary baseline data monitored covered three (3) months i.e., from **Mid December 2023 –Mid March 2024**, and secondary data was collected from Government and Semi-Government organizations. The primary baseline data has been conducted by M/s. Ekdant Enviro Services (P) Limited, Chennai, NABL approved Environmental Testing Laboratory for following Terrestrial environmental components.

S. No	Description of Section	Section	Parameters
1	Meteorology	Section 3.5.2	Temperature, Relative Humidity, Rainfall, Wind Speed & Direction
2	Ambient Air Quality	Section 3.5.4	As per NAAQS, 2009 and TVOC as per ToR
3	Ambient Noise Levels	Section 3.6	Day equivalent noise levels, Night equivalent noise levels (As per CPCB Standards)
4	Water Quality	Surface water – Section 3.7.2 Ground water – Section 3.7.3	Ground Water – IS 10500:2012 Surface Water – IS 2296 (Class – A)
5	Soil Quality	Section 3.8	ICAR (Indian Council of Agricultural research)
6	Ecology	Section 3.9	Flora and Fauna
7	Social Economic Status	Section 3.10	Socio Economic Profile of Study area (Population Profile, Employment and Livelihood, Education and Literacy, etc.,)

3.2 Description of 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 10Km from the boundary of the project. The PIA covers approximately 30 villages. 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.**

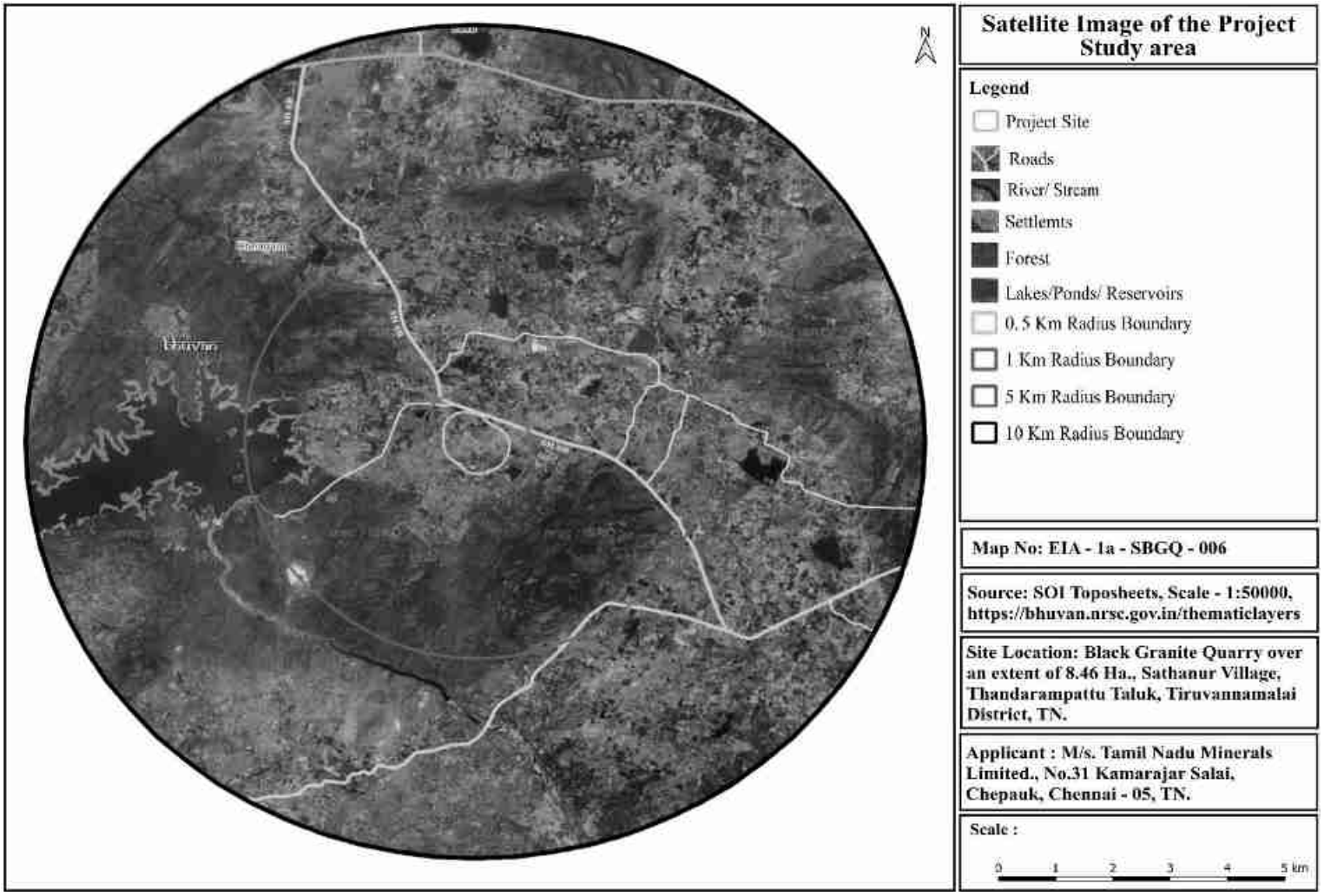


Figure 3-1 Satellite Image of the study area of Project.

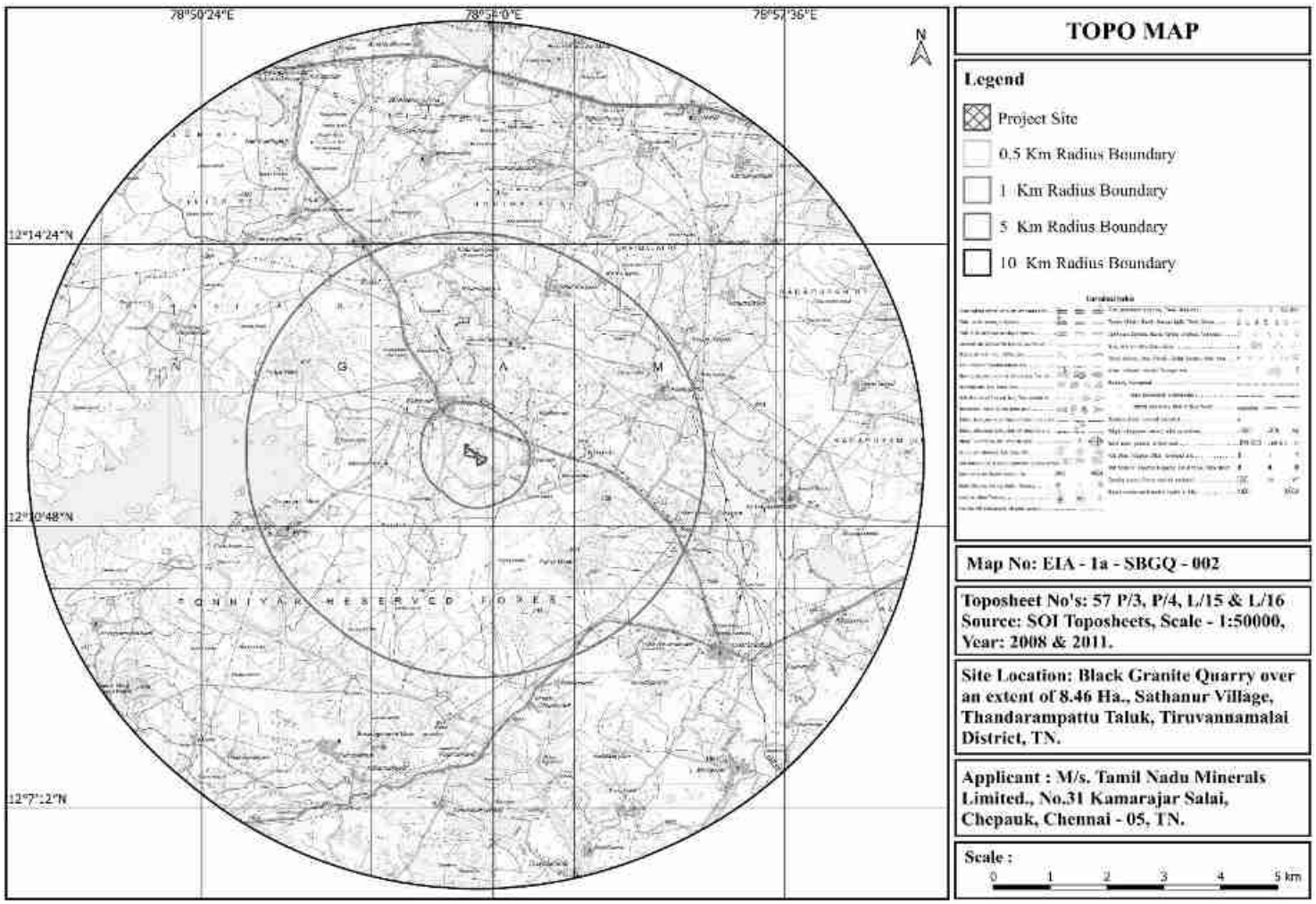


Figure 3-2 Topo Map of Study area

3.3 Environmentally/Ecologically Sensitive areas

The environmental sensitive areas covering an aerial distance of 15km from the project boundary is given in **Table 3-1**and Map showing Environmental sensitive areas within 15 km from project boundary is given in **Figure 3-3.**

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

<table>
<tr><th>S. No.</th><th>Areas</th><th>Distance & Direction from project boundary</th></tr>
<tr><td>1</td><td>List of Monuments and Heritages</td><td>
<table>
<tr><th>S.No.</th><th>Location</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Prehistoric Site</td><td>10.69</td><td>SW</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>List of Water Bodies</td><td>
<table>
<tr><th>S. No</th><th>Name of the Waterbody</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Sathanur Dam</td><td>3.28</td><td>W</td></tr>
<tr><td>2</td><td>Lake near Kil Vanakambadi</td><td>5.39</td><td>E</td></tr>
<tr><td>3</td><td>Taradapattu</td><td>3.9</td><td>NE</td></tr>
<tr><td>4</td><td>Lake near Naykkanur</td><td>1.27</td><td>NE</td></tr>
<tr><td>5</td><td>Lake near Sattannur</td><td>1.34</td><td>N</td></tr>
<tr><td>6</td><td>Lake near Mallikapuram</td><td>0.79</td><td>WNW</td></tr>
<tr><td>7</td><td>Lake near Site</td><td>0.54</td><td>SSE</td></tr>
<tr><td>8</td><td>Lake near Melkarippur</td><td>4.16</td><td>NNE</td></tr>
<tr><td>9</td><td>Lake near Govindapuram</td><td>2.92</td><td>N</td></tr>
<tr><td>10</td><td>Lake near Melpennathur</td><td>5.87</td><td>NNW</td></tr>
<tr><td>11</td><td>Lake near Sorappanandal</td><td>10.79</td><td>NW</td></tr>
<tr><td>12</td><td>Lake near Eraiyur</td><td>9.08</td><td>N</td></tr>
<tr><td>13</td><td>Lake near Ammapalaiyam</td><td>9.83</td><td>NNW</td></tr>
<tr><td>14</td><td>Lake near Nedungavadi</td><td>6.99</td><td>NE</td></tr>
<tr><td>15</td><td>Lake near Asuvangasuranai</td><td>10.16</td><td>ENE</td></tr>
<tr><td>16</td><td>Lake near Perumbakkam</td><td>9.97</td><td>E</td></tr>
<tr><td>17</td><td>Samudram Tank</td><td>14.15</td><td>E</td></tr>
<tr><td>18</td><td>Lake near Melserumbakkam</td><td>10.96</td><td>E</td></tr>
<tr><td>19</td><td>Lake near Kilserupakkam</td><td>13.04</td><td>E</td></tr>
<tr><td>20</td><td>Lake near Kilvanakkambadi</td><td>7.52</td><td>ESE</td></tr>
<tr><td>21</td><td>Lake near Gudalur</td><td>12.1</td><td>ESE</td></tr>
<tr><td>22</td><td>Lake near Mudiyanur</td><td>8.26</td><td>SE</td></tr>
<tr><td>23</td><td>Lake near Rayantapuraml</td><td>11.75</td><td>SSE</td></tr>
<tr><td>24</td><td>Lake near Kallenta</td><td>12.56</td><td>S</td></tr>
<tr><td>25</td><td>Lake near Tiruvadattanur</td><td>8.44</td><td>S</td></tr>
<tr><td>26</td><td>Lake near Pudurnattam</td><td>7.94</td><td>SSW</td></tr>
<tr><td>27</td><td>Lake near Tandarampattu</td><td>6.21</td><td>SE</td></tr>
<tr><td>28</td><td>Lake near Taradapattu</td><td>2.26</td><td>ENE</td></tr>
</table>
</td></tr>
</table>

		29 Lake near Site 0.66 N 30 Lake near Peyyalampattu 10.9 NW 31 Lake near kottakulam 11.2 NNW 32 Lake near Muttanur 12.08 NNW 33 Lake near Melmudiyanur 11.57 N 34 Lake near Padi Agraharam 14.23 N 35 Lake near Torappadi 12.41 N 36 Lake near Pinjur 12.46 WNW
3	List of Reserved Forests	S. No / Name / Distance (~km) / Direction 1 Ponnaiyar RF 1.16 SSE 2 Rayandapuram RF 11.56 S 3 Rayandapuram RF 13.55 S 4 Pumalai RF 9.86 SE 5 Radapuram RF 5.67 ENE 6 Uchhimalai RF 3.93 NE 7 Uchimalai RF 5.32 N 8 Kavuttimalai RF 11.3 NNE 9 Erraiyur Malai RF 8.11 N 10 PInjur RF 6.59 NW 11 Pinjur RF 7.24 NW 12 Pinjur RF 11.88 NW 13 Munnurmangalam RF 12.51 N 14 Munnurmangalam RF 13.82 N
4	Nearby Town, City and Head Quarters	**Town:** Thandarampattu ~ 5.90 Km (SSE) **City:** Tiruvanamalai ~ 15.28 Km (E)) **District HQ:** Tiruvanamalai ~ 15.28 Km (E)
5	Nearest Airport, Port and Railway Stations	**Railway Station:** Tiruvannamalai R. S ~ 20.08 km (E) **Airport:** Chennai Int. Airport ~ 161.01 Km (NE)
6	Nearest Densely Populated Habitations	S. No / Name of the villages / Distance (~km) &Direction / Population (Census 2011) 1 Thandarampattu 5.90 (SSE) 8034 2 Sathanur 0.56(NW) 4964 3 Tharadapattu 3.60(ENE) 4086

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

3.3.1 Physical Conditions of PIA district

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

3.3.2 PIA District Profile

Tiruvannamalai District was created from erstwhile North Arcot District on 30-09-1989. The district is surrounded by Kanchipuram district in the East, Villupuram district in the south, Dharmapuri and Krishnagiri Districts in the West and Vellore District in the North as its boundaries. Tiruvannamalai District is divided into 3 Revenue Divisions namely Tiruvannamalai, Arni and Cheyyar and 12 Taluks namely Tiruvannamalai, Kilpennathur, Chengam, Thandarampattu, KalasapakkamPolur, Arni, Chetput, Cheyyar, Vembakkam, Vandavasi and Jamanamarathur. They are further sub-divided into 18 development blocks, 4 Municipalities and 10 Town Panchayats and 860 Village Panchayats.

***Source** : https://tiruvannamalai.nic.in/district-at-a-glance/*

3.3.3 Climatic Conditions and Rainfall

This district has moderate climate. In Tiruvannamalai and Chengam taluks, the climate is cool in winter and hot during summer. The district gets rainfall during both north-east monsoon and southwest monsoon. The physiographic nature prevailing in the district forces variation in the climatic conditions. The radiation of the heat from the rocky hills and the dry weather due to sandy bed of the Palar minimises the rainfall in the region. The rainfall of the region depends on the south-west and the north-east monsoons. Except southern taluks of Cheyyar and Vandavas, the district experience moderate rainfall during north-east monsoon.

In summer, from March to June, the wind is hot and uncomfortable. In the monsoon seasons, from July to November, the wind is mild and from December to February, the wind is cold.

***Source :** DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI*

3.4 Natural Resources of PIA District

3.4.1 Forest Resources of PIA district

One sixth of the area of this district is covered by reserve forest. Hill ranges in the district forms part of Eastern Ghats under Jawadhu Hills. The important hills above the mean sea level in this district are Tiruvannamalai (2668 ft), Jawadhu hills (2500 ft) and Kailasagiri (2743 ft). This district has thick forest areas in Chengam and Polur taluks. The district has 79677.7 hectares of forest area which is about 14.8% to the total area of the entire district. The hilly areas of this district are “dry” deciduous type. In the low land, the ordinary vegetation like Tamarind trees, Teak wood, Sandal wood, Ven teak, Casurina, Bamboo etc. are the important trees in the district. Number of rare

plant species are spread over the Tiruvannamalai hill. Of these, more than 50% of the species are used by the local people for various medicinal uses.

Regarding fauna, some wild animals are found in the mountainous tracts. Bisons are seen in small numbers in Jawadhu Hill ranges and Tigers are occasionally seen. Leopards, Black Bears, Hyena, Samburs, Spotted Deer, Jungle Sheep, Barking Deer, Antelopes, and Varieties of snakes including Cobras are spread over at different regions. The reserved forests in the district found with sandalwood, bamboos, herbal plants, tamarind trees, teakwood, Ven teak and casurina.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

3.4.2 Irrigation of PIA district

Tanks and wells are the main sources of irrigation. There has been a spurt in the installation of electrical pump-sets for irrigation. This has given a boost to agricultural techniques in the use of fertilizers, pesticides, improved seed varieties and modern agricultural implements etc. Thus, there was an increase in agricultural production. Three majorrivers contribute largely to irrigation in this district, viz Palar, Pennaiyar and Cheyyar. Farmers in Chengam and Tiruvannamalai taluks receive water from Sathanur Dam for irrigation whenever the dam is filled with water.

Towards meeting the irrigation needs, the district has one reservoir. The numbers of tanks in the district are 1965. There were 144 canals running about 119 kms in the district. There were 174709 open wells (for irrigation only) besides 19266 wells used for domestic purposes during 2009-10.

The farmers have started installing bore-wells for exploiting the ground water for irrigation purpose. Dry land cultivation is common in the district. Majority of the area in the district is rain fed in nature.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

3.4.3 Agricultural Resources of PIA district

Agriculture is the main source of livelihood for the people in the district. The district is dependent on seasonal rains for successful agricultural operations. Different crops in dry and wetlands are cultivated in the district. Some of the taluks, in particular, which enjoy irrigation facilities are\ Tiruvannamalai, Cheyyar, Polur and Vandavasi. Paddy is the main agricultural crop in this district.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

3.4.4 Mineral Resources of PIA district

Quartz is available in little quantity in the border regions near Viluppuram district. Black granite and multi-coloured marble stones are available in plenty in the regions of Chengam and Vandavasi.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

3.4.5 Land Use & Land Cover of PIA district.

Total geographic area of Tiruvannamalai district is **6191.01Sq.Km**. Urban Built-up area is 31.41 Sq. Km and Rural Built-up area is 174.09Sq.Km. Details of land use/land cover statistics for Tiruvannamalai district were given in **Table 3-2.**Land Use pattern of Tiruvannamalai district is given in **Figure 3-4**.

Table 3-2 District land use/land cover statistics (2015-16) for Tiruvannamalai district

S. No	Description	Area (Sq. Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Built up, Urban	31.41	7761.57	3141	0.51
2	Built up, Rural	174.09	43018.51	17409	2.81
3	Built up, Mining	8.56	2115.22	856	0.14
4	Agriculture, Crop land	3113.88	769455.32	311388	50.30
5	Agriculture, Plantation	37.58	9286.21	3758	0.61
6	Agriculture, Fallow	1006.36	248676.59	100636	16.26
7	Forest, Evergreen/ Semi evergreen	229.71	56762.49	22971	3.71
8	Forest, Deciduous	843.11	208336.70	84311	13.62
9	Forest, Forest Plantation	20.02	4947.04	2002	0.32
10	Forest, Scrub Forest	0.08	19.77	8	0.001
11	Barren/unculturable/ Wastelands, Salt Affected land	8.74	2159.70	874	0.14
12	Barren/unculturable/ Wastelands, Scrub land	96.08	23741.85	9608	1.55
13	Barren/unculturable/ Wastelands, Sandy area	0.24	59.31	24	0.004
14	Barren/unculturable/ Wastelands, Barren rocky	57.85	14295.02	5785	0.93
15	Wetlands/Water Bodies, Inland Wetland	0.47	116.14	47	0.01
16	Wetlands/Water Bodies, River/Stream/canals	49.08	12127.91	4908	0.79
17	Wetlands/Water Bodies, Reservoir/Lakes/Ponds	513.75	126950.19	51375	8.30
	Total	**6191.01**	**1529829.5**	**619101**	**100**

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

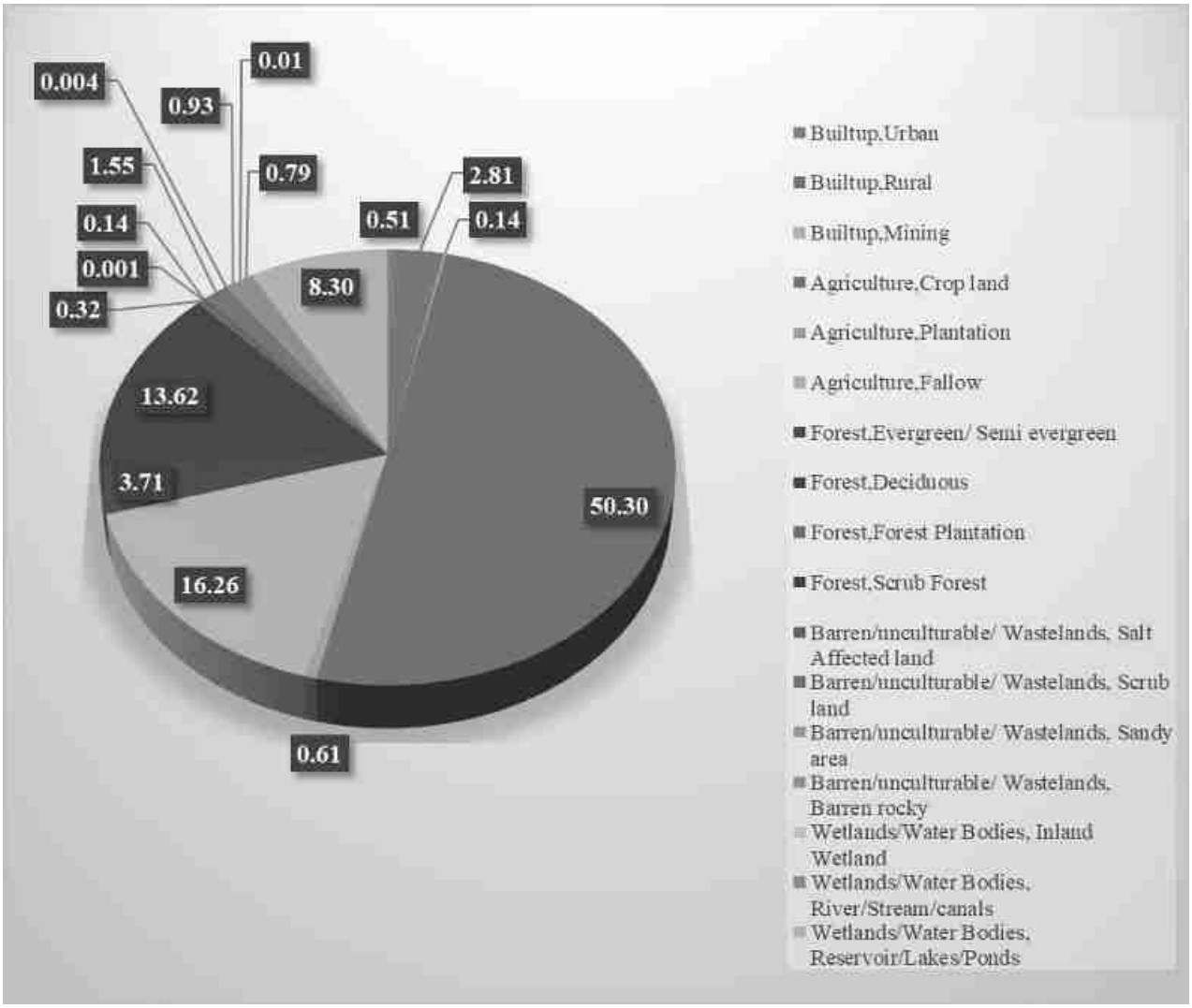


Figure 3-4 Land Use pattern of Tiruvannamalai district.

3.4.5.1 Land Use and Land Cover of the Study Area

The total Project Study area is **337.06 Sq.km**. The Land Use Pattern is given in **Table 3-3.** The Land Use Pattern and Land Use Map of the Study area are given in**Figure 3-5** and **Figure 3-6** respectively.

Table 3-3 Land Use Pattern of the Study Area

S. No	Description	Area (Sq. Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Barren rocky	8.6	2125.10	860	2.55
2	Crop land	124.78	30833.76	12478	37.02
3	Deciduous	79.07	19538.59	7907	23.46
4	Evergreen / Semi Evergreen	6.64	1640.78	664	1.97
5	Fallow	74.16	18325.31	7416	22.00
6	Forest Plantation	1.52	375.60	152	0.45
7	Mining	0.85	210.04	85	0.25
8	Plantation	0.45	111.20	45	0.13
9	River / Stream / Canals	3.36	830.27	336	1.00
10	Rural	7.1	1754.45	710	2.11
11	Scrub land	3.7	914.29	370	1.10
12	Urban	0.82	202.63	82	0.24
13	Waterbodies	26.01	6427.20	2601	7.72
Total		**337.06**	**83289.21**	**33706**	**100.00**

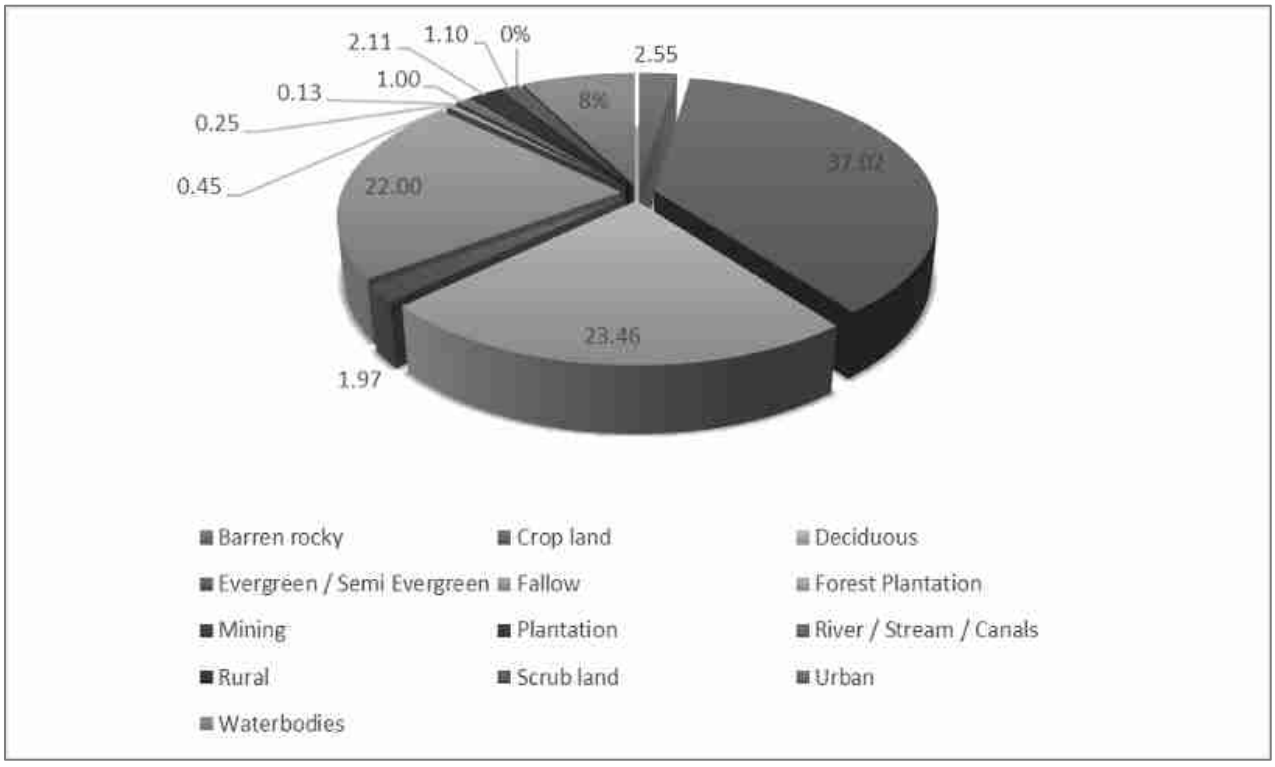


Figure 3-5Land Use Pattern of the Study Area

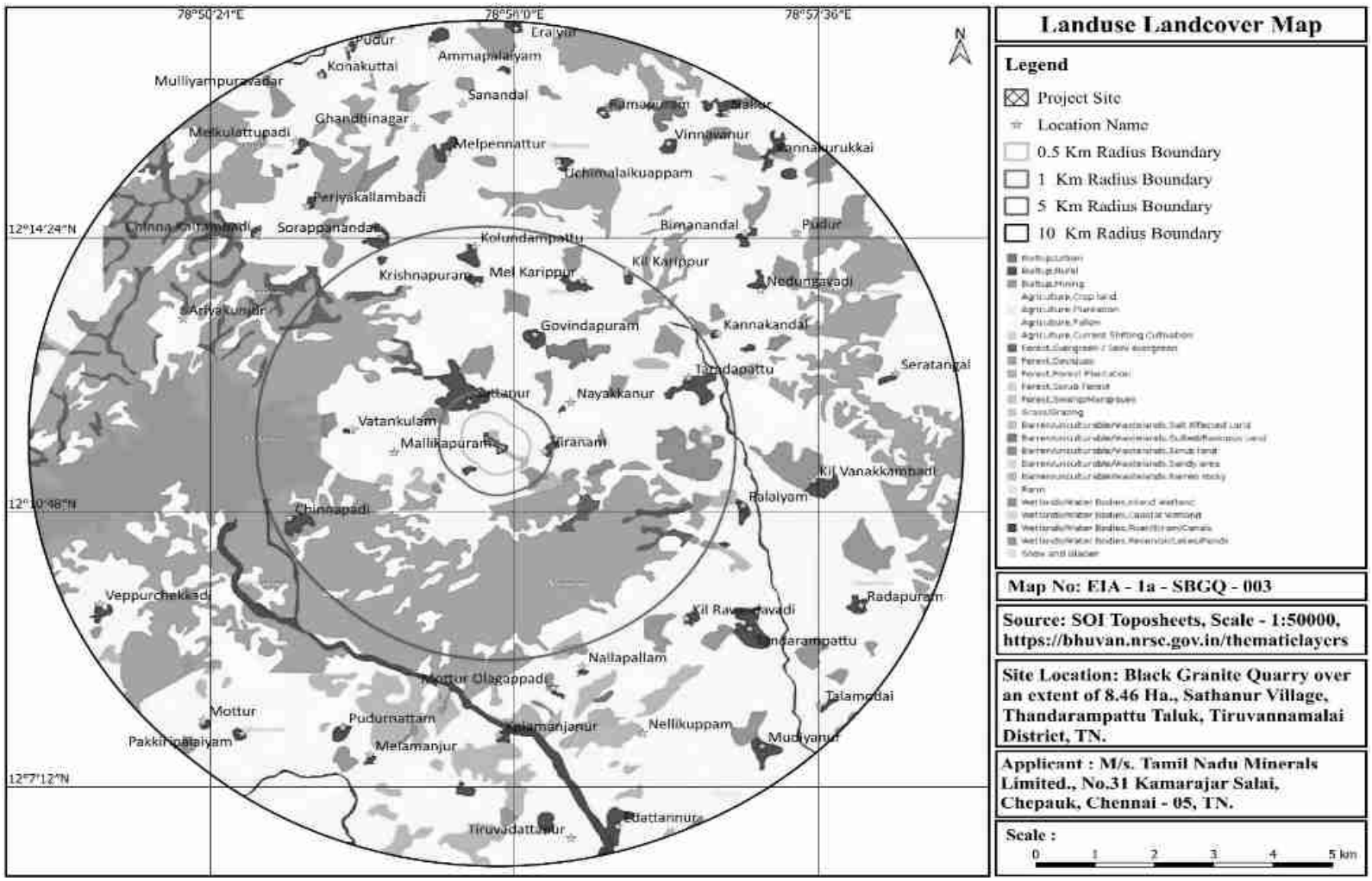


Figure 3-6 Land Use Land Cover map of the study area

3.4.6 Geology of PIA district

Tiruvannamalai District mainly comprises of rocks of Archaeon age. The type of rocks found in the district are Charnockite, Granitic gneiss, Epidote Hornblende Gneiss, Amphibolite, Pyroxenite, Dunite, Migmatites, Banded Magnetite Quartzite, Shale, and Clay. Dolerite dykes (Black Granite) are also noticed cutting across the country rocks. The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supracrustal sequences of Sathyamangalam and Kolar groups and Peninsular Gneissic Complex (Bhavani Group), intruded by ultramafic-mafic complexes, basic dykes, granites and syenites. The sedimentary rocks of the coastal belt include fluviatile, fluvio-marine, and marine sequences, such as Gondwana Supergroup (Carboniferous to Permian and Upper Jurassic to Lower Cretaceous), marine sediments of Cauvery basin (Lower Cretaceous to Paleogene), Cuddalore /Pannambarai Formation (MioPliocene) and sediments of Quaternary and Recent age.

Source :https://cdn.s3waas.gov.in/s318997733ec258a9fcaf239cc55d53363/uploads/2019/05/2019053158.pdf

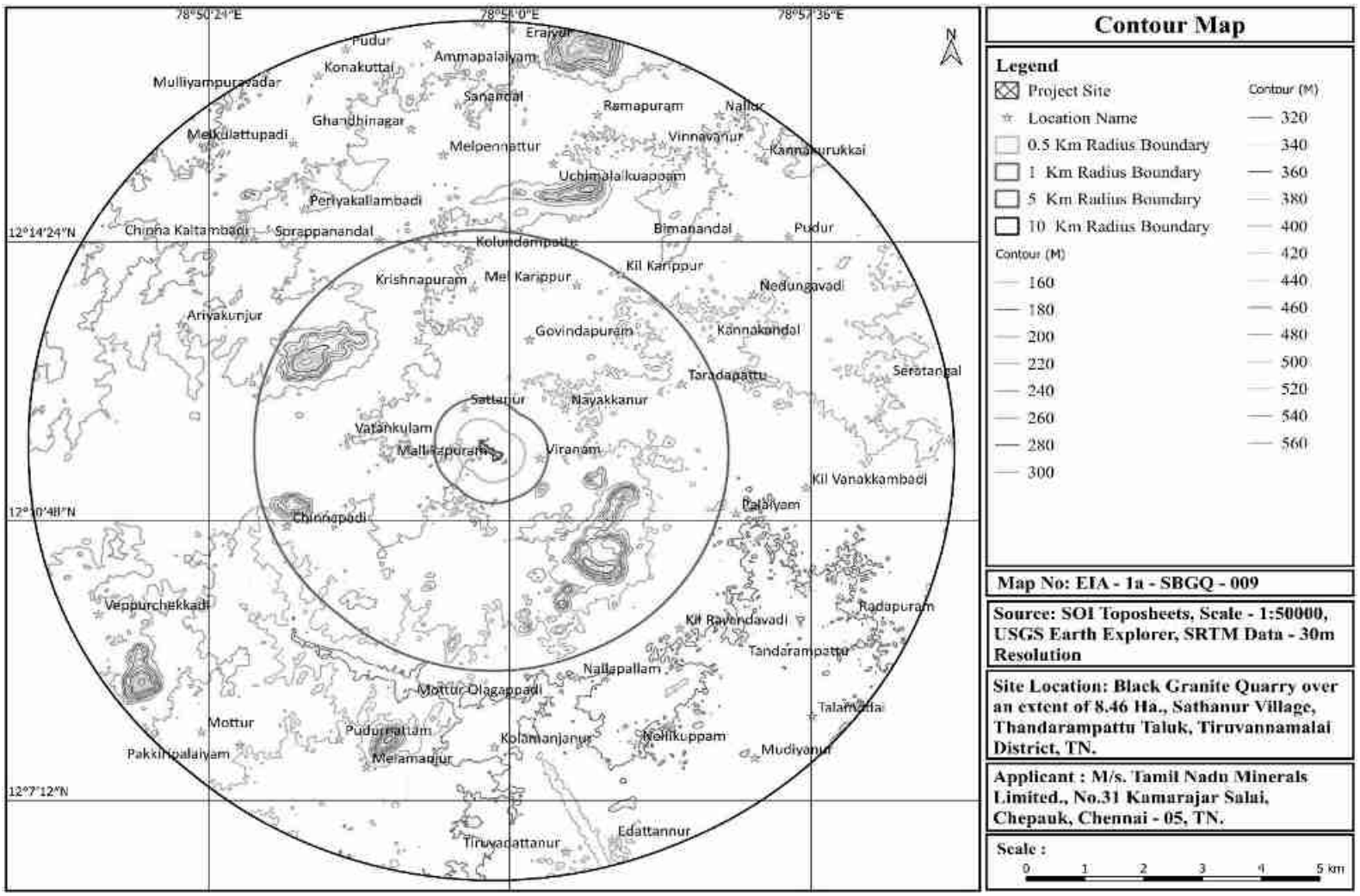


Figure 3-7 Contour map of study area.

3.4.7 Geomorphology of the Study Area

The total Geographical area of the study area is **337.06 Sq.Km**. The Geomorphology of the study area is given in **Table 3-4** and Geomorphology pattern and Geomorphology Map of the study area is given in **Figure 3-8** and **Figure 3-9** respectively.

Table 3-4 Geomorphology of the Study Area

S. No	Geomorphology	Area (Sq. Km)	Total Area (%)
1	Structural Origin-Moderately Dissected Hills and Valleys	14.52	4.31
2	Structural Origin-Low Dissected Hills and Valleys	3.36	1.00
3	Denudational Origin-Moderately Dissected Hills and Valleys	1.98	0.59
4	Denudational Origin-Low Dissected Hills and Valleys	1.57	0.47
5	Denudational Origin-Pediment-PediPlain Complex	284.94	84.54
6	Anthropogenic Origin-Anthropogenic Terrain	14.52	4.31
7	Waterbodies	16.17	4.80
Total		**337.06**	**100**

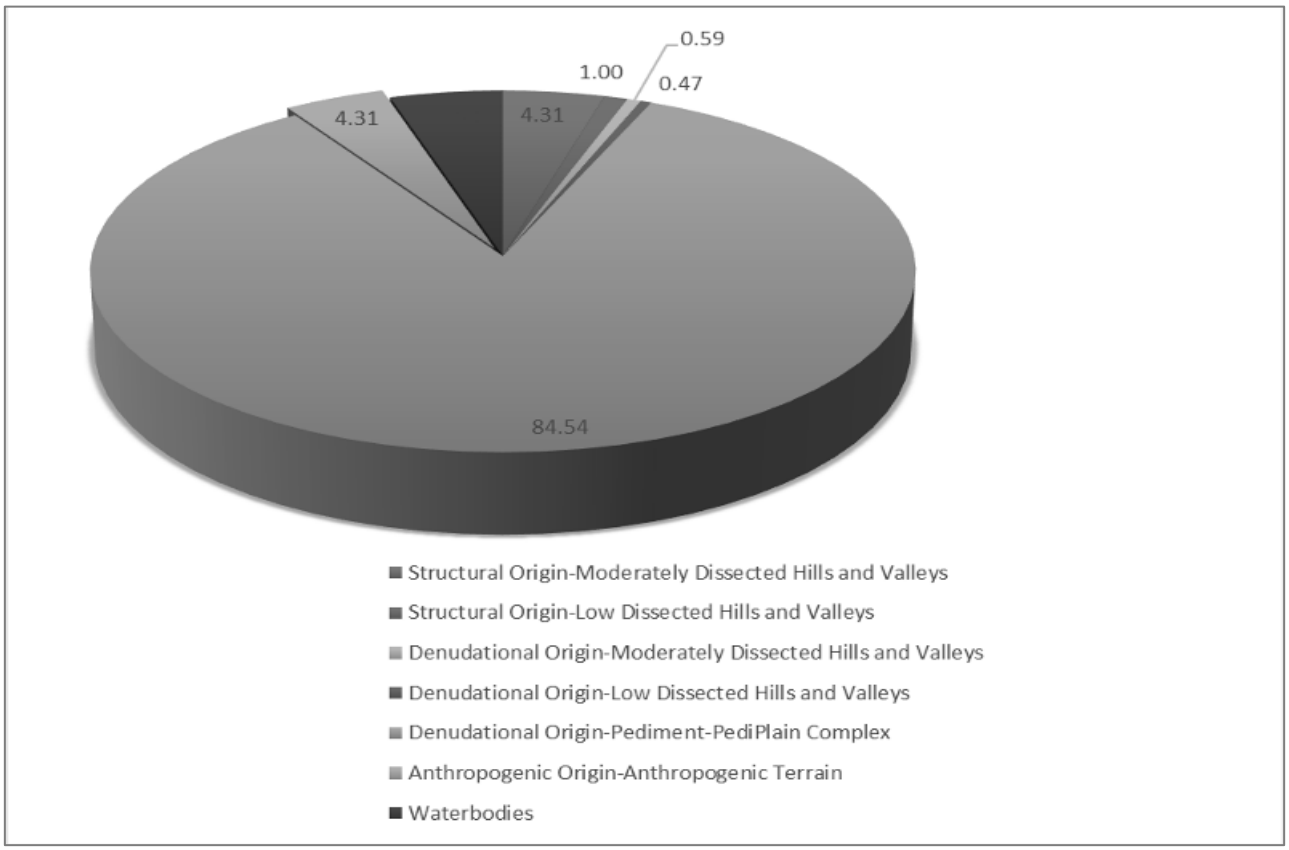


Figure 3-8 Geomorphology Pattern of the Study Area

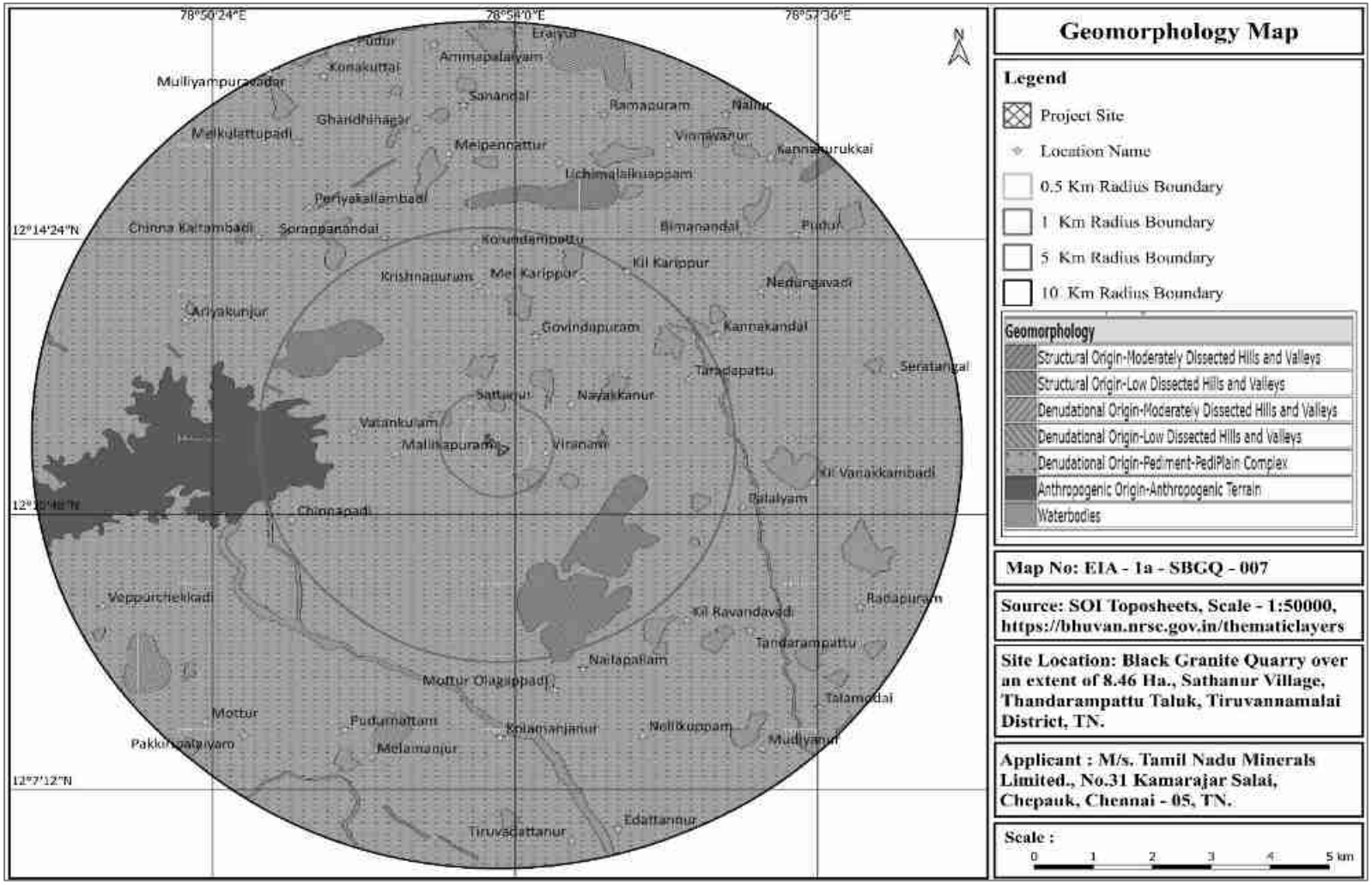


Figure 3-9 Geomorphology map of the study area.

3.4.8 Drainage Pattern of PIA district

Cheyyar river which originates from Jawadhu Hills, flows in a southern direction at first, and turns south-east near Chengam after flowing through Polur, Vandavasi and Cheyyar taluks. Palar raising nearNandidurg in Mysore enters Vellore district passingthrough Gudiyatham, Walajah and Arakonam taluksbefore entering into Cheyyar taluk of Tiruvannamalaidistrict and there after enters into Kancheepuramdistrict.

Pennaiyar and South Pennaiyar originate fromNandidurg of Karnataka. They pass through Dharmapuri district and enters southern part of Chengam taluk before entering into Viluppuram district. Finally, the river enters into the Bay of Bengalat Cuddalore. The river is dry for the most part of the year. Water flows during the monsoon season when it is fed by the southwest monsoon in catchment area and the northeast monsoon in Tamil Nadu. A dam has been constructed across this river at Sathanur which is a picnic spot in this district. Sathanur Reservoir provides drinking water to Tiruvannamalai town and the water is used forirrigation when the reservoir is filled with surpluswater.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

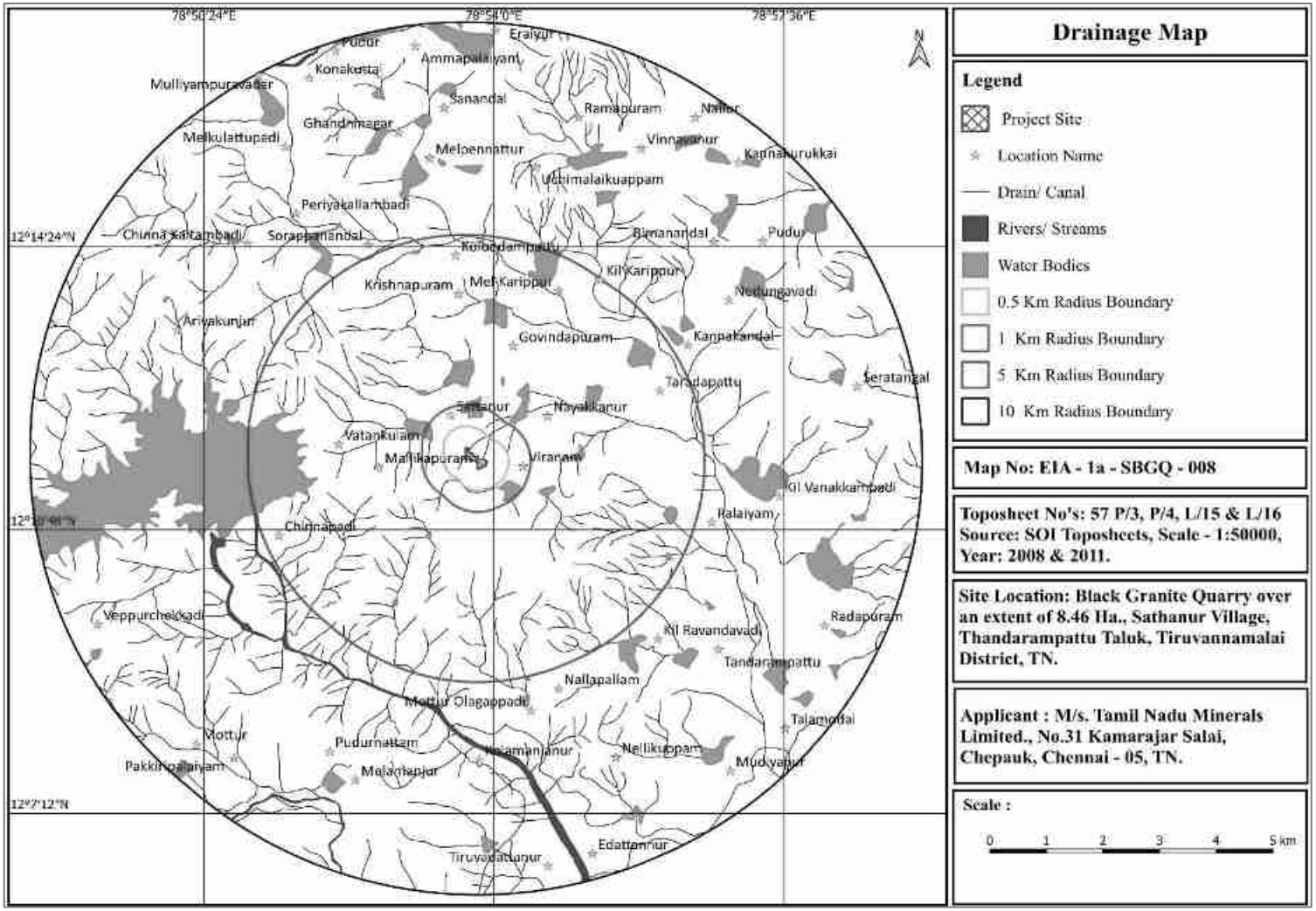


Figure 3-10 Drainage map of the study area.

3.4.9 Seismicity

As per Seismicity Map of India, the project location/study area falls in Zone III, which is categorized as a Moderate Active Zone. The Seismicity Map of India is shown in **Figure 3-11.**

Figure 3-11 Seismicity map of India.

3.4.10Soils of PIA District

The red loamy soil is predominantly found in this district but more predominant in Tiruvannamalai and Vandavasi taluks. However, Polur taluk has concentration of red series loam. The district has also different types of soils such as ferruginous loamy and sandy loamy. However, black series loam is found in tanks and riverbeds of Cheyyar and Vandavasi taluks.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

3.5 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. The baseline status of air environment in the study area is assessed through a systematic air quality surveillance program.

3.5.1 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. 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 proposed utilities like Thermic fluid Heater & DG sets etc.

3.5.2 General Meteorological Scenario based on IMD Data

The nearest Indian Meteorological Department (IMD) station located to project site is Tiruppattur. The Climatological data of Tiruppattur (12°29 ' and 78°34’ E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 29-year period (1971-2000), 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 –Tiruppattur (1971-2000)

Month	Temp (°C)		Rainfall		Mean Wind Speed (Kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total (mm)	No. of days		08:30	17:30
Jan	30.6	16.6	3.1	0.3	3.1	N	NE
Feb	33.4	18.9	4.1	0.4	3.6	N	NE
Mar	36.2	21.1	9.3	0.7	3.8	N	NE
Apr	37.5	23.6	27.3	1.8	3.6	N	NE

Month	Temp (°C)		Rainfall		Mean Wind Speed (Kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total (mm)	No. of days		08:30	17:30
May	37.8	24.4	83.7	5.5	3.7	N	NE
Jun	35.0	23.8	68.2	3.9	4.3	S	W
Jul	33.7	23.4	112.8	5.0	4.8	W	W
Aug	33.2	23.1	148.3	6.7	4.4	W	W
Sep	33.1	22.8	206.7	9.6	3.7	W	W
Oct	31.9	22.0	145.2	7.8	3.2	S	S
Nov	30.2	20.3	83.2	5.7	2.7	S	S
Dec	29.3	17.9	41.7	2.4	2.8	N	S
Max.	37.8	24.4	206.7	9.6	4.8	**The Predominant wind direction is North**	
Min.	29.3	16.6	3.1	0.3	2.7		
Annual Avg/Total.	33.5	21.5	933.6	49.8	3.6		

Source : IMD

3.5.3 Meteorological Scenario during Study Period

The meteorological scenario in and around the project site is an essential requirement during the study period for proper interpretation of baseline air quality status. Meteorological data was collected during the study period (**Mid December 2023 – Mid March 2024**) and is presented in **Table 3-6**. The wind rose for the study period is given in **Figure 3-12**.

Table 3-6 Meteorological Data for the Study Period (Mid December2023 – Mid March 2024)

S. No	Parameter	Observation
1.	Temperature	Max Temperature: 37^0C Min Temperature: 21^0C Avg Temperature: 29.7^0C
2.	Average Relative Humidity	49.42 %
3.	Average Wind Speed	2.47 m/s
4.	Predominant Wind Direction during study period	Southeast

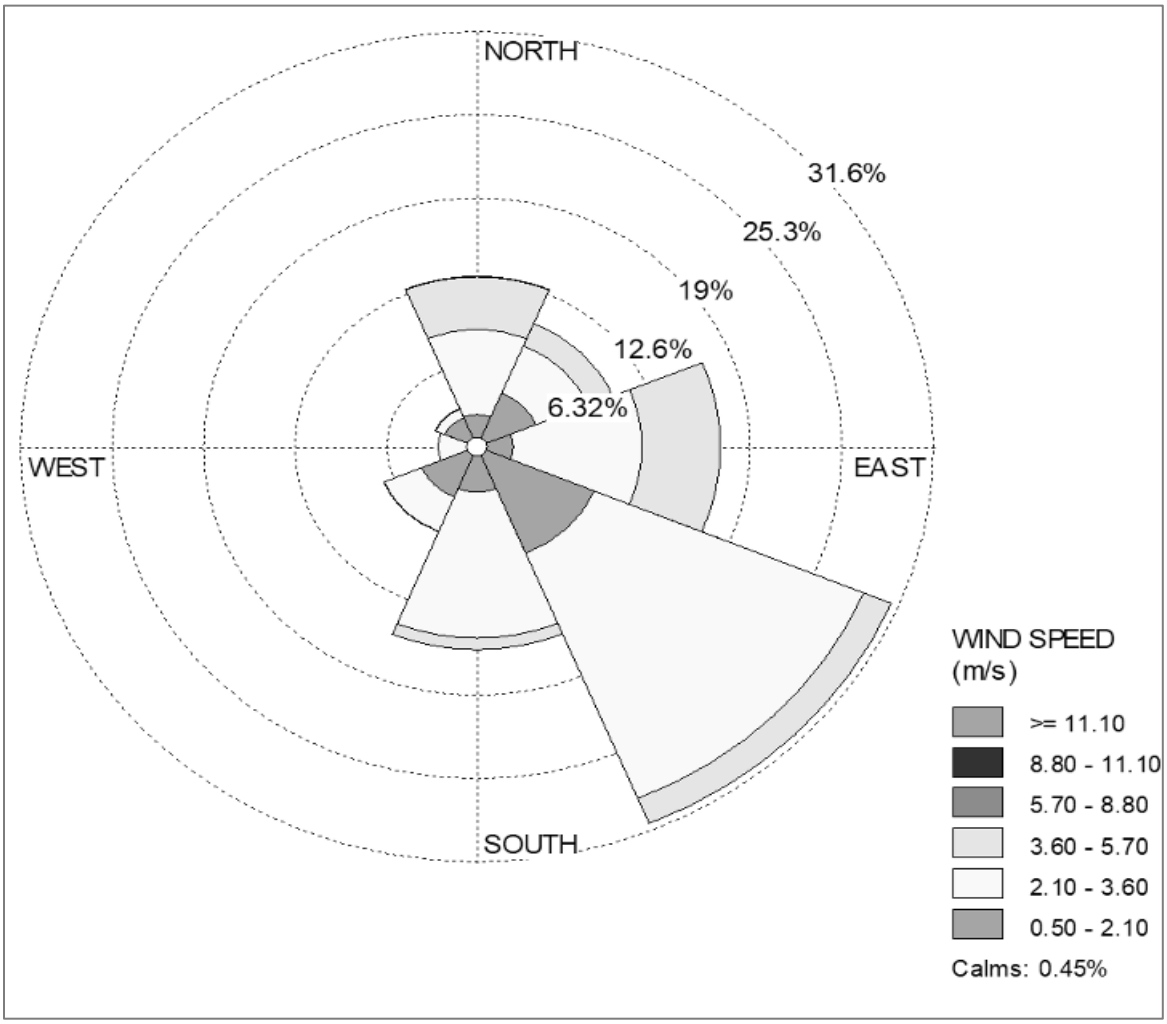


Figure 3-12 Wind rose for the study period.

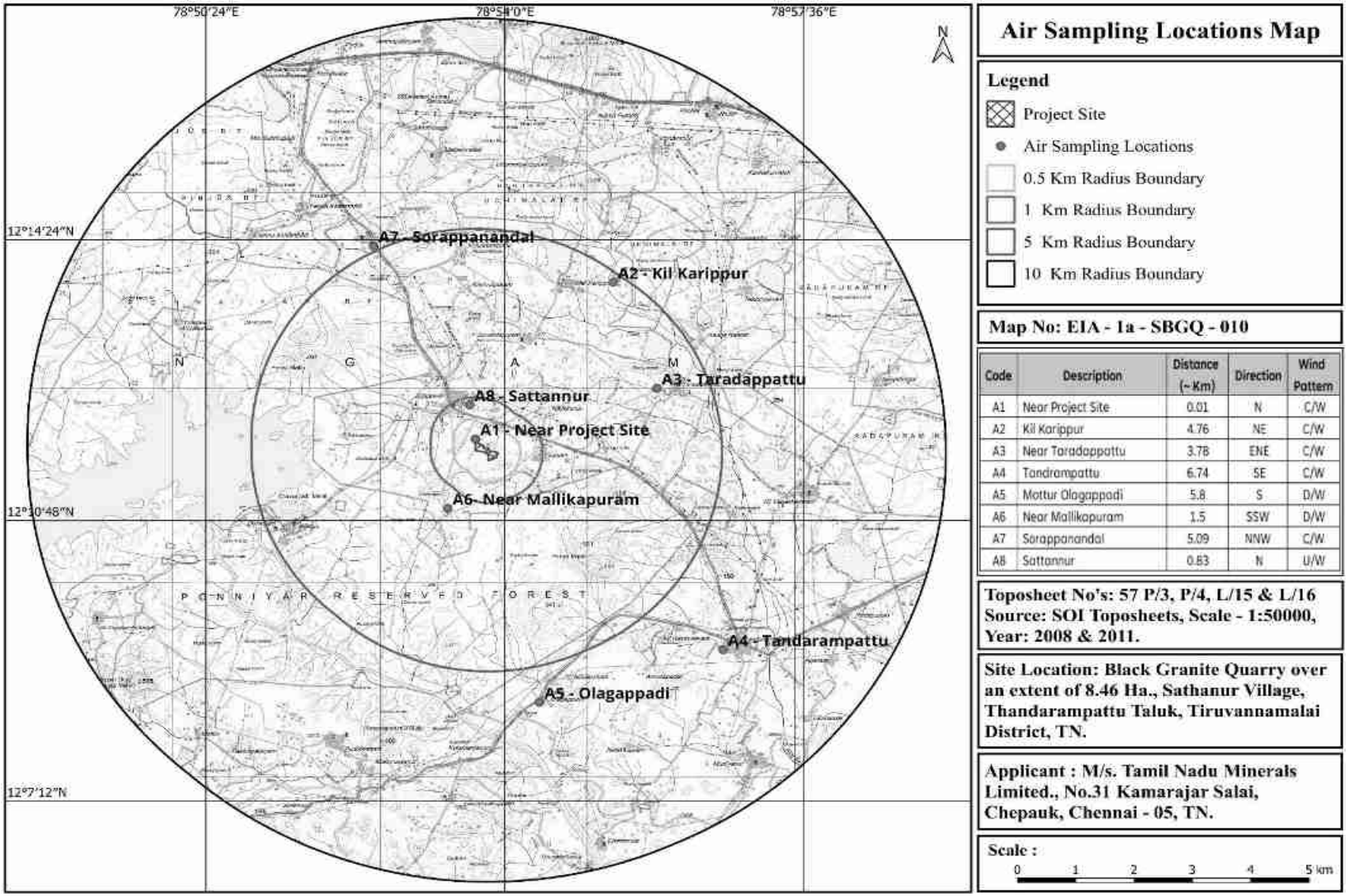
3.5.4 Ambient Air Quality

3.5.4.1 Ambient Air Quality Monitoring Stations

Eight (08) monitoring locations have been identified as per annual wind predominance of Tiruppattur from IMD. AAQ monitoring locations are selected based on Annual wind predominance, map showing the Ambient Air Quality monitoring locations is given in **Figure 3-13** 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
A1	Near Project Site	C/W	0.01	N
A2	Kil Karippur	C/W	4.76	NE
A3	Near Taradappattu	C/W	3.78	ENE
A4	Tandrampattu	C/W	6.74	SE
A5	MotturOlagappadi	D/W	5.8	S
A6	Near Mallikapuram	D/W	1.5	SSW
A7	Sorappanandal	C/W	5.09	NNW
A8	Sattannur	U/W	0.83	N



Code	Description	Distance (~ Km)	Direction	Wind Pattern
A1	Near Project Site	0.01	N	C/W
A2	Kil Karippur	4.76	NE	C/W
A3	Near Taradappattu	3.78	ENE	C/W
A4	Tandrampattu	6.74	SE	C/W
A5	Mottur Olagappadi	5.8	S	D/W
A6	Near Mallikapuram	1.5	SSW	D/W
A7	Sorappanandal	5.09	NNW	C/W
A8	Sattannur	0.83	N	U/W

Figure 3-13 Ambient Air Quality monitoring locations

3.5.5 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., 3 months (**Mid December2023 – Mid March 2024**). PM_{10}, $PM_{2.5}$, SO_2, NO_x, Pb, NH_3, C_6H_6, $C_{20}H_{12}$, As, Ni and TVOC were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in**Table 3-8** and the Summary of the average baseline concentrations of pollutants is given in **Table 3-9.**

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

S. No	Parameters	Analytical method
1	Sulphur Dioxide (SO_2), µg/m^3	IS 5182(Part 2) : 2001 RA
2	Nitrogen Dioxide (NO_2), µg/m^3	IS 5182(Part 6) : 2006 RA
3	Particulate Matter ($PM_{2.5}$), µg/m^3	SOP – EA -001- In house validated method / Issue No/Date : 03 / 04.08.2014:
4	Particulate Matter (PM_{10}), µg/m^3	IS 5182(Part 23) : 2006 RA
5	CO mg/m^3	NIOSH- 6014
6	Pbµg/m^3	IS 5182(Part 22): 2004 RA
7	O3, µg/m^3	IS 5182(Part 9): 1974 RA
8	NH3, µg/m^3	SOP – EA -009 - In house validated method / Issue No/Date: 03/04.08.2014 (Based on CPCB Method)
9	Benzene, µg/m^3	IS 5182(Part 11): 2006 (RA 2012)
10	Benzo (a) pyrene, ng/m^3	IS 5182(Part 12) :2004 RA
11	Arsenic, ng/m^3	SOP – EA -010 - In house validated method / Issue No/Date :03/04.08.2014 (Based on CPCB Method)
12	Nickel ng/m^3	SOP – EA -011 - In house validated method / Issue No/Date :03/04.08.2014 (Based on CPCB Guideline)
13	TVOC	USEPA Method

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

Parameters	Conc.	NAAQ Standards	Locations							
			Near Project Site	Kil Karippur	Near Taradappattu	Tandrampattu	MotturOlagappadi	Near Mallikapuram	Sorappanandal	Sattannur
			AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8
PM_{10} Conc. ($\mu g/m^3$)	Min.	100 (24 Hours)	35.2	33.0	38.8	42.8	39.7	38.5	38.0	35.3
	Max		50.1	47.0	55.3	61.0	56.6	54.9	54.1	50.3
	Avg.		**42.2**	**39.6**	**46.6**	**51.4**	**47.7**	**46.2**	**45.6**	**42.4**
	98th 'tile		49.8	46.7	55.0	60.7	56.3	54.5	53.8	50.0
$PM_{2.5}$ Conc. ($\mu g/m^3$)	Min.	60 (24 Hours)	19.3	18.1	21.4	23.6	21.9	21.2	20.9	19.4
	Max		27.6	25.9	30.4	33.6	31.2	30.2	29.8	27.7
	Avg.		**23.2**	**21.8**	**25.6**	**28.3**	**26.2**	**25.4**	**25.1**	**23.3**
	98th 'tile		27.4	25.7	30.3	33.4	31.0	30.0	29.6	27.5
SO_2 Conc. ($\mu g/m^3$)	Min.	80 (24 Hours)	6.6	5.6	6.5	7.7	7.1	6.8	5.8	6.3
	Max		9.4	8.0	9.3	10.9	10.1	9.6	8.2	9.0
	Avg.		**7.9**	**6.7**	**7.8**	**9.2**	**8.5**	**8.1**	**6.9**	**7.6**
	98th 'tile		9.3	7.9	9.2	10.9	10.1	9.6	8.2	9.0
NO_2 Conc.($\mu g/m^3$)	Min.	80 (24 Hours)	14.3	13.4	15.3	16.6	16.6	17.7	14.8	15.1
	Max		20.3	19.2	21.8	23.7	23.7	25.2	21.1	21.5
	Avg.		**17.1**	**16.1**	**18.3**	**19.9**	**19.9**	**21.2**	**17.7**	**18.1**
	98th 'tile		20.2	19.0	21.7	23.5	23.5	25.1	20.9	21.4

Parameters	Conc.	NAAQ Standards	Locations							
			Near Project Site	Kil Karippur	Near Taradappattu	Tandrampattu	MotturOlagappadi	Near Mallikapuram	Sorappanandal	Sattannur
			AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8
CO (mg/m^3)	Avg.	4 (1hour)	0.20	0.26	0.38	0.28	0.41	0.31	0.27	0.39
Pb (µg/m3)	Avg.	1 (24 hour)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
O3 (µg/m^3)	Avg.	180 (1hour)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NH3 (µg/m^3)	Avg.	400 (24 hours)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene (µg/m^3)	Avg.	5 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo (a) pyrene, (ng/m^3)	Avg.	1 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic (ng/ m^3)	Avg.	6 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel (ng/m^3)	Avg.	20 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TVOC (µg/m^3)	Avg.	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL (Below detectable limit), DL (Detectable limit)

3.5.6 Interpretations of Results

The monitoring results of ambient air quality were compared with the National Ambient Air Quality Standards (NAAQS) Prescribed by MoEFCC; GoI Notification dated 16.11.2009. The baseline levels of PM_{10} (33.0–61.0µg/m³), $PM_{2.5}$ (18.1–33.6 µg/m³), SO_2(5.6–10.9µg/m³), NO_2(13.4-25.2 µg/m³), While thus it was found that concentration of pollutants was within the limits of NAAQ standards.

All the results of ambient air quality parameters have been found within the limit as per NAAQS. Based on comparison study of results for tested parameters with NAAQS, it is interpreted that ambient air quality of studied locations is average. This interpretation narrates the results found for corresponding locations and study period.

3.6 Noise Environment

The ambient noise level at a location varies continuously depending on the type of surrounding activities. Ambient noise levels have been established by monitoring noise levels at Eight (08) locations in and around 10Km distance from project area during the study period using precision noise level meter. Noise levels were recorded on an hourly basis for one complete day at each location using pre- calibrated noise levels. A map showing the noise monitoring locations is given in **Figure 3-14**.

3.6.1 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

S. No	Location	Location Code	Distance (km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1	Near Project Site	N1	0.01	N	49.6	40.8	75	70	Industrial
3	Kil Karippur	N2	4.76	NE	50.2	40.5	55	45	Residential
4	Near Taradappattu	N3	3.78	ENE	53.2	42.6	55	45	Residential
5	Tandrampattu	N4	6.74	SE	52.7	41.4	55	45	Residential
6	MotturOlagappadi	N5	5.8	S	50.0	40.2	55	45	Residential
7	Near Mallikapuram	N6	1.5	SSW	48.6	39.6	55	45	Residential
8	Sorappanandal	N7	5.09	NNW	51.6	41.9	55	45	Residential
2	Sattannur	N8	0.83	N	52.6	41.8	55	45	Residential

3.6.2 Interpretations of Results

The observations of day equivalent and night equivalent noise levels at all locations are given below:

- In Industrial areas daytime noise levels were about 49.6 dB(A) and 40.8 dB(A) during nighttime, which is within prescribed limit by CPCB (75 dB(A) Day time & 70 dB(A) Nighttime).
- In residential areas daytime noise levels varied from 48.6 dB(A) to 53.2 dB(A) and nighttime noise levels varied from 39.6 dB(A) to 42.6 dB(A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels are well within the prescribed limit by CPCB (55 dB(A) Day time & 45 dB(A) Nighttime).

The Noise levels recorded during the daytime (6:00 a.m to 10:00 p.m) and night-time (10:00 p.m to 6:00 a.m) at all stations are within the CPCB limits. The major source of noise in the study area is transportation and vehicular movement.

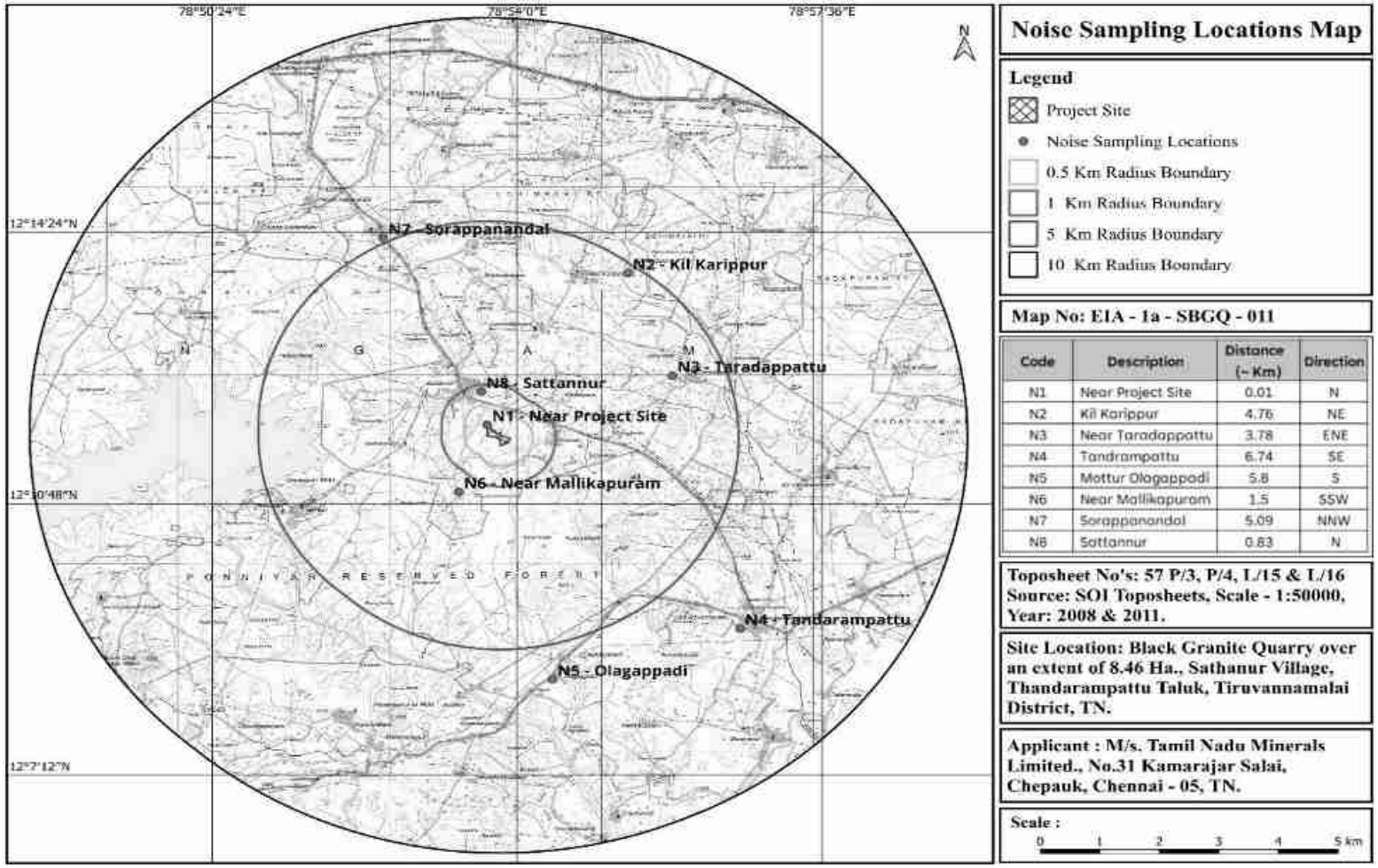


Figure 3-14 Noise Monitoring locations

3.7 Water Environment

3.7.1 Surface Water Resources of PIA district

Cheyyar river which originates from JawadhuHills, flows in a southern direction at first, and turnssouth-east near Chengam after flowing through Polur, Vandavasi and Cheyyar taluks. Palar raising nearNandidurg in Mysore enters Vellore district passingthrough Gudiyatham, Walajah and Arakonam taluksbefore entering into Cheyyar taluk of Tiruvannamalaidistrict and there after enters into Kancheepuram district.

Pennaiyar and South Pennaiyar originate fromNandidurg of Karnataka. They pass throughDharmapuri district and enters southern part ofChengam taluk before entering intoViluppuramdistrict. Finally, the river enters into the Bay of Bengalat Cuddalore. The river is dry for the most part of the year. Water flows during the monsoon seasonwhen it is fed by the southwest monsoon in catchmentarea and the northeast monsoon in Tamil Nadu. Adam has been constructed across this river atSathanur which is a picnic spot in this district. Sathanur Reservoir provides drinking water toTiruvannamalai town and the water is used forirrigation when the reservoir is filled with surpluswater.

Source : ***DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI***

3.7.2 Surface Water Quality Assessment

To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10 Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in **Table 3-11**.

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

S. No	Parameter Measured	Test Method
1	Turbidity	APHA 23rd Edition 2017 /2130B/P 2-9 Nephelometric Method/ IS 3025(Part 10): 1984 RA
2	Color	APHA 23rd Edition 2017 2120B /P2-2 Visual Comparision Method / IS 3025(Part 4): 1983 RA
3	pH	APHA 23rd Edition 2017 4500 H+ / P 4-90 Electrometric Method/IS 3025(Part 11): RA
4	Conductivity	APHA 23rd Edition 2017/ 2510 B /P 2 – 47 Electrometric Method/IS3025(Part 14): 2013 RA
5	Total Dissolve Solids	APHA (23rd Edition) 2017/ 2540 C / P 2-58 Gravimetric Method/IS 3025 (part 16) :1984 RA
6	Total Suspended Solids	APHA 23rd Edition 2017/ 2540 D /2 -58 / IS 3025(Part 17): 1984 (RA 2012) Gravimetric Method

S. No	Parameter Measured	Test Method
7	Alkalinity as CaCO3	APHA 23rd Edition 2017/2320 B / P 2 – 27 Titrimetric Method/IS3025(Part 23): 1986 RA
8	Total Hardness as CaCo3	APHA 23rd Edition 2017 /2340 C / P 2 – 37 EDTA Titrimetric Method/IS 3025(Part 21): 2009 RA
9	Sodium	APHA 23rd Edition 2017/ 3500 Na B / P 3-98 Flame Emission Photometric Method/IS 3025(Part 45): 1993 RA
10	Potassium	APHA 23rd Edition 2017/ 3500 K B / P 3-98 Flame Emission Photometric Method/IS 3025(Part 45): 1993 RA
11	Calcium as Ca	APHA 23rd Edition 2017 3500 Ca B /P 3-65 Calculation Method /IS 3025(Part 40): 1991 RA
12	Magnesium as Mg	IS 3025(Part 46): RA /APHA 23rd Edition 2017 2340 C / P 3-84 Calculation Method
13	Chloride	IS 3025(Part 32): 1988 / APHA 23rd Edition 2017 4500 Cl- B / P 4-70 Argenometric Method
14	Sulphate SO4	APHA 23rd Edition 2017 4500 SO42- E / P 4-188 Turbidity Method/IS 3025(Part 24): 1986 RA
15	Nitrate as NO3	APHA 23rd Edition 2017 4500 NO3 B Ultraviolet Spectro Photometric Screening Method
16	Phosphate	IS 3025 Part 31: 1988 Chapter-12
17	Fluorides as F	APHA23rd Edition F-D: 2017
18	Cyanide	APHA 23rd Edition 2017 4500- CN- E/ P 4-42 Calorimetric Method
19	Arsenic	APHA 23rd Edition 2017 3500- As / P 3-61 Silver Diethyldithiocarbamate Method
20	Boron	APHA 23rd Edition 2017 :4500 BB/P4-23
21	Cadmium	IS 3025 (Part - 41)1991
22	Chromium, total	IS 3025(Part 52) RA / APHA 23rd Edition 2017/3500 Cr / P 3- 67 1,5Diphenylcarbazide Method
23	Copper	APHA 23rd Edition 2017 3500 Cu B/P 3-72 Atomic Absorption Spectrometric Method / IS 3025(Part 42): 1992 RA
24	Iron	APHA 23rd Edition 2017 3500 Fe- B/ P 3-77 1,10 Phenanthroline Method /IS 3025(Part 53): 2003 RA
25	Lead	APHA 23rd Edition 2017 3500 Pb B / P 3 -80 Atomic Absorption Spectrometric Method / IS 3025(Part 47): 1994 RA
26	Manganese	IS 3025(Part 46): RA /APHA 23rd Edition 2017 2340 C / P 3-84Calculation Method
27	Mercury	IS 3025 (Part48):1994 RA 1999
28	Nickel	IS 3025:(Part-54):2003(Reaff 2009)
29	Selenium	IS 3025 Part (56)2003
30	Zinc	APHA 22nd Edition 2017/ 3500 Zn B / P 3 – 106 Atomic Absorption Spectrometric Method/IS 3025(Part 49): 1994 RA
31	Dissolved Oxygen	IS:3025 (Part - 38)1989 (Reaff 2009)
32	BOD at 27Â°C for 3 days	IS:3025 (Part – 58): 2006

S. No	Parameter Measured	Test Method
33	COD	IS:3025 (Part – 44): 1993

Classification of Surface Standard- IS 2296:

Class A – Drinking water without conventional treatment but after disinfection.
Class B – Water for outdoor bathing.
Class C – Drinking water with conventional treatment followed by disinfection.
Class D – Water for fish culture and wildlife propagation.
Class E – Water for irrigation, industrial cooling, and controlled waste disposal

The prevailing status of surface water quality has been assessed during the study period. Surface water sampling Locations and Its results are given in **Table 3-12** and **Table 3-13** respectively. A map showing the surface water monitoring locations is given in**Figure 3-15**.

Table 3-12 Details of Surface water sampling locations

S.No	Water bodies	Location code	Distance from project boundary (~Km)	Direction from project boundary
1	Lake near Govindapuram	SW1	2.96	N
2	Lake near Taradappattu	SW2	3.08	ENE
3	Lake near Viranam	SW3	0.83	ESE
4	Ponnaiyar River D/S	SW4	8.72	SSE
5	Ponnaiyar River U/S	SW5	6.4	S
6	PambanAr/River	SW6	8.56	SSW
7	SathanurDam	SW7	3.6	W
8	Lake near Sattannur	SW8	0.82	WNW

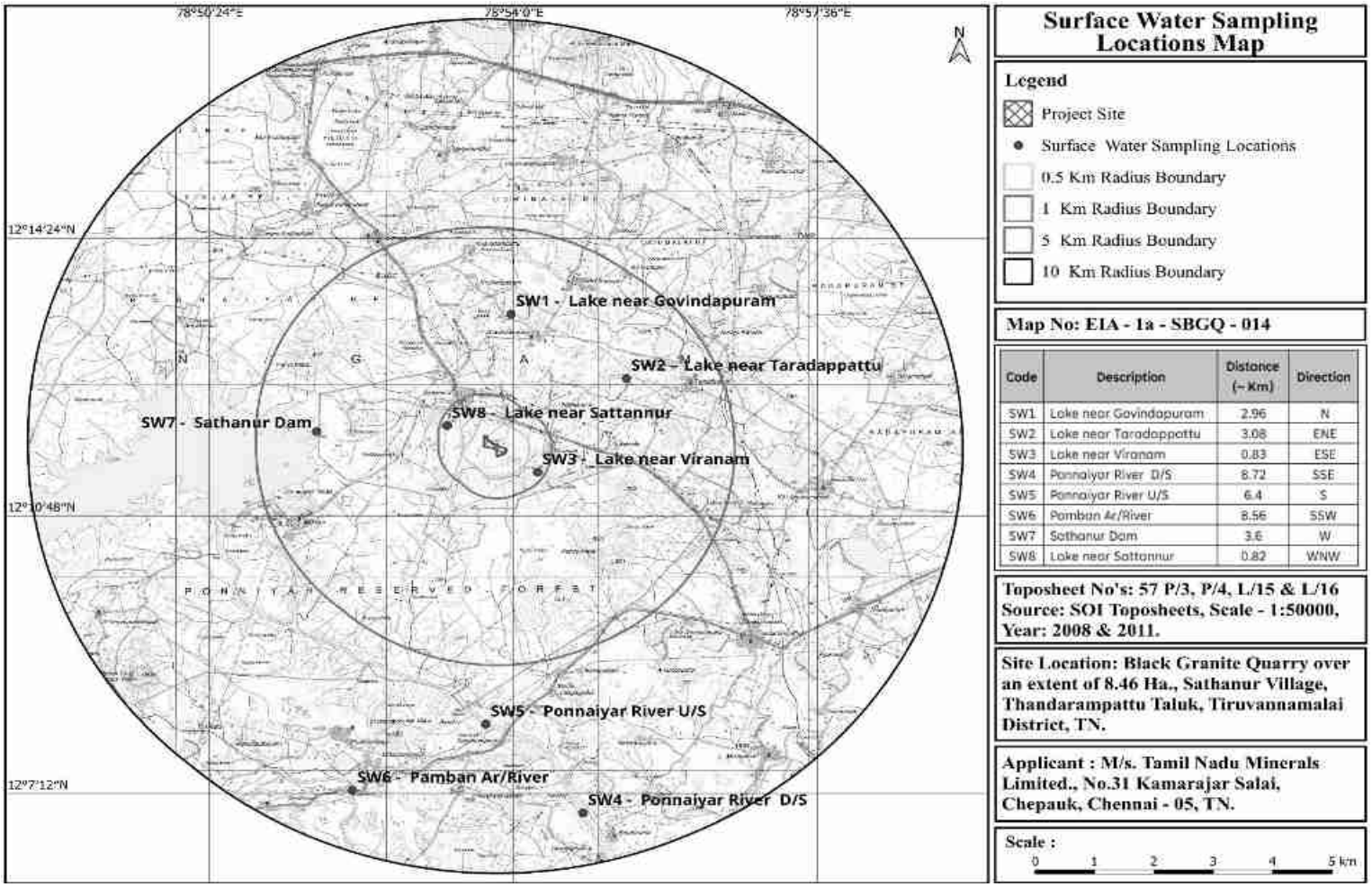


Figure 3-15 Surface water monitoring locations

Table 3-13 Surface water Monitoring Results

S. No	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Lake near Govindapuram	Lake near Taradappattu	Lake near Viranam	Ponnaiyar River D/S	Ponnaiyar River U/S	PambanAr/River	SathanurDam	Lake near Sattannur
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW7	SW8
1	Turbidity	NTU	1	3.2	2.1	1.2	1.1	1.4	2.4	1.3	2.7
2	pH (at 25°C)	--	6.5-8.5	7.71	7.32	7.24	7.42	7.31	7.51	7.21	7.61
3	Electrical Conductivity	µS/cm	-	1086	502	385	815	554	721	635	566
4	Total Dissolved Solids	mg/l	500	690	315	247	526	357	464	402	365
5	Total Suspended Solids	mg/l	-	21.2	14.1	12	11.2	13.5	15.6	12.5	14.9
6	Total Alkalinity as $CaCO_3$	mg/l	-	262.1	119.8	93.9	199.8	135.8	176.4	152.7	138.7
7	Total Hardness as $CaCO_3$	mg/l	300	289.6	132.4	111.2	236.6	160.8	208.9	180.9	164.3
8	Sodium as Na	mg/l	-	120.6	46.8	43.2	91.9	62.5	68.9	52.3	62.6
9	Potassium as K	mg/l	-	30.2	11.7	10.8	23.0	15.6	17.2	13.1	15.7
10	Calcium as Ca	mg/l	-	60.9	28.9	27.3	52.9	27.3	43.3	32.1	30.5
11	Magnesium as Mg	mg/l	-	33.1	14.6	10.7	25.3	22.4	24.3	24.3	21.4
12	Chloride as Cl	mg/l	250	228	88	82	173	118	130	100	120
13	Sulphate as SO_4	mg/l	400	56.9	22.1	20.4	34.7	23.6	32.5	25.1	30.1
14	Nitrate as NO_3	mg/l	20	11.2	3.3	2.8	2.5	3.6	4.8	5.6	4.2
15	Phosphate as PO4	mg/l	-	0.41	0.12	0.1	0.08	0.15	0.36	0.22	0.31
16	Fluorides as F	mg/l	1.5	0.81	0.45	0.32	0.25	0.51	0.38	0.45	0.41
17	Cyanide	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18	Arsenic	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19	Boron as B	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Cadmium as Cd	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

21	Chromium, Total	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Copper as Cu	mg/l	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Iron as Fe	mg/l	0.3	0.61	0.36	0.2	0.11	0.39	0.42	0.19	0.11
24	Lead as Pb	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25	Manganese as Mn	mg/l	0.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Mercury	mg/l	0.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27	Nickel as Ni	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	Selenium as Se	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zinc	mg/l	15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30	Dissolved Oxygen	mg/l	6	4.8	5.1	5.3	6.1	5.4	5	5.1	5.5
31	Chemical Oxygen Demand as O_2	mg/l	-	36.2	32.6	24.5	20.9	28.6	36.1	32.6	28.1
32	BOD, 3 days @ 27°C as O_2	mg/l	2	3.9	1.6	1.3	1.1	1.2	2.9	2.5	1.3

Note: *BDL- Below Detectable Limit*

Interpretations of Results:

The surface water results were compared with IS 2296:1992 standard and in respect of CPCB water Quality Criteria for designated best use. Based on comparison study of test results with Surface water Quantity Standards (Is 2296 Class A), it is interpreted that water qualities of studied locations are classified under Class E, which can be used for irrigation industrial cooling, and controlled waste disposal.

- The pH value ranges from 7.21 to 7.71 and within the limits (6.5 – 8.5) of IS 2296:1992.
- The Electrical Conductivity (EC) of the collected surface water ranges from 385µS/cm to 1086 µS/cm.
- The chloride content in the collected surface water ranges from 82 mg/l to 228 mg/l.
- The sulphate content in the collected surface water sample ranges from 20.4 mg/l to 56.9 mg/l.
- The Total hardness of the collected surface water sample ranges from 111.2 mg/l to 289.6 mg/l.
- COD of the collected surface water sample ranges from 20.9 mg/l to 36.2 mg/l.
- BOD of the collected surface water sample ranges from 1.1 mg/l to 3.9 mg/l.

3.7.3 Ground Water Quality

Total **Eight (08)** ground water monitoring locations were identified for assessment in different villages around the project site. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3-14** and

Table 3-15 respectively. A map showing the groundwater monitoring locations is given in **Figure 3-16**.

Table 3-14 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance (~km) from Project boundary	Azimuth Directions
GW1	Near Project Site	0.01	N
GW2	Kil Karippur	4.76	NE
GW3	Near Taradappattu	3.78	ENE
GW4	Tandrampattu	6.74	SE
GW5	Mottur Olagappadi	5.8	S
GW6	Near Mallikapuram	1.5	SSW
GW7	Sorappanandal	5.09	NNW
GW8	Sattannur	0.83	N

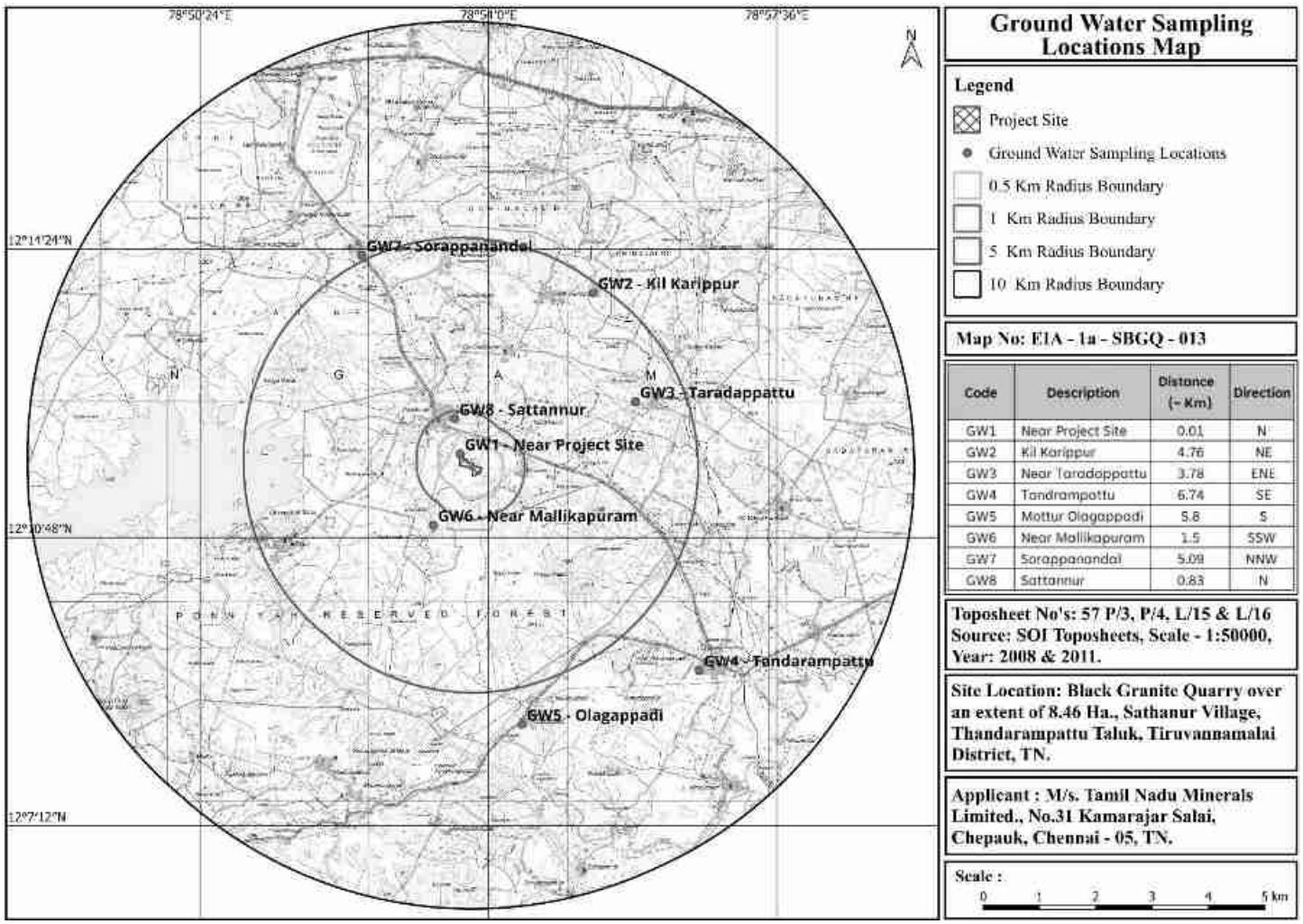


Figure 3-16 Groundwater monitoring locations.

Table 3-15 Ground Water Monitoring Results

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Near Project Site	Kil Karippur	Near Taradappattu	Tandrampattu	MotturOlagappadi	Near Mallikapuram	Sorappanandal	Sattannur
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1	Colour	Hazen	5	15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2	Turbidity	NTU	1	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3	pH	--	6.5-8.5	NR	7.35	7.51	7.45	7.22	7.48	7.65	7.31	7.16
4	Conductivity	µS/cm	-	-	701	910	865	852	925	826	1125	745
5	Total Dissolve Solids	mg/l	500	2000	444	566	554	520	587	539	720	457
6	Total Suspended Solids		-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	Alkalinity as $CaCO_3$	mg/l	200	600	138	175	172	161	182	188	223	160
8	Total Hardness as $CaCO_3$	mg/l	200	600	169	255	210	197	223	226	274	237
9	Sodium as Na	mg/l	-	-	65.8	76.1	82.2	77.1	99.6	88.5	106.8	53.7
10	Potassium as K	mg/l	-	-	16.5	19.0	20.5	19.3	24.9	22.1	26.7	13.4
11	Calcium as Ca	mg/l	75	200	41.7	54.5	46.5	43.3	48.1	49.7	60.9	49.7
12	Magnesium as Mg	mg/l	30	100	15.6	29.2	23.3	21.4	25.3	25.3	29.2	27.2
13	Chloride as Cl	mg/l	250	1000	124	181	155	146	188	167	202	128

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Near Project Site	Kil Karippur	Near Taradappattu	Tandrampattu	MotturOlagappadi	Near Mallikapuram	Sorappanandal	Sattannur
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
14	Sulphate SO_4	mg/l	200	400	31.1	45.3	38.8	36.4	47.0	41.7	50.4	32.0
15	Nitrate as NO_3	mg/l	45	NR	3.2	6.6	6.5	7.1	6.8	5.6	7.5	4.5
16	Phosphate PO4	mg/l	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Fluorides as F	mg/l	1	1.5	0.21	0.43	0.31	0.35	0.4	0.33	0.45	0.24
18	Cyanide	mg/l	0.05	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19	Arsenic as As	mg/l	0.01	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Boron as B	mg/l	0.5	1.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	Cadmium as Cd	mg/l	0.003	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Chromium as Cr	mg/l	0.05	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Copper	mg/l	0.05	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Iron	mg/l	0.3	NR	0.21	0.25	0.18	0.2	0.22	0.19	0.26	0.12
25	Lead	mg/l	0.01	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Manganese as Mn	mg/l	0.1	0.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27	Mercury	mg/l	0.001	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	Nickel as Ni	mg/l	0.02	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Selenium as Se	mg/l	0.01	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30	Zinc as Zn	mg/l	5		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: *BDL- Below Detectable Limit; NR-No Relaxation*

Interpretations of Results:

Physio-chemical characteristics of ground water samples collected from the selected villages during post-monsoon. The Ground water results were compared with drinking water standards (IS 10500:2012).

- The ground water results of the study area indicate that the pH range varies between 7.16 and 7.65. It is observed that the pH range is within the limit of IS 10500:2012.
- The Total Dissolved Solids range varies between 444 mg/l – 720 mg/l for the ground water. All the samples are well within the permissible limit of IS 10500: 2012.
- The acceptable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area ranges between 124 mg/l – 202 mg/l. It is observed that all are well within the permissible limit of IS 10500:2012.
- The desirable limit of the sulphate content is 200 mg/l and permissible limit is 400 mg/l. The sulphate content of the ground water of the study area varies between 31.1 mg/l – 50.4 mg/l. It is observed that all the samples are within the Acceptable Limit and permissible limit of IS 10500: 2012.

Based on comparison study of test results with drinking water standard, it is interpreted that water qualities of studied locations meet with the drinking water standards as per **IS 10500: 2012 Permissible Limit**. These interpretations relate to the sample tested for location only. To prevent ground water contamination and improving the quality and Quantity, rainwater harvesting, and groundwater recharging may be helpful.

3.8 Soil quality

Eight locations in and around the proposed project were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface. Soil analysis was carried out as per IS: 2720 methods. The methodology adopted for each parameter is described in **Table 3-16**. Soil quality monitoring locations & results are given in **Table 3-17** & **Table 3-18.** Map showing the soil monitoring locations is given in **Figure 3-17**.

Table 3-16 Test methods used for the analysis of Soil.

S. No	Parameter Measured	Test Method
1	pH @ 25^{o} C	IS 2720 (Part 26): 1987
2	Electrical conductivity	IS 14767: 2000
3	Nitrogen as N	IS 14684: 1999 / FAO 2007 RA
4	Phosphorus	IS 14684: 1999 RA
5	Potassium	FAO-UN 2007 RA

S. No	Parameter Measured	Test Method
6	Organic Carbon/ Organic Matter	IS 2720 (Part 22): 1972
7	Cation exchange capacity	SOP No. CB/CL/SOP/S- 9 by Calculation Method

Table 3-17 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (Km) w.r.t project site	Direction w.r.t. project site
S1	Near Project Site	0.01	N
S2	Kil Karippur	4.76	NE
S3	Near Taradappattu	3.78	ENE
S4	Tandrampattu	6.74	SE
S5	MotturOlagappadi	5.8	S
S6	Near Mallikapuram	1.5	SSW
S7	Sorappanandal	5.09	NNW
S8	Sattannur	0.83	N

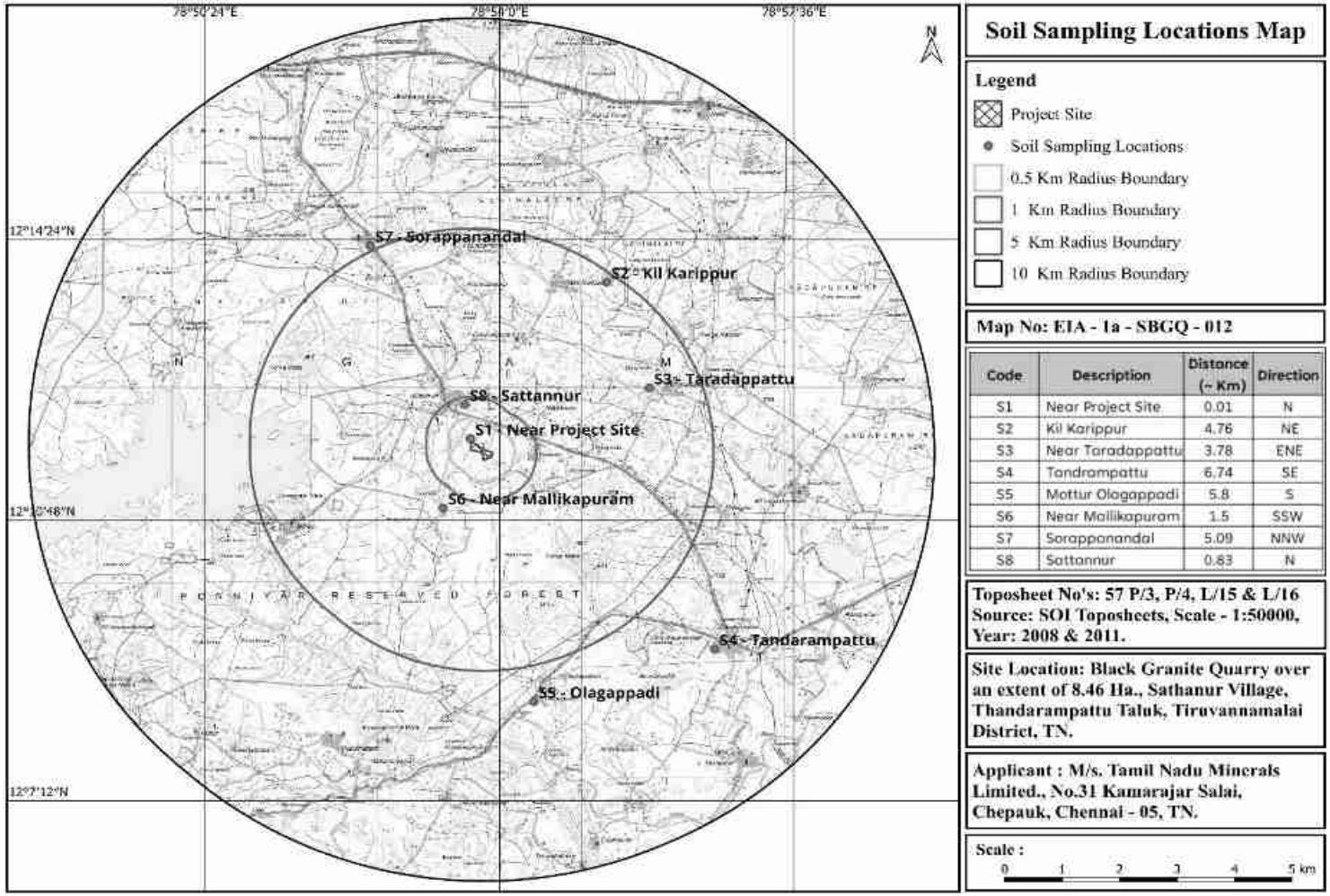


Figure 3-17 Soil monitoring locations.

Table 3-18 Soil & Sediment Quality Monitoring Results

S. No	Parameters	Units	Near Project Site	Kil Karippur	Near Taradappattu	Tandrampattu	MotturOlagappadi	Near Mallikapuram	Sorappanandal	Sattannur
			S1	S2	S3	S4	S5	S6	S7	S8
1	Soil Texture	-	Sandy clay loam	Sandy loam	Sandy clay loam	Sandy loam	Sandy clay loam	Sandy loam	Sandy clay loam	Sandy loam
2	Sand	%	39.8	32.5	55.6	58.1	44.2	24.6	39.5	55.3
3	Silt	%	21.2	44.6	17.2	14.6	19.3	27.2	26.8	30.2
4	Clay	%	39.0	22.9	27.2	27.3	36.5	48.2	33.7	14.5
5	pH	-	7.45	7.81	8.04	7.33	7.65	7.56	7.26	7.58
6	Electrical conductivity	µmhos/cm	242	252	260	236	271	281	328	326
7	Nitrogen as N	Kg/ha	229	262	255	352	279	292	402	285
8	Phosphorus	Kg/ha	176	165	162	192	155	142	198	257
9	Potassium	Kg/ha	192	342	615	541	434	210	342	507
10	Cation Exchange Capacity	meq/100 gm	9.5	1.7	3.6	4.0	8.4	14.3	7.7	11.6
11	Organic Carbon	%	0.145	0.205	0.145	0.222	0.188	0.175	0.366	0.341
12	Organic matter	%	0.250	0.353	0.250	0.383	0.324	0.302	0.631	0.588

The soil characteristics are compared with ICAR (Indian Council of Agricultural research):

S. No	Parameters	Units	Near Project Site	Kil Karippur	Near Taradappattu	Tandrampattu	MotturOlagappadi	Near Mallikapuram	Sorappandal	Sattannur
			S1	S2	S3	S4	S5	S6	S7	S8
1	pH	-	Slightly Alkaline	Moderately Alkaline	Moderately Alkaline	Slightly Alkaline	Slightly Alkaline	Slightly Alkaline	Neutral	Slightly Alkaline
2	Electrical conductivity	µmhos /cm	Average	Average	Average	Average	Average	Average	Average	Average
3	Nitrogen as N	Kg/ha	Better	Better	Better	Sufficient	Better	Better	Sufficient	Better
4	Phosphorus	Kg/ha	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient
5	Potassium	Kg/ha	Medium	Better	More Than Sufficient	More Than Sufficient	More Than Sufficient	Medium	Better	More Than Sufficient

Interpretations of Results:

Summary of analytical results

- The pH of the soil samples ranged from 7.26 to 8.04 Indicating that the soils are slightly acidic to moderately alkaline in nature.
- Conductivity of the soil samples ranged from 236 µmhos/cm to 328 µmhos/cm.
- Nitrogen content ranged from 229 kg/ha to 402 kg/ha.
- Phosphorous ranged from 142 kg/ha to 257 kg/ha.
- Potassium content ranges from 192 kg/ha to 615 kg/ha.

3.9 Biological Environment

3.9.1 Ecological Environment

3.9.1.1 Introduction

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 undertaking appropriate action to mitigate the impact, if any. The biological study was undertaken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measures for maintaining its health. Secondary source information was conducted to study the flora & fauna in the 10km radius. Some of the information was gathered from the local habitants. The entire secondary data were classified to interpret the impact of pollution on the flora and fauna of that region. A survey of the wild plants as well as cultivated crop plants was conducted, and all the available information was recorded.

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

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

Methodology

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

3.9.1.2 Flora Assessment

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

3.9.1.3 Fauna Assessment

Secondary information collected from published government data etc. List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.

Emphasis is given to identifying available fauna 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.

Floristic composition within the study area

For secondary information based on a total species found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3-19**. Sathanur reservoir was created in 1957 on the River Ponniar at Sathanur Village in Tiruvannamalai Sambuvarayar district (12° 12'N). It covers 2010 Ha at the FRL of 222.2 m. The reservoir has a capacity of 228.91 million m^3 at full level and a mean depth of 11.4 m. Shore and volume development indices are favourable for productivity. The reservoir supports agricultural practices and Ponniyar Reserved Forest covers the region.

3.9.1.4 List of Flora

For secondary information based on a total 136 species under different family found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3-19.**

Table 3-19 Checklist of floral diversity in and around the area

Flora of PIA					
S.No.	**Scientific Name**	**Common Name**	**Vernacular Name**	**Occurrence**	**IUCN Status**
Trees					
1	*Albizia saman*	Rain tree	Amaivagai	Native	LC
2	*Areca catechu*	Betel palm	Ataikkay	Native	LC
3	*Artocarpus heterophyllus*	Jackfruit tree	Pala Maram	Native	LC
4	*Azadirachta indica*	Neem	Veppai	Native	LC
5	*Bauhinia purpurea*	Orchid tree	Nilattiruvatti	Native	LC
6	*Borassus flabellifer*	Palm tree	Panaimaram	Native	LC
7	*Callistemon speciosus*	Bottle brush	Palasu	Invasive	LC
8	*Carica papaya*	Papaya tree	Pappali	Native	LC
9	*Caryotaurens*	Fishtail palm	Kontalpanai	Native	LC
10	*Cassia auriculata*	Matura tea tree	Avaram	Native	LC
11	*Citrus limon*	Lemon	elumichai	Native	LC
12	*Cocos nucifera*	Coconut tree	Tennai	Native	LC
13	*Cordia dichotoma*	Fragrant manjack	Naruvili	Invasive	LC
14	*Cordia sebestena*	Geiger tree	Achinaruvili	Invasive	LC
15	*Cupressus macrocarpa*	Monterey cypress	-	Invasive	LC
16	*Delonix regia*	Flame of forest	Mayil kondrai	Native	LC
17	*Dracaena marginata*	Dragon tree	-	Native	LC
18	*Eucalyptus globulus*	Southern blue gum	Karpuramaram	Native	LC
19	*Ficus benghalensis*	Indian Banyan	Alamaram	Native	LC
20	*Ficus benjamina*	Indian fig	nintamaravakai	Native	LC
21	*Ficus elastica*	Rubber fig	-	Native	LC
22	*Ficus racemosa*	Cluster fig	Athi	Native	LC

23	*Lagerstroemia indica*	Common crape myrtle	Pavalakkurinji	Native	LC
24	*Leucaena leucocephala*	Whitelead tree	Periya-takarai	Native	LC
25	*Madhuca longifolia*	Butter tree	Iluppai	Native	LC
26	*Mangifera indica*	Mango	Maamaram	Native	LC
27	*Manilkara zapota*	Sapota	chimaiyiluppai	Native	LC
28	*Melia azedarach*	Indian lilac	Kattuvembhu	Native	LC
29	*Millingtonia hortensis*	Tree jasmine	Maramalli	Native	LC
30	*Mimusopselengi*	Medlar tree	Magizhamboo	Native	LC
31	*Morindapubescens*	Indian Mulberry	Mannanunai	Native	LC
32	*Moringa oleifera*	Drumstick tree	Murungai	Native	LC
33	*Muntingiacalabura*	Singapore cherry	Ten pazham	Native	LC
34	*Peltophorumpterocarpum*	Copper pod	Perungkonrai	Native	LC
35	*Phoenix sylvestris*	Sugar date palm	icham	Native	LC
36	*Pithecellobium dulce*	Manila tamarind	Kodukkappuli	Native	LC
37	*Polyalthia longifolia*	False Asoka	Vansulam	Native	LC
38	*Pongamia pinnata*	Indian beech	Nattamalam	Native	LC
39	*Ptychosperma elegans*	Solitaire palm	-	Native	LC
40	*Ravenalamadagascariensis*	Traveller's palm	Visirivazhai	Native	LC
41	*Roystonea regia*	Cuban royal palm	-	Native	LC
42	*Saracaasoca*	Ashoka tree	Ashogamaram	Native	LC
43	*Sterculia foetida*	Java olive tree	Kutiraippitukku	Native	LC
44	*Stereospermumtetragonum*	Yellow snake tree	Punkali	Native	LC
45	*Syzygiumcumini*	Java plum	Nagai	Native	LC
46	*Terminalia cattappa*	Badam tree	Nattuvadumai	Native	LC
47	*Thespesia populnea*	Portia tree	Poovarasu	Native	LC
Shrubs					
48	*Allamanda cathartica*	Golden trumpet	Allamanda	Invasive	LC
49	*Alpinia galangal*	Galangal	Perarathai	Native	LC
50	*Bougainvillea spectabilis*	Great bougainvillea	Kaakitha poo	Native	LC
51	*Caesalpinia pulcherrima*	Peacock flower	Mayilkonrai	Native	LC
52	*Calotropis gigantea*	Calotrope	Erukku	Native	LC
53	*Cestrum diurnum*	Day jasmine	-	Native	LC
54	*Cestrum nocturnum*	Night blooming jasmine	Pavazhamalli	Native	LC
55	*Datura metel*	Devil's trumpet	Karu oomathai	Native	LC
56	*Durantaerecta*	Golden dew drop	Aagayapoo	Native	LC
57	*Ecliptaprostrata*	False daisy	Karisilanganni	Native	LC
58	*Euonymus japonicus*	Japanese spindle	-	Invasive	LC
59	*Euphorbia tithymaloides*	Redbird flower	Kannadikalli	Invasive	LC
60	*Ficus elastica*	Rubber fig	Seemaiaalai	Native	LC
61	*Hamelia patens*	Fire bush	Theepudhar	Native	LC
62	*Hibiscus Rosa sinensis*	Indian Hibiscus	Cembarutti	Native	LC
63	*Ixora coccinea*	Ixora	Vedchi	Native	LC

64	*Jasminum arborescens*	Navamallika	Kattumalligai	Native	LC
65	*Jasminum auriculatum*	Juhi	Uccimalligai	Native	LC
66	*Jasminum officinale*	Common jasmine	Jathi malli	Native	LC
67	*Jasminum polyanthum*	Pink Jasmine	Thalavam	Native	LC
68	*Jasminum sambac*	Arabian jasmine	Gundu malli	Native	LC
69	*Nerium oleander*	Nerium	Arali	Native	LC
70	*Piper longum*	Indian long pepper	Tippili	Native	LC
71	*Plectranthusamboinicus*	Indian borage	Karpuravalli	Native	LC
72	*Plumeria obtusa*	Singapore graveyard flower	Ponnalari	Native	LC
73	*Plumeria rubra*	Temple tree	Sampangi	Native	LC
74	*Pseuderanthemumcarruthersii*	Carruther's false face	-	Native	LC
75	*Punica granatum*	Pomegranate	madulai	Native	LC
76	*Symphoricarpos orbiculatus*	Coral berry	-	Native	LC
77	*Tecoma capensis*	Cape honey suckle	Velai	Invasive	LC
78	*Tecoma stans*	Trumpet bush	Sonnapatti	Invasive	LC
79	*Valeriana officinalis*	Garden heliotrope	Catamaci	Invasive	LC
80	*Volkameriainermis*	The glory bower	Sangam	Invasive	LC
Herbs					
81	*Acalypha indica*	Indian Acalypha	Kolippuntu	Native	LC
82	*Acalypha wilkesiana*	Copper leaf	Kuppaimeni	Native	LC
83	*Achyranthes aspera*	Chaff flower	Nayuruvi	Native	LC
84	*Allmanianodiflora*	Node flower	Kumattikkirai	Native	LC
85	*Aloe vera*	Indian aloe	Kattralai	Native	LC
86	*Alternanthera sessilis*	Sessile joyweed	Ponnankanni	Native	LC
87	*Amaranthus viridis*	Green amaranth	Kuppaikeerai	Native	LC
88	*Andrographis paniculata*	Green chiretta	Nilavempu	Native	LC
89	*Apludamutica*	Mauritian grass	Moongilpillu	Native	LC
90	*Aristida setacea*	Broom grass	Thudappampillu	Native	LC
91	*Bambusa bamboo*	Bamboo	Moongil	Native	LC
92	*Basella alba*	Indian spinach	Vasalakkirai	Native	LC
93	*Calliandra tergemina*	Powder puff	-	Native	LC
94	*Canna indica*	Indian shot	Kattuvalai	Native	LC
95	*Catharanthus pusillus*	Tiny periwinkle	Chetthai	Native	LC
96	*Catharanthus roseus*	Pink periwinkle	Nithyakalyani	Native	LC
97	*Centella asiatica*	Indian pennywort	Matanti	Native	LC
98	*Chloris barbata*	Swollen finger grass	Cevvarakumpul	Native	LC
99	*Cleome viscosa*	Tick weed	Naikaduku	Native	LC
100	*Cyanodondactylon*	Bermuda grass	Arugam pillu	Native	LC
101	*Cyperus rotundus*	Nut grass	Korai pillu	Native	LC
102	*Dactylocteniumaegyptium*	Egyptian grass	Kavarapillu	Native	LC

103	*Euphorbia heterophylla*	Japanese poinsettia	Paal perukki	Invasive	LC
104	*Gardenia jasminoides*	Cape Jasmine	Parijatham	Native	LC
105	*Hemigraphiscolorata*	Red Ivy	Vadaikutti	Native	LC
106	*Heteropogoncontortus*	Spear grass	Oosipillu	Native	LC
107	*Hymenocallis littoralis*	Beach spider lily	-	Native	LC
108	*Kalanchoe pinnata*	Air plant	Runakkali	Native	LC
109	*Leucas aspera*	Common leucas	Thumbai	Native	LC
110	*Mimosa pudica*	Touch me not plant	Thottaccurungi	Native	LC
111	*Mollugo nudicaulis*	Naked stem carpet weed	Parpadagam	Native	LC
112	*Musa paradisiaca*	Banana	Vaazhai	Native	LC
113	*Ocimumgratissimum*	Clove basil	Vanatulasi	Native	LC
114	*Ocimumtenuiflorum*	Tulsi	Karuntulasi	Native	LC
115	*Phyllanthus amarus*	Gale of the wind	Kilhkainelli	Native	LC
116	*Phyllanthus virgatus*	Seed under leaf	Patar nelli	Native	LC
117	*Portulaca grandiflora*	Moss rose	Pattu rose	Native	LC
118	*Solanum nigrum*	Black nightshade	Manathakkali	Native	LC
119	*Solanum trilobatum*	Pea Eggplant	Thuthuvalai	Native	LC
120	*Sphagneticolatrilobata*	Chinese wedelia	Manjalkarilamkanni	Native	LC
121	*Stylosantheshamata*	Caribbean stylo	-	Native	LC
122	*Tephrosia purpurea*	Wild indico	kavali	Native	LC
123	*Tradescantia spathacea*	Boat lily	-	Native	LC
124	*Trichodesma indicum*	Indian borage	Kavizhthumbai	Native	LC
Climbers/Creepers					
125	*Asparagus racemosus*	Satamuli	Shatavari	Native	LC
126	*Cardiospermum halicacabum*	Balloon plant	Mudakithan	Native	LC
127	*Cayratiapedata*	Birdfoot Grape vine	Panni kodi	Native	LC
128	*Cissus quandrangularis*	Veld grape	Pirandai	Native	LC
129	*Cissus vitiginea*	South indiantreebine	Mutainari	Native	LC
130	*Coccinia grandis*	Ivy gourd	Kovai	Native	LC
131	*Cucumis melo*	Muskmelon	Thumattikai	Native	LC
132	*Dioscorea tomentosa*	Five leaf yam	Noora kizhangu	Native	LC
133	*Evolvolusalsinoides*	Dwarf morning glory	-	Native	LC
134	*Hemidesmus indicus*	Indian sarsaparilla	Nannari	Native	LC
135	*Passiflora foetida*	Bush passion fruit	Siruppunaikkali	Invasive	LC
136	*Tylophora indica*	Indian Ipecac	Avaci	Native	LC

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature, WPA-1972 (wildlife Protection Act - 1972).

Source:

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

- Nair, N.C. and A.N. Henry. 1983. Flora of Tamil Nadu, India.Series 1, Vol. 1, Botanical Survey of India, Southern Circle, Coimbatore. 1-184.
- Henry, A.N., Kumari, G.R. and Chitra, V. (1987) Flora of Tamil Nadu India. Series 1: Analysis. Vol. 2, Botanical Survey of India, Coimbatore.
- Hooker J.D. 1872-1897. Flora of British India. (Vol. 1-7), Ashford: Reeve and Company. 5568 p.
- Henry, A.N., Chithra, V.N. and Balakrishnan, P. (1989) Flora of Tamil Nadu India. Series 1: Analysis. Vol. III. Botanical Survey of India, Coimbatore.
- Treepedia Tamil Nadu: https://www.tntreepedia.com/tree-location/

3.9.1.5 Fauna Diversity

Fauna diversities were collected from secondary information and cross check with relevant literatures (Smith 1933-43, Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar 1988). The nearbyPonniyarReserved Forest was considered while documenting the faunal diversity in the region.

3.9.1.6 Birds' species

A total of 57 species belonging different families have been identified from Agricultural and nearby forest area. A comparative chart of the total number of bird species belonging to different families along with their feeding preference and abundance are provided in **Table 3-20**.

Table 3-20 Birds from the study site

S. No	*Scientific name*	Common name	IUCN status	Nativity	WPA 1972
1	*Acridotheres tristis*	Common myna	LC	Native	-
2	*Aerodramus unicolor*	Indian Swiftlet	LC	Native	-
3	*Alcedo atthis*	Common Kingfisher	LC	Native	-
4	*Amaurornisphoenicurus*	white-breasted waterhen	LC	Native	-
5	*Anastomusoscitans*	Asian openbill stork	LC	Native	-
6	*Ardeolagrayii*	Pond Heron	LC	Native	-
7	*Athene brama*	Spotted owlet	LC	Native	-
8	*Bubo bengalensis*	Indian eagle-owl	LC	Native	-
9	*Bubulcus ibis*	Cattle Egret	LC	Native	-
10	*Caprimulgus indicus*	Jungle Nightjar	LC	Native	-
11	*Centropus sinensis*	Greater coucal	LC	Native	-
12	*Cerylerudis*	Pied kingfisher	LC	Native	-
13	*Charadrius hiaticula*	Common ringed plover	LC	Native	-
14	*Chrysommasinense*	Yellow-Eyed Babbler	LC	Native	-
15	*Cinnyris asiaticus*	Purple sunbird	LC	Native	-
16	*Clamatorcoromandus*	Red-Winged	LC	Native	-
17	*Clamatorjacobinus*	Pied Cuckoo	LC	Native	-

18	*Columba livia*	Blue rock pigeon	LC	Native	Sch - IV
19	*Copsychussaularis*	Magpie-robin	LC	Native	-
20	*Corvus splendens*	Hose crow	LC	Native	-
21	*Cuculuscanorus*	Common cuckoo	LC	Native	-
22	*Cuculusmicropterus*	Indian Cuckoo	LC	Native	-
23	*Dendrocittavagabunda*	rufous treepie	LC	Native	-
24	*Dicrurus macrocercus*	Black drongo	LC	Native	-
25	*Duculaaenea*	Green Imperial Pigeon	NT	Native	-
26	*Egrettagarzetta*	Little Egret	LC	Native	-
27	*Eudynamysscolopaceus*	Koel	LC	Native	-
28	*Falco tinnunculus*	Common Kestral	LC	Native	-
29	*Francolinuspondicerianus*	Grey francolin	LC	Native	-
30	*Fulica arta*	Common coot	LC	Native	-
31	*Gallicrex cinerea*	Watercock	LC	Native	-
32	*Glareolapratincola*	Collared Pratincole	LC	Native	-
33	*Haliasturindus*	Brahminy kite	LC	Native	-
34	*Leptocomazeylonica*	Sunbird	LC	Native	-
35	*Lonchura Malacca*	Black headed munia	LC	Native	-
36	*Lonchurapunctulata*	Scaly breasted munia	LC	Native	-
37	*Lonchura striata*	White rumped munia	LC	Native	-
38	*Megalaimahaemacephala*	Copper smith barbet	LC	Native	-
39	*Megalaima zeylanica*	Brown headed barbet	LC	Native	-
40	*Meropsorientalis*	Green bee eater	LC	Native	-
41	*Meropsphilippinus*	Blue-tailed bee-eater	LC	Native	-
42	*Microcarboniger*	Little Cormorant	NA	Native	-
43	*Milvus migrans*	Black kite	LC	Native	-
44	*Orthotomussutorius*	Common tailorbird	LC	Native	-
45	*Phaethon lepturus*	White-Tailed Tropicbird	LC	Native	-
46	*Phalacrocorax carbo*	Great Cormorant	NA	Native	-
47	*Phalacrocorax fuscicollis*	Indian Cormorant	LC	Native	-
48	*Phalacrocorax niger*	Little cormorant	LC	Native	
49	*Podiceps nigricollis*	Eared grebe	LC	Native	
50	*Porphyriopoliocephalus*	Grey-Headed Swamphen	LC	Native	-
51	*Psittaculakrameri*	Rose ringed parakeet	LC	Native	-
52	*Rallinaeurizonoides*	Slaty-Legged Crake	NA	Native	-
53	*Sturniapagodarum*	Brahminy starling	LC	Native	-
54	*Tachybaptus ruficollis*	Dabchick	LC	Native	-
55	*Turdoidesaffinis*	Yellow-billed Babbler	LC	Native	
56	*Turnixtanki*	Yellow-Legged Buttonquail	LC	Native	-
57	*Vanellus indicus*	Red wattled lapwing	LC	Native	-

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature, WPA-1972 (wildlife Protection Act - 1972).

3.9.1.7 Mammals:

The presence of mammals in the project influence area is documented based on secondary information.

Table 3-21Mammals recorded from the secondary Survey in the Study area and their Conservation Status

S.No	Species name	Family	Common name	IUCN Conservation Status	Schedule WPA1972
1	Canis aureus	Canidae	Naree	LC	-
2	*Felis chaus*	Felidae	Kaattupoonai	LC	-
3	*Funambulus pennanti*	Sciuridae	Anil	LC	-
4	*Bandicotabenghalensis*	Muridae	Varappu Eli	LC	-
5	*Cynopterus sphinx*	Pteropodidae	Nari mookuVavval	LC	-
6	*Macaca radiata*	Cercopithecidae	kurangu	LC	-
7	*Herpetesedwardsi*	Herpestidae	Keeri Pillai	LC	-
8	*Sus scrofa cristatus*	Suidae	KattuPandri	LC	-
9	*Axis axis*	Cervidae	Pulli Maan	LC	-

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature. WPA-1972 (wildlife Protection Act - 1972).

3.9.1.8 Reptiles & Amphibians

Reptiles and amphibian species were prepared with secondary information sourced from publications.

Table 3-22 Reptiles & Amphibians recorded from the Primary Survey in the Study area and their Conservation Status

S.No.	Scientific name	Common name	IUCN Status	WPA 1972
Reptiles				
1	*Hemidactylus sp.*	House lizard	LC	-
2	*Eutropismacularia*	Common skink	LC	-
3	*Ophisopsleschenault*	Snake-eyed lizard	LC	-
4	*Calotesversicolar*	Garden lizard	LC	-
5	*Naja naja*	Nalla Pambu	LC	Sch II (Part II)
6	*Ptyas mucosa*	SaaraiPambu	LC	-
7	*Ophiophagus hannah*	King Cobra	VU	Sch II (Part II)
8	*Varanus bengalensis*	Common Indian Monitor	LC	-
Amphibians				
1	*Rana tigrina*	Common yellow frog	LC	-
2	*Rana hexadactyla*	Indian Green frog	LC	-
4	*Oziotelphusaravi*	Field Crab	LC	-
5	*Nerodiasipedon*	ThanniPambu	LC	
6	*Lissemys punctata*	Indian Flapshell Turtle	LC	-

3.9.1.9 Butterfly Species

Butterflies 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. They participate in most of the ecological processes that sustain ecosystems. A total of 35 species belonging to five families of butterflies were recorded.

Table 3-23 Occurrence of butterfly species in buffer zone

S. No	Scientific Name	Family	Common Name
1	*Ariadne merione*	Nymphalidae	Common Caster
2	*Atrophaneuraaristolochiae*	Paplionidae	Common Rose
3	*Acraea terpsicore*	Nymphalidae	Tawny coster
4	*Anthenelycaenina*	Polyommatinae	Pointed Ciliate Blue
5	*Athymaperius*	Nymphalidae	Common Sergeant
6	*Belenoisaurota*	Pieridae	Pioneer
7	*Euremaandersonii*	Pieridae	One-spotgrass yellow
8	*Ceporanerissadapha*	Pieridae	Common gull
9	*Catopsiliapomona*	Pieridae	Common Emigrant
10	*Catopsiliapyranthe*	Pieridae	Mottled Emigrant
11	*Cupithapurreea*	Hesperiidae	Wax Dart
12	*Colotisetrida*	Pieridae	Small Orange Tip
13	*Curetis spp*	Curetinae	Indian Sunbeam
14	*Danaus chrysippus*	Nymphalidae	Plain Tiger
15	*Danaus genutia*	Nymphalidae	Striped Tiger
16	*Deudorixepijarbas*	Theclinae	Cornelian
17	*Euremahecabe*	Pieridae	Common Grass Yellow
18	*Graphiumteredon*	Papilionidae	Southern Bluebottle
19	*Graphiumdoson*	Papilionidae	Narrow-banded Bluebottle
20	*Hypolimnasbolina*	Nymphalidae	Great Egg Fly
21	*Hypolimnasmisippus*	Nymphalidae	Danaid Egg Fly
22	*Junoniaalmana*	Nymphalidae	Peacock Pansy
23	*Junoniahierta*	Nymphalidae	Yellow Pansy
24	*Junonialemonias*	Nymphalidae	Lemon Pansy
25	*Junoniaorithya*	Nymphalidae	Blue Pansy
26	*Leptosianina*	Pieridae	Psyche
27	*Mycalesisperseus*	Nymphalidae	Common Bush Brown
28	*Neptishylas*	Nymphalidae	Common Sailer
29	*Neptis nata hampsoni*	Nymphalidae	Sullied Sailer
30	*Phalantaphalantha*	Nymphalidae	Common Leopard
31	*Pachlioptaaristolochiae*	Papilionidae	Common Rose
32	*Pachlioptapandiyana*	Papilionidae	Malabar Rose
33	*Sarangesapurendra Moore*	Pyrginae	Spotted Small Flat

34	*Troidesminos*	Papilionidae	Southern Birdwing
35	*Ypthimaasterope*	Nymphalidae	Common Three-ring

Source:

- List of Birds: Ali, S. (2002). The Book of Indian Birds (13th Revised Edition). Oxford University Press, New Delhi, 326pp.
- List of Butterflies: Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, 2008, 497.
- Evans WH. Identification of Indian butterflies. The Bombay Natural History Society, Bombay, 1927, 32.
- List of Mammals: Kamalakannan, M.& P.O.Nameer (2019). A checklist of mammals of Tamil Nadu, India. Journal of Threatened Taxa 11(8): 13992–14009; https://doi.org/10.11609/jott.4705.11.8.13992–14009.
- List of Reptiles: Aengals, R., Sathish Kumar, V.M., Palot, M.J. & Ganesh, S.R. (2018). A Checklist of Reptiles of India. 35 pp. Version 3.0. Online publication is available at www.zsi.gov.in (Last update: May 2018).
- S. S. Mishra, Laishram Kosygin, P. T. Rajan and K. C. Gopi, Zoological Survey of India in Venkataraman, K., Chattopadhyay, A. and Subramanian, K.A. (editors). 2013. Endemic Animals of India(vertebrates): 1–235+26 Plates. (Published by the director, Zoological Survey of india, Kolkata).
- Indian Reptiles, Amphibians and Insects in CITES Appendices. Maheshwar Hegde, S. Bhupathy*, K. R. Sasidharan, T. P. Raghunath and N. Krishnakumar Institute of Forest Genetics and Tree Breeding, R.S. Puram, Coimbatore-2

3.9.1.10 Fish Diversity presence.

The study area transverse agricultural land, open shrub land, rivers etc. that support the presence of fish diversity. Fish in the area and their presence were reported with the help of secondary sources and from the literature available.

Table 3-24 Occurrence of fish in buffer zone

S. No	Scientific name	Family	Common name	Occurrence	IUCN status
1	*Oreochromis niloticus*	Cichlidae	Jilappi	Native	LC
2	*Labeoboga*	Cyprinidae	Kendai	Native	LC
3	*Tamarixmacrochir*	Cichlidae	Greenhead tilapia	Native	LC
4	*Channa marulius*	Channidae	Giant snakehead	Native	LC
5	*Oreochromis mossambicus*	Cichlidae	Tilapia	Native	LC
6	ChanosChanos	Cichlidae	Madavai	Native	LC
7	Cirrhinamrigala	Cyprinidae	Kendai	Native	LC
8	*Catlacatla*	Cyprinidae	katla	Native	LC
9	*Labeorohita*	Cyprinidae	Roghu	Native	LC
10	Hypselobarbusperiyarensis	Cyprinidae	Periyar Barb	Native	LC
11	Hypselobarbuspulchellus	Cyprinidae	Jerdon's carp	Endemic	CR
12	Karalla dussumieri	Leiognathidae	Vari Kare	Native	LC
13	Arius maculatus	Ariidae	keluthi	Native	LC
14	Barbodescarnaticus	Cyprinidae	Cauvery kendai	Native	LC
15	Chanda nama	Ambassidae	Kakkachee	Native	LC
16	Channa marulius	Channidae	Iru viral	Native	LC
17	Channa striata	Channidae	Viral wrahl	Native	LC
18	Cirrhinuscirrhosus	Cyprinidae	Ven Kendai	Native	LC
19	Ctenopharyngodonidella	Xenocyprididae	Pullukendai	Native	LC

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature. WPA-1972 (wildlife Protection Act - 1972).

Source:

- Tamil Nadu Reservoirs: https://www.fao.org/3/v5930e/V5930E03.htm
- S. S. Mishra, Laishram Kosygin, P. T. Rajan and K. C. Gopi, Zoological Survey of India in Venkataraman, K., Chattopadhyay, A. and Subramanian, K.A. (editors). 2013. Endemic Animals of India(vertebrates): 1–235+26 Plates. (Published by the director, Zoological Survey of India, Kolkata)
- Talwar, P.K. and A.G. Jhingran 1991 Inland fishes of India and adjacent countries. vol 1. A.A. Balkema, Rotterdam. 541 p.

3.10 Socio Economic Profile

3.10.1 Demographic details

In 2011, Tiruvannamalai had population of 2,464,875 of which male and female were 1,235,889 and 1,228,986 respectively. In 2001 census, Tiruvannamalai had a population of 2,186,125 of which males were 1,095,859 and remaining 1,090,266 were females.

Source: https://www.census2011.co.in/census/district/26-tiruvannamalai.html

3.10.2 Population Density

The initial provisional data released by census India 2011, shows that density of Tiruvannamalai district for 2011 is 398 people per sq. km. In 2001, Tiruvannamalai district density was at 353 people per sq. km. Tiruvannamalai district administers 6,188 square kilometers of areas.

Source: https://www.census2011.co.in/census/district/26-tiruvannamalai.html

3.10.3 Sex Ratio

With regards to Sex Ratio in Tiruvannamalai, it stood at 994 per 1000 male compared to 2001 census figure of 995. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 930 girls per 1000 boys compared to figure of 948 girls per 1000 boys of 2001 census data.

Source: https://www.census2011.co.in/census/district/26-tiruvannamalai.html

Scheduled Castes and Scheduled Tribes

The Scheduled Castes (SCs) population in Tiruvannamalai district was 21.4 per cent in 2001 census which has now increased to 22.9 per cent in 2011 census. The rural-urban composition of SCs was 25.1 per cent and 14.4 per cent respectively in 2011 census. The Scheduled Tribes population in the district was 3.3 per cent in 2001 census and returned with a marginal increase to 3.7 per cent in 2011 census.

Source : DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI

3.10.4 Socio Economic Aspects

A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status in the study area. The study provides information such as demographic structure, population dynamics, infrastructure resources, and the status of human health and economic attributes like employment, per-capita income, agriculture, trade, and industrial development in the study area. The study of these characteristics helps in identification, prediction, and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. Socio economic Indicators of Tiruvannamalai District is given in **Table 3-25.**

Table 3-25 Social Indicators ofTiruvannamalai District

S. No	Social Indicators	Tiruvannamalai District
1	Decadal variation %	12.75
2	Urban population %	20.08
3	Population density (Persons per square Km)	398
4	Scheduled caste population %	22.94
5	Scheduled tribe population %	3.69
6	Literacy rate %	74.21
7	Work Participation rate %	50.23

Source : *DH_2011_3305_PART_A_DCHB_TIRUVANNAMALAI*

3.10.5 Education & Literacy

Average literacy rate of Tiruvannamalai in 2011 was 74.21 compared to 74.21 of 2001. If things are looked out at gender wise, male and female literacy were 83.11 and 65.32 respectively. For the 2001 census, same figures stood at 79.17 and 55.63 in Tiruvannamalai District. Total literate in Tiruvannamalai District were 1,626,813 of which male and female were 909,803 and 717,010 respectively. In 2001, Tiruvannamalai District had 1,297,151 in its district.

Source :*https://www.census2011.co.in/census/district/26-tiruvannamalai.html*

Table 3-26 Education Infrastructures in theTiruvannamalai District

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
Primary	1439	660	1307	401
Primary + Upper Primary	460	84	410	44
Primary + Upper Primary + Secondary + Higher Secondary	13	122	5	52
Upper Primary only	5	0	5	0
Upper Primary + Secondary + Higher Secondary	133	28	123	20
Primary + Upper Primary + Secondary	5	50	3	43
Upper Primary + Secondary	202	18	197	14

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

3.10.6 Social Economic Profile of the study area

Table 3-26 provides the details on population profile within study area. Table 3-28show the socio-economic indicator within the study area.

Table 3-27 Population profile within study area

Name	Household	Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0-5km							
Sathanoor	162	687	344	343	63	397	0
Kolundampattu	794	3177	1574	1603	367	1237	158
Veeranam	560	2432	1220	1212	314	1143	25
Tharadapattu	928	4086	2028	2058	494	1708	874
Kilkaripoor	285	1371	726	645	177	482	21
Melkaripur	628	2479	1267	1212	275	887	0
Tharadapattu	928	4086	2028	2058	494	1708	874
Total	**4285**	**18318**	**9187**	**9131**	**2184**	**7562**	**1952**
5-10km							
Puthur	815	3362	1640	1722	331	594	3
Palayam	1153	4901	2432	2469	608	1554	8
Vanakkambadi (THEN)	284	1106	574	532	120	347	1
Vanakkambadi (VADA)	269	1074	532	542	112	508	14
Nallur	1505	5976	3049	2927	629	514	127
Mudur	268	1126	576	550	105	392	52
Pakkiripalayam	1667	7035	3599	3436	925	1270	117
Eraiyur	963	4089	2077	2012	529	1126	0
Ariyakunjur	197	811	406	405	75	480	54
Melpennathur	792	3405	1767	1638	452	1287	0
Vinnavanur	477	1926	973	953	232	870	0
Kannakurkkai	733	2998	1550	1448	389	914	0
Veppurchekkadi	503	2210	1148	1062	308	258	35
Kanakkandal	371	1529	792	737	219	129	226

Nedungavadi	223	908	447	461	109	266	0
Radhapuram	1154	5229	2582	2647	677	1013	86
Olagalapadi	351	1398	710	688	160	332	92
Melamanjanoor	1079	4732	2383	2349	605	861	54
Edathanur	714	2819	1398	1421	339	788	0
Radhapuram RF	2	10	6	4	1	0	0
Periyakilambadi	272	1119	574	545	115	54	4
Sorappanandal	74	351	178	173	58	154	0
Thandarampatti	1901	8034	3986	4048	900	2651	925
Total	**15767**	**66148**	**33379**	**32769**	**7998**	**16362**	**1798**
Grand Total	**20052**	**84466**	**42566**	**41900**	**10182**	**23924**	**3750**

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

Table 3-28 Summary of Socioeconomic indicators within the study area

S. No	Particulars	Study Area	Unit
1	Number of villages in the Study Area	30	Nos.
2	Number of Towns/Municipality in study area	0	Nos.
3	Total Households	20052	Nos.
4	Total Population	84466	Nos.
5	Children Population (<6 Years Old)	10182	Nos.
6	SC Population	23924	Nos.
7	ST Population	3750	Nos.
8	Total Working Population	43879	Nos.
9	Main Workers	35690	Nos.
10	Marginal Workers	8189	Nos.
11	Literates	51410	Nos.

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

3.10.7 Employment and livelihood

Table 3-29 shows the classification of workers within the study area. Details of Literacy population in the study area is given in **Table 3-30.**

Table 3-29 Classification of workers within study area

Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Main		Marginal	
				Main		Marginal					
				Cultivators	Agri.	Cultivators	Agri.	Household	Others	Household	Others
0-5 km											
Sathanoor	384	382	2	87	232	1	1	0	63	0	0
Kolundampattu	1906	1675	231	394	938	23	184	8	335	9	15
Veeranam	1406	1238	168	151	657	3	94	6	424	55	16
Tharadapattu	1919	1646	273	803	474	25	92	46	323	13	143
Kilkaripoor	480	454	26	256	169	2	13	1	28	1	10
Melkaripur	1465	1350	115	662	458	10	73	21	209	0	32
Tharadapattu	1919	1646	273	803	474	25	92	46	323	13	143
Total	**9479**	**8391**	**1088**	**3156**	**3402**	**89**	**549**	**128**	**1705**	**91**	**359**
5-10 km											
Puthur	1401	888	513	251	329	75	264	2	306	7	167
Palayam	2356	2163	193	395	581	13	93	219	968	14	73
Vanakkambadi (THEN)	632	625	7	243	228	1	2	0	154	0	4
Vanakkambadi (VADA)	609	540	69	159	210	8	28	5	166	1	32
Nallur	3486	3300	186	1022	1778	28	90	36	464	5	63
Mudur	550	234	316	156	23	40	141	18	37	2	133
Pakkiripalayam	3887	2954	933	1368	743	55	567	203	640	98	213
Eraiyur	1725	1429	296	492	539	108	122	32	366	6	60
Ariyakunjur	233	195	38	163	10	1	21	1	21	0	16
Melpennathur	1768	1742	26	938	619	4	20	0	185	0	2
Vinnavanur	883	650	233	203	232	17	199	8	207	0	17
Kannakurkkai	1678	943	735	638	169	123	568	7	129	3	41
Veppurchekkadi	1211	1197	14	322	804	8	2	18	53	0	4

Kanakkandal	986	935	51	172	675	9	39	6	82	0	3
Nedungavadi	517	185	332	53	60	11	294	1	71	4	23
Radhapuram	2966	2098	868	486	1265	10	757	14	333	11	90
Olagalapadi	947	293	654	134	70	116	482	10	79	15	41
Melamanjanoor	2597	2289	308	666	1329	61	140	6	288	7	100
Edathanur	1465	1335	130	425	645	4	95	12	253	7	24
Radhapuram RF	8	8	0	6	0	0	0	0	2	0	0
Periyakilambadi	679	620	59	210	265	8	43	2	143	1	7
Sorappanandal	133	34	99	6	0	13	36	11	17	32	18
Thandarampatti	3683	2642	1041	270	801	39	561	49	1522	37	404
Total	**34400**	**27299**	**7101**	**8778**	**11375**	**752**	**4564**	**660**	**6486**	**250**	**1535**
Grand Total	**43879**	**35690**	**8189**	**11934**	**14777**	**841**	**5113**	**788**	**8191**	**341**	**1894**

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

Table 3-30 Details of Literacy population in the study area

Name	Literates Population	Male Literates	Female Literates	Literates %
0-5 km				
Sathanoor	437	247	190	0.86
Kolundampattu	1851	1085	766	3.65
Veeranam	1453	802	651	2.87
Tharadapattu	2418	1345	1073	4.77
Kilkaripoor	887	514	373	1.75
Melkaripur	1498	902	596	2.96
Tharadapattu	2418	1345	1073	4.77
Total	**10962**	**6240**	**4722**	**21.63**
5-10km				
Puthur	2299	1277	1022	4.54
Palayam	3313	1858	1455	6.54
Vanakkambadi (THEN)	687	406	281	1.36
Vanakkambadi (VADA)	721	420	301	1.42
Nallur	3608	2079	1529	7.12
Mudur	711	414	297	1.40
Pakkiripalayam	4270	2438	1832	8.42
Eraiyur	2356	1359	997	4.65
Ariyakunjur	534	293	241	1.05
Melpennathur	1799	1058	741	3.55
Vinnavanur	1083	614	469	2.14
Kannakurkkai	1894	1115	779	3.74
Veppurchekkadi	985	626	359	1.94
Kanakkandal	1011	587	424	1.99
Nedungavadi	579	337	242	1.14

Radhapuram	3124	1734	1390	6.16
Olagalapadi	881	505	376	1.74
Melamanjanoor	2454	1363	1091	4.84
Edathanur	1741	980	761	3.43
Radhapuram RF	6	6	0	0.01
Periyakilambadi	724	444	280	1.43
Sorappanandal	202	114	88	0.40
Thandarampatti	5466	2945	2521	10.78
Total	**40448**	**22972**	**17476**	79.80
Grand Total	**51410**	**29212**	**22198**	**101.42**

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

Interpretation of Results:

59.84% of Literacy and 48.25% of Non-Workers in 0-5km zone and 61.15% of Literacy and 48.00% of Non-Workers in 5-10km zone. The literacy rate of the study region is 60.86%. The study area has more than 45% non-workers. There is a need to establish more industries so that the maximum number of employments can be generated.

S. No	Impact Zone	Number of villages	Total Population	Male%	Female%	SC population%	ST population%	Total Workers%	Main Workers%	Marginal Workers%	Literacy%	Non-Workers%
1	0-5km	7	18318	50.15	49.85	41.28	10.66	51.75	45.81	5.94	59.84	48.25
2	5-10km	23	66148	50.46	49.54	24.74	2.72	52.00	41.27	10.74	61.15	48.00
Total		**30**	**84466**	**50.39**	**49.61**	**28.32**	**4.44**	**51.95**	**42.25**	**9.70**	**60.86**	**48.05**

3.11 Summary

Ambient Air Quality Monitoring						
S. No	**Criteria Pollutants**	**Unit**	**Maximum value**	**Minimum Value**	**98th Percentile Value**	**Prescribed Standard**
1	PM_{10}	µg/m^3	61.0	33.0	59.6	100
2	$PM_{2.5}$	µg/m^3	33.6	18.1	32.8	60
3	SO_2	µg/m^3	10.9	5.6	10.7	80
4	NO_x	µg/m^3	25.2	13.4	24.6	80
All the results of ambient air quality parameters have been found within the limit as per NAAQS. Based on comparison study of results for tested parameters with NAAQS, it is interpreted that ambient air quality of studied locations is good. This interpretation relates to the results found for corresponding locations and study period.						

Noise Monitoring					
S. No	**Parameters**	**Unit**	**Maximum Value**	**Minimum value**	**Prescribed standard (residential areas)**
1	Leq (day)- residential areas)	dB(a)	53.2	48.6	55
2	Leq(Night)residential areas)	dB(a)	42.6	39.6	45
In Industrial areas daytime noise levels were about 49.6 dB(A) and 40.8 dB(A) during nighttime, which is within prescribed limit by CPCB (75 dB(A) Day time & 70 dB(A) Nighttime). The field observations during the study period indicate that the ambient noise levels are well within the prescribed limit by CPCB (55 dB(A) Day time & 45 dB(A) Nighttime).					

Surface Water					
S. No	**Parameters**	**Unit**	**Maximum Value**	**Minimum Value**	**IS 2296 Class A**
1	pH	-	7.71	7.21	6.5-8.5
2	TDS	mg/l	690	247	500
3	DO	mg/l	6.1	4.8	6
4	COD	mg/l	36.2	20.9	-
5	BOD	mg/l	3.9	1.1	2
The surface water results were compared with IS 2296:1192 standard and in respect of CPCB water Quality Criteria for designated best use. Based on comparison study of test results with Surface water Quantity Standards (Is 2296 Class A), it is interpreted that water qualities of studied locations are classified under Class E, which can be used for irrigation industrial cooling, and controlled waste disposal					

Ground Water						
S. No	**Parameters**	**Unit**	**Maximum Value**	**Minimum Value**	**Acceptable Limit**	**Permissible Limit**
1	pH	-	7.65	7.16	6.5-8.5	-

2	Total Hardness	mg/l	274	169	200	600
3	Chloride	mg/l	202	124	250	1000
4	Fluoride	mg/l	0.45	0.21	1.0	1.5
5	Sulphate	mg/l	50.4	31.1	400	200

Based on comparison study of test results with drinking water standard, it is interpreted that water qualities of studied locations meet with the drinking water standards as per IS 10500: 2012 Permissible Limit. These interpretations relate to the sample tested for location only. To prevent ground water contamination and improving the quality and Quantity, rainwater harvesting, and groundwater recharging may be helpful.

Soil Quality

S. No	Parameters	Unit	Maximum Value	Minimum Value
1	pH	-	7.81	6.78
2	EC	µmhos/cm	410	202
3	Nitrogen	kg/ha	201	123
4	Phosphorus	kg/ha	108	69
5	Potassium	kg/ha	510	195

As per the Indian Council of Agricultural research characterization all locations soils are having PH, Neutral to Moderately t Alkaline range, Electrical conductivity is Average, potassium rages from Medium to More Than Sufficient, Nitrogen as N is better to good range and Phosphorus range is sufficient range.

Ecology and Biodiversity

This area hosts common animals. Indian Dogs, Jungle and Domestic cat, Rhesus macaque, Domestic Cows, Buffaloes, Bullocks, and Goat etc. are found amongst mammals. There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area (Buffer zone). There is no rare or endangered species in the core zone and Buffer zone of the study area.

Socio-Economic

The literacy rate of the study region is 60.86%. The study area has more than 45% non-workers. There is a need to establish more industries so that the maximum number of employments can be generated.

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, Drilling, 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 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

Objective of this chapter is to:

- Identify project activities that could beneficially or adversely impact the environment.
- Predict and assess the environmental aspects and impacts of such activities.
- Examine each environmental aspect-impact relationship in detail and identify its degree of significance.
- Identify possible mitigation measures for these project activities and select the most appropriate mitigation measure, based on the reduction in significance achieved and practicality in implementation.

This methodology is used in this chapter for preparing impacts and their listing evaluation. Mitigation measures are formulated based on the significance of the impact as discussed in Methodology; environmental impacts have been identified based on an assessment of environmental aspects associated with the project. The symbol 'a-Ve' indicates an adverse (negative) impact, and 'b+Ve' indicates a beneficial (positive) impact. Identified environmental impacts have been listed in **Table 4-1.**

Table 4-1 Impact Identification from proposed project

S. No	Project activities/Aspects	Potential Environmental attributes									Summary of Indication
		Land use/ Landcover (LU/LC)	Air Quality (AQ)	Noise and Vibration (NV)	Surface Water (SW)	Ground Water (GW)	Soil (S)	Ecology & Biodiversity (EB)	Socio-Economic (SE)	Occupational Health, Community Health & Safety (OH / CH&S)	
1	Site selection-Land Acquisition	*a-Ve*	-	-	-	-	-	-	*b +Ve*	-	LU/LC (-): Potential change in land cover SE (+): Economic development and Employment to local
2	Preparation of site-Clearance of vegetation at site	*a-Ve*	-	-	-	-	*a-Ve*	*a-Ve*	-	-	LC (-): Change in land cover from vegetation cover to barren (since land use change will be long term /permanent being development operations) EB (-): Possible loss of vegetation cover SE (+): short time employment
3	Excavation	*a-Ve*	*a-Ve*	*a-Ve*	*a-Ve*	*a-Ve*	*a-Ve*	*a-Ve*	*b +Ve*		LU (-) Creation of pit and some area will be converted to the reservoir. AQ (-) Dust emission due to mining activities, use of rock breaker, vehicular movement, and use of dewatering pump NV (-) Due to mining activities, use of compressor and use of machineries for mining

											SW, GW (-) use of water for dust suppression, domestic purpose and Greenbelt development EB (-) dust emission, Removal of vegetation and generation of noise SE (+) generation of employment
4	Stacking of Mineral Reject and Handling	-	*a-Ve*	*a-Ve*	-	-	-	*a-Ve*	-	-	AQ (-) generation of dust NV (-) generation of noise EB (-) generation of noise and dust emission
5	Transportation of mining material	-	*a-Ve*	*a-Ve*	-	-	-	*a-Ve*	*b +Ve*	-	AQ (-) generation of dust NV (-) generation of noise EB (-) generation of noise SE (+) Employment Generation
6	Land Reclamation	*a-Ve*	*a-Ve*	-	-	*a-Ve*	*a-Ve*	*b +Ve*	*b +Ve*	-	LU (-) some areas will be converted to water reservoir. AQ (-): Dust emission due to leveling. EB (+): Some areas will be converted to water reservoirs. SE (+): generation of water reservoir

4.1 Land Environment

The total extent of lease area is 8.46.0 Ha. The land is classified as a government land. The lease area exhibits hilly terrain topography covered by massive granite formation. Quarry lease was granted over an extent of 8.46.0Ha. In SF. No. 315,316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State for 20 years the lease proceeding letter is enclosed as **Annexure-2.** The land use pattern is given in **Table 2-15.**

4.1.1 Anticipated Impact

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

- Landdegradationis duetodisposaloflargevolumesofwastematerials.
- Creation of infrastructural facilities like office, rest shelter, first-aid Centre, and other service facilities.
- Exposure of topsoil to wind and water erosion.

Table 4-2 Land Use Pattern of the lease area

S. No	Description	Present Area (Ha.)	Area to be required at the present Mining Plan Period (Ha.)	Area at the end of life of quarry (Ha.)
1	Area under Quarry (Existing pit area -1.65Ha.	1.65.0	1.70.0	5.10.5
2	Waste Dump	0.58.0	1.18.0	2.47.0
3	Infrastructure	-	0.01.0	0.01.0
4	Tar Road	0.00.5	-	0.00.5
5	Village Road	0.05.5	-	0.05.5
6	Mine Approach Road	0.10.5	-	0.01.0
7	Afforestation (0.23.5 Ha above the Waste Dump)	-	0.06.5	-
8	Un-utilized Area	6.06.5	3.11.0	0.80.5
Total		**8.46.0**	**6.06.5**	**8.46.0**

Land Use Impact and Indications

S. No	Project Activities. Aspects	Potential Environmental Impact on LU/LC	Summary of Indication
1	Land acquisition	-ve	LU/LC (-): Potential change in land cover
2	Clearance of vegetation at site	-ve	LC (-): Change in land cover from vegetation cover to barren (Since land use change will be a long term/permanent being development operations)
3	Excavation	-ve	LU (-) creation of pit and some area will be coverted to the reservoir / open pit

4	Land Reclamation	-ve	LU (-) some area will be converted to water reserviror / open pit

Based on this above identification of impacts, environmental indices that are likely to beimpacted due to the project are:

- Removal of site vegetation will change Land cover.
- Generation of Debris and generation of pit leading to change in topography due to
- Generation of Debris and generation of pit leading to change in topography other machinery, workers / labours etc.

4.1.2 Mitigation Measures

- Dust suppression on exposed are as using water tankers.
- Contour over burden dump to minimize erosion.
- Plantation around service building, along road, in and around safety zone using native plant sapling.
- Compliance with mine decommissioning plan.
- Drainage control structures like garland drain to be made around quarry to avoid water flow during monsoon.
- Levelling, grading, and drainage arrangement for stock dumps

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 26^0. 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 inherententry of public and cattle.
- Management plan for topsoil utilization andc onservation.
- Progressive year-wise green belt development inside.

4.2 Air Environment

Base line data reveals that ambient air quality in the study area for the Parameters PM_{10}, $PM_{2.5}$ & NO_2, are well within the permissible Limits as prescribed by the National Ambient Air Quality Standards (NAAQS) for Industrial Area, Residential, Rural & Other areas.

The major air pollution sources from the mining operations are mining activities such as blasting, drilling, loading & unloading, Excavating and transportation etc. The particulate emissions &

gaseous 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. The sources of air emission are detailed below in**Table 4-3.**

Table 4-3 Sources of air pollution at quarry

S. No	Source of emission	Pollutant
1.	Excavation / Mining activity	PM
2.	Operation of diesel driven equipment	Gaseous emission/Fugitive emissions
3.	Transportation	PM

4.2.1 Anticipated Impacts

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.

4.2.2 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:

- Useofadequatebooster/primer.
- Proper stemming of the blast hole.
- Development of greenbelt.

4.2.2.1 During Mining

- Bore hole Drills of 32mm diameter will be used. Wet drilling is proposed.
- Personal protection equipment will be issued to drillers.
- The road in lease will be macadamized.
- Tipper trucks will be covered.

4.2.2.2 Green Belt

- There are no major trees existing within the lease area, except some bushes and thorny plants.
- The plantation will be developed inside the mining lease about 0.06.5 Ha, out of 8.46.0Ha. The safety distance along the eastern side of the lease area has been identified to be utilized for afforestation. Native species will be planted.
- There is some topsoil, scattered at places, within the lease area and will be utilized for plantation purposes, on both sides of the approach road, to support trees.

Table 4-4 Fugitive dust & Particulate matter control in quarry

S. No	Activities	Fugitive Dust control Mitigation measure	Dust control. Mitigation measure/Control options
1	Drilling	• Drills should be provided with dust extractors (wet system)	• Liquid injection (water or water plus a wetting agent) • Capturing and venting emissions to a control device.
2	Blasting	• Water sprinkling before blasting. • Water sprinkling on blasted material prior to transportation. • Use of control blasting technique	
3	Excavation of site, Movement of JCBs, other machinery, workers / labors etc.	• Water sprinkling will be carried out as and when required.	
4	Transportation of mined material	• 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	
5	Loading	• Water sprinkling	
6	Hauling (emissions from roads)	• Water spray, treatment with surface agents, soil stabilization, paving, traffic control.	

4.2.3 Meteorological Data

The site-specific meteorological data for three months from **Mid-December to Mid-March** was obtained and wind rose was plotted and shown in **Figure 4-1**. The meteorological data of three months 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.

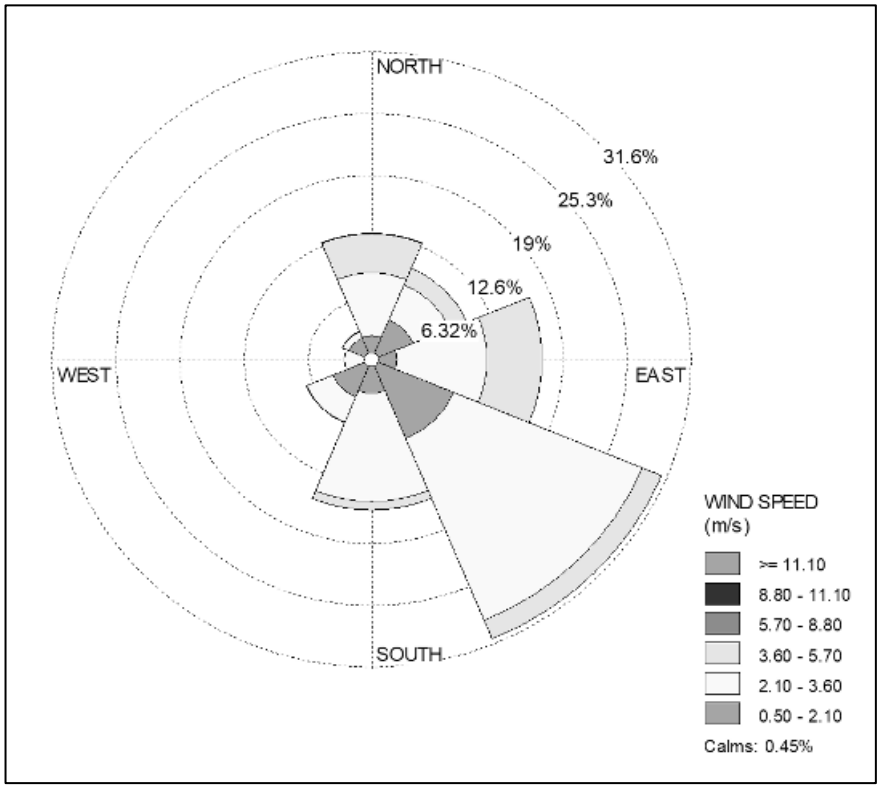


Figure 4-1 Wind rose of meteorology considered for modelling Mid-December to Mid-March

4.2.4 AERMET Process

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

4.2.5 AERMOD Process

AERMOD Software Version 22112 was used for air dispersion modelling. AERMOD MPI is Lakes Environmental parallel version of the AERMOD model. AERMOD MPI Version 22112 is the parallel version for the US EPA AERMOD model dated 22112 released by the US EPA on June 27, 2022, and is applicable to a wide range of buoyant or neutrally buoyant emissions up to a range of 50 km. In addition to more straightforward 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 behaviour 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 the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL AERMOD treats the enhancement of lateral dispersion resulting from plume meander. The emissions from proposed stacks are estimated and these stack emissions are used for the air dispersion modeling as shown in**Table 4-5.**

Maximum concentration value for PM10, PM2.5, & NOx obtained through modelling is shown in **Figure 4-2**, and **Figure 4-4** respectively and the first ten highest values of Ground Level Concentration (GLC) for proposed stacks is given in **Table 4-10**,

Table 4-11 and

Table 4-12 respectively.

4.2.6 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 number 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.

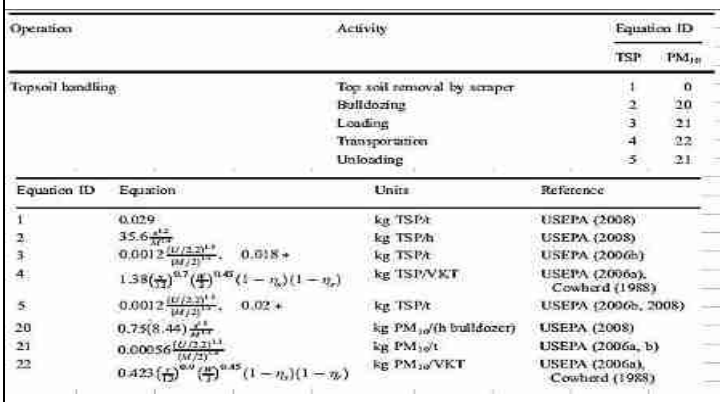
4.2.7 Mining Operational data

Table 4-5 Overview of the Source Parameters

S. No	Description	Symbol	Quantity
1.	Moisture Content (%)	M	0.45
2.	Silt Content (%)	s	3
3.	Production / Day (m^3)		14.5
4.	Production / Day (Ton)		39.0
5.	No. of vehicles with categorization		1 no. HW 2 no. 4W
6.	Working Hours per day (hrs)		8
7.	**Control Efficiency Loading/Unloading, Excavation Operations (%)**	ŋ	97%

4.2.8 Emission Factors

Table 4-6Emission Factor

Activity	Uncontrolled Emissions Factor	Reference
Topsoil excavation	Activities: 1. Bulldozing 2. Loading 3. Unloading 4. Transportation	***Jose I. Huertas & Dumar A. Camacho & Maria E. Huertas, Standardized emissions inventory methodology for open-pit mining areas, Environ Sci Pollut Res,2012.*** 
Wet Drilling for rough stone, Gravel	8.00E-05 lbs PM10 /ton	*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.*
Loading	1.00E-04 lbs PM10 /ton	
Unloading	1.60E-05 lbs PM10 /ton	
Haulage	6.2 lbs PM10 / Mile Tipper	

Operation	Activity	Equation ID	
		TSP	PM_{10}
Topsoil handling	Top soil removal by scraper	1	0
	Bulldozing	2	20
	Loading	3	21
	Transportation	4	22
	Unloading	5	21

Equation ID	Equation	Units	Reference
1	0.029	kg TSP/t	USEPA (2008)
2	$35.6\frac{s^2}{M^2}$	kg TSP/h	USEPA (2008)
3	$0.0012\frac{(U/2.2)^{1.3}}{(M/2)^{1.4}} - 0.018 *$	kg TSP/t	USEPA (2006b)
4	$1.38\left(\frac{s}{12}\right)^{0.7}\left(\frac{M}{2}\right)^{0.45}(1-\eta_s)(1-\eta_r)$	kg TSP/VKT	USEPA (2006a), Cowherd (1988)
5	$0.0012\frac{(U/2.2)^{1.3}}{(M/2)^{1.4}} - 0.02 *$	kg TSP/t	USEPA (2006b, 2008)
20	$0.75(8.44)\frac{s^{1.5}}{M^{1.4}}$	kg PM_{10}/(h bulldozer)	USEPA (2008)
21	$0.00056\frac{(U/2.2)^{1.2}}{(M/2)^{1.3}}$	kg PM_{10}/t	USEPA (2006a, b)
22	$0.423\left(\frac{s}{12}\right)^{0.9}\left(\frac{M}{2}\right)^{0.45}(1-\eta_s)(1-\eta_r)$	kg PM_{10}/VKT	USEPA (2006a), Cowherd (1988)

4.2.9 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 PM2.5, which is particulate matter of 2.5µm or less in diameter, were not available in literature. Thus, PM2.5 emissions have been calculated considering an assumption that 60% of PM10 emissions contribute to PM2.5.

4.2.10 Mining Activities Emissions considered for mining.

Table 4-7 Mining Activities Emissions considered for mining.

S. No	Activities	Emission rate (g/s)			
		PM10	PM2.5	SO_2	Nox
1	Topsoil excavation	0.08025	0.04815	-	-
2	Wet drilling	0.00170	0.00102	-	-
3	Hauling	0.98300	0.59000	-	-
4	Conveyor loading	0.00213	0.00128	-	-
5	Unloading	0.00034	0.00020	-	-
Total (g/s)		**1.06742**	**0.64065**	-	-

Table 4-8 Vehicular Emissions

S.No	Activities	PM10 Emission rate (g/s)	PM2.5 Emission rate (g/s)	NOX Emission rate (g/s)
1	4Wheels (Tippers & tankers)-1 Nos	0.000174	0.000104	0.00174
2	HW (Excavator)-2Nos	0.000833	0.000500	0.09720

Table 4-9 Emission considered for GLC.

S. No	Activities	PM_{10} Emission rate (g/s)	$PM_{2.5}$ Emission rate (g/s)	NO_X Emission rate (g/s)
1	**Area Source**			
	Topsoil excavation	0.08025	0.04815	-
	Wet drilling	0.00170	0.00102	-
	Conveyor loading	0.00213	0.00128	-
	Unloading	0.00034	0.00020	-
	Sub Total (g/s)	**0.08442**	**0.05065**	-
2	**Line Source**			
	Haulage	0.983000	0.590000	-
	4Wheels (Tippers & tankers)-5 Nos	0.000174	0.000104	0.00174
	HW (Excavator)-2Nos	0.000833	0.00050	0.09720
	Sub Total (g/s)	**0.984007**	**0.590604**	**0.009894**

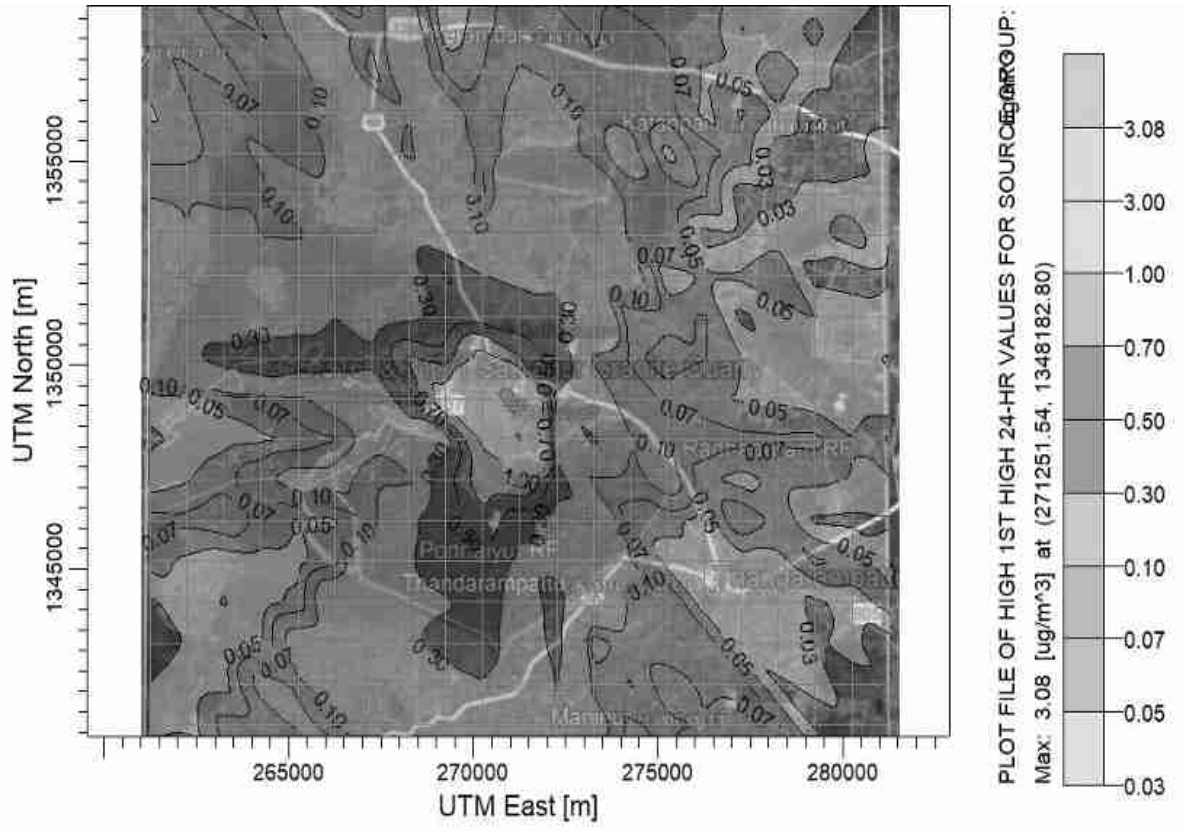


Figure 4-2Predicted 24-Hrs GLC of PM_{10} within 10 km Radius of the Study Area

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

S. No	UTM Coordinates		Conc. (µg/m³)	Name of the habitation	Distance(km)	Direction
	E	N				
1	271251.5	1348183	3.07929	Project Site	-	-
2	271251.5	1349183	2.41365	No habitation	1.00	N
3	270251.5	1349183	2.33283	No habitation	1.00	N
4	269251.5	1349183	1.20492	Mallikapuram	1.00	W
5	270251.5	1350183	1.14622	No habitation	1.00	N
6	270251.5	1348183	1.05521	Chegapatti	1.36	SE
7	271251.5	1347183	0.95164	No habitation	1.87	SW
8	270251.5	1347183	0.8593	No habitation	2.26	S
9	268251.5	1350183	0.71129	Aannavelankali	3.17	NE
10	271251.5	1350183	0.71047	No habitation	1.00	E

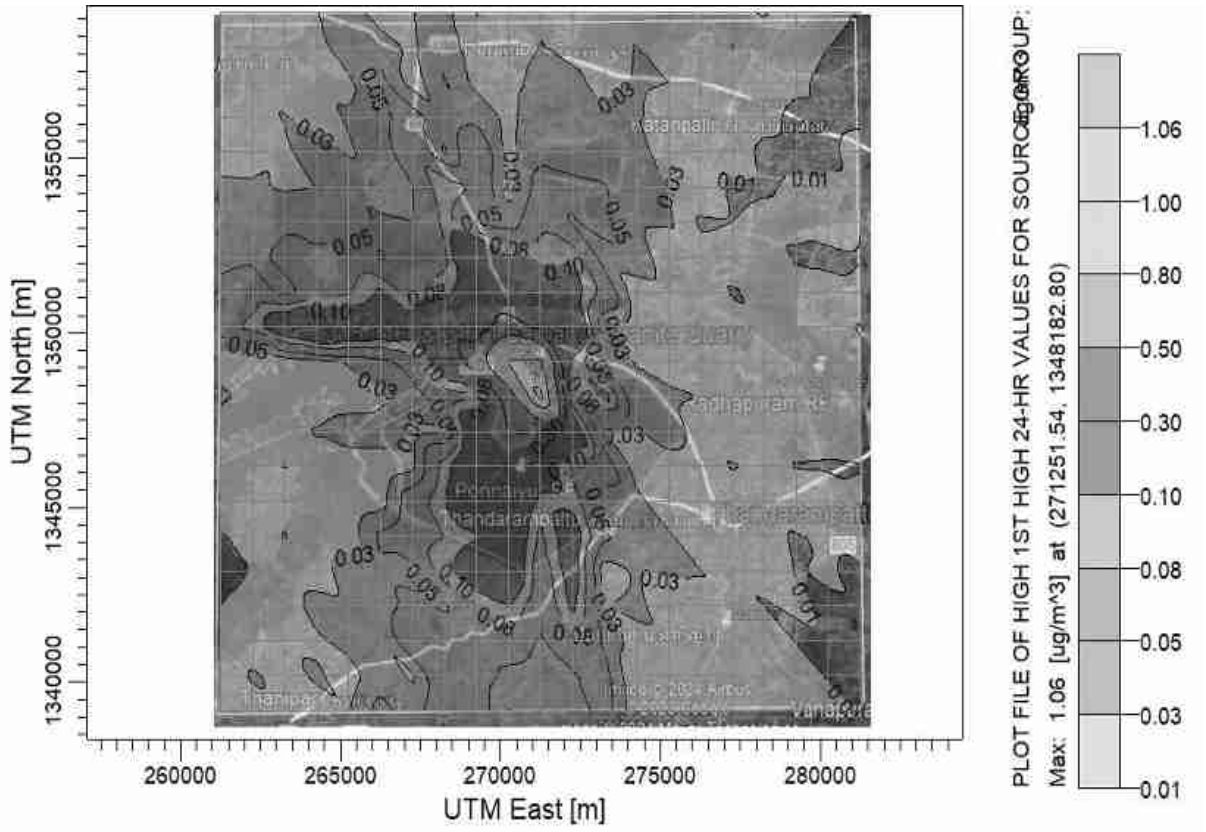


Figure 4-3Predicted 24-Hrs GLC of $PM_{2.5}$ within 10 km Radius of the Study Area

Table 4-11Predicted Highest and Habitation receptors Concentrations $PM_{2.5}$

S. No	UTM Coordinates		Conc. (µg/m³)	Name of the habitation	Distance(km)	Direction
	E	N				
1	271251.5	1348183	1.06413	Project Site	-	-
2	271251.5	1349183	0.83593	No habitation	1.00	N
3	270251.5	1349183	0.81616	No habitation	1.00	N
4	269251.5	1349183	0.41935	Mallikapuram	1.00	W
5	270251.5	1350183	0.39841	No habitation	1.00	N
6	270251.5	1348183	0.36858	Chegapatti	1.36	SE
7	271251.5	1347183	0.32994	No habitation	1.87	SW
8	270251.5	1347183	0.29845	No habitation	2.26	S
9	271251.5	1350183	0.24851	Aannavelankali	3.17	NE
10	268251.5	1350183	0.24672	No habitation	1.00	E

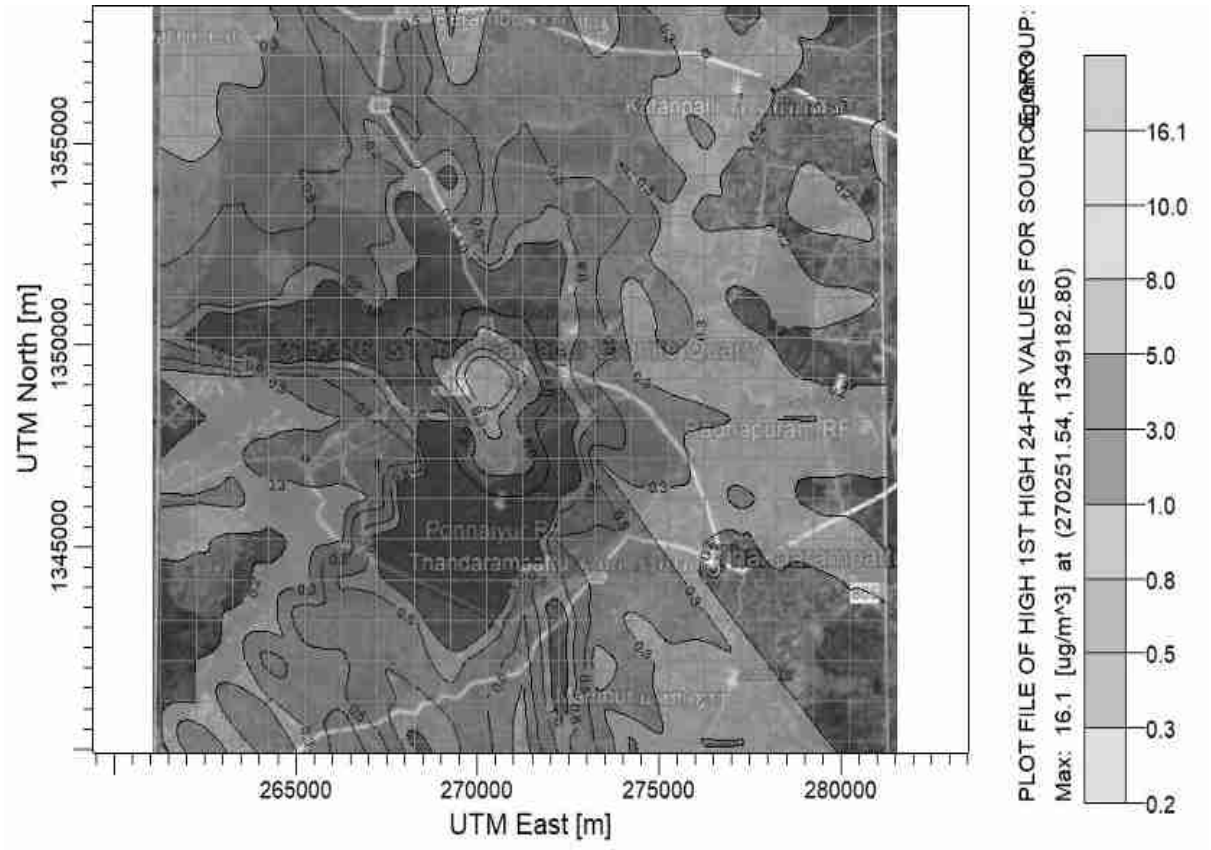


Figure 4-4Predicted 24-Hrs GLC of NO_X within 10 km Radius of the Study Area

Table 4-12Predicted Highest and Habitation receptors Concentrations NO_X

S. No	UTM Coordinates		Conc. (µg/m³)	Name of the habitation	Distance(km)	Direction
	E	N				
1	270251.5	1349183	16.07352	Project Site	-	-
2	270251.5	1348183	9.45238	No habitation	1.00	N
3	271251.5	1349183	8.6251	No habitation	1.00	N
4	269251.5	1349183	7.1965	Mallikapuram	1.00	W
5	270251.5	1347183	6.62107	No habitation	1.00	N
6	271251.5	1347183	6.45421	Chegapatti	1.36	SE
7	270251.5	1350183	6.09909	No habitation	1.87	SW
8	271251.5	1350183	4.0759	No habitation	2.26	S
9	271251.5	1348183	3.81754	Aannavelankali	3.17	NE
10	268251.5	1350183	3.56218	No habitation	1.00	E

4.2.11 Conclusion

It was observed that the maximum ground level concentration observed due to mining activities and traffic movement without control measures for PM10, PM2.5 and NOx are 3.08 µg/m^3, 1.06 µg/m^3 and 16.1 µg/m^3 respectively. The highest concentration levels identified at the project site only. So, it can be concluded that even during operation of quarry the impact envisaged is moderate. The total increase in concentrations above baseline status to estimate the percentage increase is summarized in **Table 4-13**.

Table 4-13 Total Maximum GLCs due to Mining Activities without Control measures

Pollutant	Max. Baseline Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard	% Increase
PM_{10}	58.9	3.08	61.9	100	5.20
$PM_{2.5}$	32.4	1.06	33.4	60	3.27
NO_X	23.7	16.1	39.8	80	16.7

4.2.12 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 day.

Average production is 4404 m^3/annum of Granite. Considering an operating calendar of 240 days per year. Considering the recovery of the dimensional stones from the quarry is less than 10% and as the boulders exposed from the bottom of the existing pits exhibit better quality when compared to the excavated boulders, conservative estimation is made with 10% recovery.

The average saleable production will be about 18.35 m3 per day, which is about 54 Tons/ day (bulk density of 2.8 Tones/m3 or 3 Tonne per cubic meter). Considering an average carrying capacity of truck as 10 Tons, the number of truck trips will be about 2 trips per day. Further, considering an operating hours of 8 hours per day, about 1-2 trips will be flying on the nearby village road subject market condition. This minimum trip does not create impact on existing transportation.

4.2.12.1 Mitigation Measures

The increment in the dust emissions will be mainly due to Excavation &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.

- Wet drilling will be followed.
- 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

There are no surface sources viz. rivers/ lake within the proposed quarry lease area.

There will not be any ground water withdrawal, as the total water requirement is being metby private water tankers. As the mine lease area is a Hilly area, the proposed mining will be carried out from the top of the hill (above ground level). Hence, there will not be any groundwater level intersect. Therefore, ground water regime will be undisturbed. The list water bodies available within the 15km radius from the project site is provided in **Table 4-14.**

The existing water environment quality has been studied and the study results are discussed in **Section- 3.7** of **Chapter-3**, which show that generally the water quality in the area is well within statutory standards.

Table 4-14 List of waterbodies within the 15km radius of the project site

S. No	Name of the Waterbody	Distance (~km)	Direction
1	Sathanur Dam	3.28	W
2	Lake near Kil Vanakambadi	5.39	E
3	Taradapattu	3.9	NE
4	Lake near Naykkanur	1.27	NE
5	Lake near Sattannur	1.34	N
6	Lake near Mallikapuram	0.79	WNW
7	Lake near Site	0.54	SSE
8	Lake near Melkarippur	4.16	NNE
9	Lake near Govindapuram	2.92	N
10	Lake near Melpennathur	5.87	NNW
11	Lake near Sorappanandal	10.79	NW
12	Lake near Eraiyur	9.08	N
13	Lake near Ammapalaiyam	9.83	NNW
14	Lake near Nedungavadi	6.99	NE
15	Lake near Asuvangasuranai	10.16	ENE
16	Lake near Perumbakkam	9.97	E
17	Samudram Tank	14.15	E
18	Lake near Melserumbakkam	10.96	E
19	Lake near Kilserupakkam	13.04	E
20	Lake near Kilvanakkambadi	7.52	ESE

21	Lake near Gudalur	12.1	ESE
22	Lake near Mudiyanur	8.26	SE
23	Lake near Rayantapuraml	11.75	SSE
24	Lake near Kallenta	12.56	S
25	Lake near Tiruvadattanur	8.44	S
26	Lake near Pudurnattam	7.94	SSW
27	Lake near Tandarampattu	6.21	SE
28	Lake near Taradapattu	2.26	ENE
29	Lake near Site	0.66	N
30	Lake near Peyyalampattu	10.9	NW
31	Lake near kottakulam	11.2	NNW
32	Lake near Muttanur	12.08	NNW
33	Lake near Melmudiyanur	11.57	N
34	Lake near Padi Agraharam	14.23	N
35	Lake near Torappadi	12.41	N
36	Lake near Pinjur	12.46	WNW

4.3.1 Anticipated Impacts

There are no surface sources and ground water regime will not be altered during mining. There would not be any impact if stored rainwater in the quarry pits is used for dust control. 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.

Impacts identification on water environment:

S.No.	Project Activity	Identify Aspects	Impacts	Significance / Consequence	Operation controls / mitigation measures
1	Excavation at site, movement of JCBs, other machinery, workers/labours etc.,	Consumption of water	Temporary and one time will be occurred	Impact will be low	Rainwater will be harvested in mined out pits for recharge/reuse.
2		Sewage generation	Temporary and one time will be occurred	Impact will be low	Domestic wastewater will be disposed through septic tank soak pit.

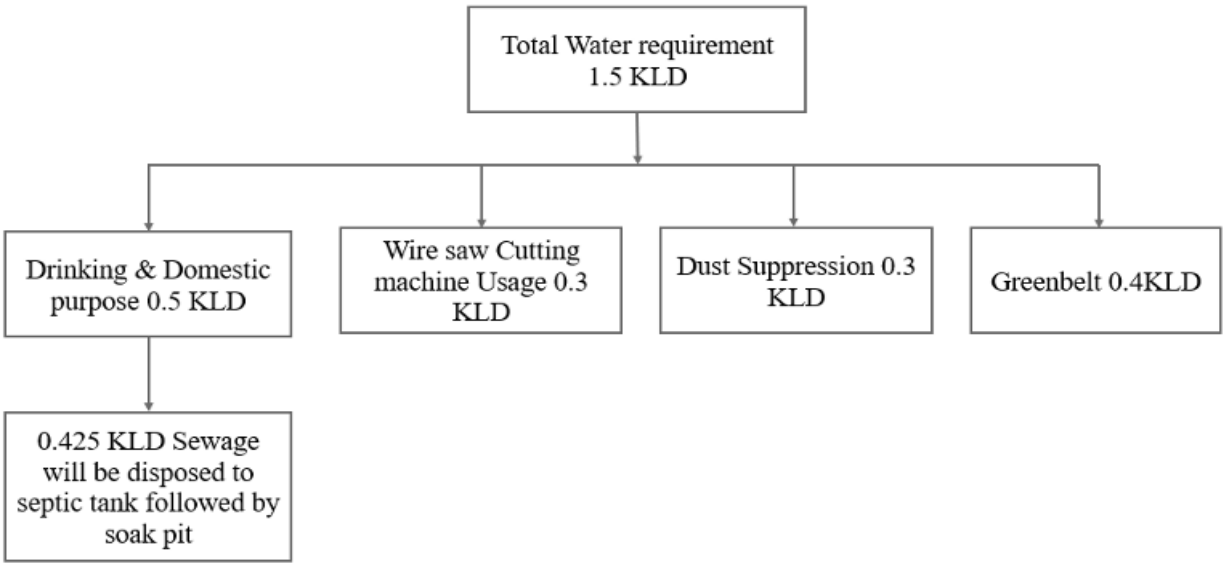


Figure 4-5 Water balance Chart.

4.3.2 Mitigation Measures

4.3.2.1 Surface Water Pollution Control Measures

- There is no process effluent generation. The domestic sewage of 0.425 KLD is disposed through septic tank followed by soak pit.
- Construction of garland drains of suitable size around mine area and dumps to prevent rainwater descent into active quarry areas.
- During monsoon season, the rainwater is being collected by natural slope of area to water fed tank of them in 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 active areas will be covered with grasses, shrubs, mulching, etc, to prevent erosion, till final backfilling of dumps in to mined out areas.
- Retaining walls of adequate dimensions will be provided at the top of dumps and theunstable 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 rainwater 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.

4.3.2.2 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 wells in the vicinity will be carried out.

4.3.2.3 Rainwater Harvesting

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

4.4 Noise Environment

The source of noise during mining operation is loading and vehicular movement. Loading operations are intermittent during working hours, while vehicle movement is intermittent. The noise sources contribute to an increase in background noise levels.

The noise generated from various mining activities like drilling, loading, transport, etc. may cause significant increase in the ambient noise levels in the work zone surrounding the active mining benches. The noise levels will be decreased over distance and will reach acceptable levels outside the mine lease area. The increase in ambient noise levels may cause the following impacts.

4.4.1 Aspect – Impact identification on Noise Levels

S. No.	Project Activity	Identify Aspects	Impacts
1	Clearance of vegetation at site	Noise due to vehicular movement	One time temporary
2	Drilling, Blasting and Excavation	▪ Due to mining activities compressor and use of machineries for mining. ▪ Noise induced Hearing Loss (NIHL) to ▪ workers exposed to higher noise levels.	Moderate & Temporary Impact and it will be restricted to the mining activities duration
3	Stacking of mineral reject and handling	Generation of noise	Moderate & temporary impact and it will be restricted to the mining activities duration
4	Transportation of mining material	▪ Generation of noise due to mining activities ▪ Temporary Threshold Shift / Permanent Threshold Shift to	Moderate & Temporary impact and it will be restricted to the mining activities duration.

		workers exposed to higher noise levels. ▪ Disturbance in communication. ▪ Annoyance/irritation to the residents in nearby villages. ▪ Disturbance to the fauna residing in the area. ▪ Sleep disturbance to the residents in ▪ nearby villages	

There are no industrial noise sources in the lease. There are no sensitive receptors like hospitals, schools, old age homes etc., within 500 km radial distance. The only source during mine operation would be drilling, blasting and movement of quarrying machinery. Drillers would be exposed to about 75-80 dB(A).

4.4.2 Noise due to Drilling, Excavation and Transportation

The noise levels in the working environment will be maintained within the standards prescribed by the Occupational Safety and Health Administration (OSHA). These standards were established with the emphasis on reducing hearing loss. The permissible limits, as laid down by OSHA, are presented in **Table 4-15**.

Table 4-15 Permissible Exposure in Cases of Continuous Noise (OSHA, Govt. of India)

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

4.4.3 Noise Due to Blasting

Blasting activities are involved in this Quarry as a green belt will be developed around the mine which restricts the propagation of noise. The main source of noise in quarrying is the 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 85dB(A), workers should be provided with earmuffs, earplugs etc.
- All vehicle sand 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.

4.4.3.1 Mitigate Measures

- Provision of suitable personal protective equipment (PPE) such as earmuffs and earplugs to Workers exposed to high noise generating operations/area.
- Job Rotation of workers working in the high noise area.
- Identification of High noise generating areas and marking with display board for warning.
- Periodical monitoring of ambient noise will be done as per CPCB guidelines.
- All the vehicles (including the transportation vehicle, Sprinkler, dumpers, and dozers
- etc.) and excavator will be properly maintained. Silencers in the Machineries will be provided to reduce the generation of noise.
- The Noise and vibrations mainly generated by mining machineries; background noise levels shall be kept in the range of 74-85 dBA.
- The noise sources shall not generate sound levels above 90 dBA.
- Equipment to be maintained in good working conditions.
- Drilling will be carried out with the help of sharp drill bits which will help in reducing noise.
- Green Belt development around infrastructure and mine areas etc., would minimize the adverse impacts likely to arise out of mining operations.

4.5 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. Safety distance along the eastern side of lease area has been identified to utilized for afforestation. This will mitigate the Vibration.

4.5.1.1 Mitigate 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 a greater number of delays will be used per blast.

4.6 Impact on Human Settlement

There are no monuments or places of worship in the quarry area. Ground vibration and noise pollution is being maintained minimal and confined to the mine area. The quality of water on

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_2 and SO_2 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 be 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 intervals.

4.7 Biological Environment

4.7.1 Mining activities and their impact on biodiversity

Table 4-16 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
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

4.7.2 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 effluentfromthemine.
  - In the Quarry area or its proximate areas there are no wetland sand the natural flow of water not available.
  - There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area (Buffer zone). There is no rare or endangered species in the core zone and Buffer zone of the study area.
  - 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 the fall of animals in the mine pits.
  - There are not any wetlands, fish breeding grounds, or marine ecology near the quarry area, which will be affected due to this project.
  - No such significantly important medicinal value species within the ML area sand its near by region.
  - There are not any wetlands, fish breeding grounds, marine ecology near by the quarry area, whichwill be affected due tothisproject.

4.8 Green Belt Development

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
  - ✓ 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.

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 0.01.3 Hectare land was earmarked for greenbelt development during first 5 years of mining plan, at the end of life of quarry; the green belt area will be 650 sq.m, 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.

Table 4-17 Proposed Greenbelt development Plan.

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

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. 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.

4.9 Social Environment

4.9.1 Anticipated Impacts

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.

4.9.2 Corporate Environmental Responsibility

TAMIN Sathanur site had no Relocation and Rehabilitation. Most villages have benefitted mutually at Sathanur 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. 2% from the Total Project cost will be used for CER activities as the committee recommendation during Public Hearing.

4.9.3 Other benefits to Community

- Project related logistical operations.
- Variou strading services for consumer goods, spare parts, sun dry items,etc.
- Contractual services connected with the project.
- Greenbelt works in the project.
- Casual labouris needed 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.

4.10 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 as follows.

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

4.10.1.1 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 4-18 Mitigation for occupational health and safety

S. No	Activity	Mitigation measures
1	Excavation	Planned excavation, avoid haphazard mining
2	Drilling and blasting	The operators and other workers should be provided with masks, helmets, gloves, and earplugs.
3	Safety zone	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	Accidents are known to happen due to overburden collapse. Therefore, slope stabilization and dump stability are critical issues for safety and environment.
5	Worker's health surveillance	Health survey program for workers and the local community. Regular training and awareness of employees to be conducted to meet health and safety objectives.

4.10.1.2 Physical Hazards

- Traumatic injury remains a significant problem and ranges from the trivial to the fatal. Common causes of fatal injury include rock fall, mobile equipment accidents, falls from height, entrapment, and electrocution.
- Noise is almost ubiquitous in mining. It is generated by drilling, blasting, materials handling, and ore transportation. Controlling noise has proven difficult in mining and noise-induced hearing loss remains common.
- Whole body vibration is commonly experienced whilst operating mobile equipment, such as load, haul, dump units, trucks, scrapers, and diggers.
- Poorly maintained roads and vehicles contribute to the problem. Hand arm vibration syndrome is also encountered with the use of vibrating tools such as air leg rock drills.

4.10.2 Biological Hazards

- The risk of tropical diseases such as malaria and dengue fever are substantial at some remote mining locations. Leptospirosis and ancylostomiasis were common in mines, but eradication of rats and improved sanitation has controlled these hazards effectively.

4.10.3 Ergonomic Hazards

- Although mining has become increasingly mechanized, there is still a substantial amount of manual handling. Cumulative trauma disorders continue to constitute the

largest category of occupational disease in mining and often result in prolonged disability. Broken ground is often encountered and can cause ankle and knee injuries.

4.10.4 Psychological Hazards

- Drug and alcohol abuse has been a difficult issue to deal with in mining. Debate continues about how to measure psychophysical impairment. Nevertheless, mining operations commonly require the measurement of urinary drug metabolites and breath or blood alcohol on pre-employment and following accidents. Remote locations are common in mining with mine employees separated from their families and communities during work periods.
- Expatriate placements are also common in mining and the associated psychosocial hazards have been reviewed recently. Unfortunately, fatal, and severe traumatic injuries continue to occur in mining and often have a profound impact on morale. Post-traumatic stress disorders sometimes develop in witnesses, colleagues, and managers. Registered managers often feel personally responsible for such injuries, even in the absence of negligence, and face the ordeal of government inquiries and legal proceedings.

4.10.5 Mitigation Measures

- 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.
- Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc.
- 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, earmuffs, 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 the above lines will ensure that in this project, health and safety problems will be minimal.
- Plantation
- Avoid blasting during unfavorable wind & atmospheric conditions.
- 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.
- Health Check programs periodically (1 Year Once).

4.11 Traffic Density

Average production is 4404 m^3/annum of Granite. Considering an operating calendar of 240 days per year. Considering the recovery of the dimensional stones from the quarry is less than 10% and as the boulders exposed from the bottom of the existing pits exhibit better quality when compared to the excavated boulders, conservative estimation is made with 10% recovery.

The average saleable production will be about 18.35 m3 per day, which is about 54 Tons/ day (bulk density of 2.8 Tones/m3 or 3 Tonne per cubic meter). Considering an average carrying capacity of truck as 10 Tons, the number of truck trips will be about 2 trips per day. Further, considering an operating hours of 8 hours per day, about 1-2 trips will be flying on the nearby village road subject market condition.

4.11.1 Mitigation Measures

Traffic will be regulated using flagging. The trucks carrying the materials will be covered with tarpaulins, to avoid any spillage along the haulage road. All tippers/ trucks will be periodically checked to confirm exhaust norms. Traffic signages will be provided. A flagger will manage traffic at convergence point of the approach road and national highway to avoid possible mishap.

5 ANALYSIS OF ALTERNATIVES

5.1 Alternate Technology

Semi mechanized opencast method will be used for mining. No alternative technology will be envisaged for this proposed project.

5.2 Site Studies

The proposed project is site specific. The proposed area is classified as Government land and a lease has been obtained for mining the granite material by following Open Cast Semi-Mechanized Method.

The proponent and the Geologist/RQP have inspected the site and studied the occurrence of Granite deposits at the site and other geological features in order that the same could be mined safely, economically and in an environmentally friendly manner. Mapping of Granite was completed. Then section wise details of reserves were worked. There is no mining being carried over the lease at present.

5.3 Method of mining

5.3.1 Opencast Method

Other alternatives for methods of opencast mining like manual mining would be unscientific and economically not viable. Semi mechanized opencast method will be used for mining. No alternative technology will be envisaged for this proposed project.

Open cast, semi-mechanized mining with 5m vertical bench with a bench width is 5m with vertical slope. Under 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.

5.4 Connectivity

The project is situated at ~0.56 km to Sathanur Village towards Northwest direction and ~0.88 km East-northeast of Veeranam Village. The project site has well-established connection facilities. The nearest national highway (NH-179B) is at distance of ~8.55km (N), The nearest State highway (SH-6B) is at ~ 0.54km (N). Tiruvannamalai railway station is located at ~ 20.08km (E). Road connectivity is shown in**Figure 5-1.**

Figure 5-1 RoadConnectivityfor quarryarea.

6 ENVIRONMENTAL MONITORING PROGRAMME

6.1 General

Environmental monitoring is the measurement of environmental parameters at regular intervals over an extended period. Monitoring allows the assessment of environmental and biological changes in an ecosystem. All the project activities shall be monitored to ensure that appropriate environmental mitigation activities are being implemented and to identify areas where Environmental Management Plan compliance is not satisfactory. Hence, Environmental quality monitoring of critical parameters is very essential in the routine activity schedule of project operation.

The mitigation measures suggested in **Chapter 4** will be implemented 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, 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 program 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 programs 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 the irregular maintenance for de-silting.
- To study the effects of project activities on the environment.
- To interact and liaise with State 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 conducting safety drills to educate employees.

- To ensure that fire fighting equipment, etc, is 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 Objective of Monitoring Program

- Evaluate effectiveness of implementation of mitigation measures identified **in Chapter 4.**
- Measure effectiveness of operational procedures
- Confirm statutory and mandatory compliance.
- To verify the result of the impact assessment study with regards to new developments.
- To follow the trend of parameters which have been identified as critical.
- To check or assess the efficiency of controlling measures.
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new project.
- To monitor effectiveness of control measures.
- Regular monitoring of environmental parameters to find out any deterioration in environmental quality.

6.3 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.

Post-project monitoring is an equally important aspect in the Environmental Management Plan. To verify the outcome on the implemented mitigation measures and to alter the proposed mitigation, Post project monitoring becomes inevitable. Environment monitoring plan is given in

Table 6-1 Post Environmental Monitoring Plan

S. No	Parameters	Measurement Methodology	Frequency	Location	Data Analysis	Reporting Schedule
1	Ambient air monitoring of parameters specified by CPCB consents from time to time (PM10, PM2.5)	IS 5182 & CPCB Guidelines Vol. 1 (Gravimetric Method)	Monthly	2 Stations (In downwind)	Comparison with specified limits and previous baseline data of the area if available	Compliance report of EC to MOEF&CC on 6 monthly basis and compliance report of consent to CPCB as per requirement. Reports to be sent to top management and the process manager as well.
2	Maintaining record of water consumption	SOP of maintaining record of water consumption for water sprinkling for dust suppression	Daily	At site and approach road	Comparison of water consumption against EC	Compliance report of EC to MOEF&CC on 6 monthly basis and Compliance report of consent to CPCB as per requirement Reports to be sent to top management and the process manager as well.
3	Monitoring of GW	APHA: 23rd Edition, 2017	Twice in a year	At nearest habitation	Comparison with specified limits	Compliance report of EC to MOEF&CC 6 monthly basis and Compliance report of Compliance report of consent to CPCB as required
4	Noise monitoring	EPA	Monthly	2 locations at site and nearest habitation	Comparison with specified limits	Compliance report of EC to MOEF&CC on 6 monthly basis and Compliance report of consent to CPCB in case as per requirement Reports to be sent to top management and the process manager as well.
5	Greenbelt development	Survival rate of Plant	Regular	At site	Replantation of dead species and water consumption	Compliance report of EC to MOEF&CC on 6 monthly basis and Compliance report of consent to CPCB in case on as per requirement Reports to

						be sent to top management and the process manager as well.
6	Soil Monitoring	IS: 2720 & Laboratory Standard Methods	Once in Year	2 locations at site and nearest cultivation land	Comparison with specified limits	Compliance report of EC to MOEF&CC on 6 monthly basis and Compliance report of consent to CPCB in case on as per requirement Reports to be sent to top management and the process manager as well.
7	Readiness for Emergency Response	Conduct mock drill in presence of observer	Once in Year	Various location in mining area	Mock drill report for identifying deficiency and opportunities for improvement	Mock drill report sent to Management as and when mock drill conducted
8	Occupational Health programs	Mine Regulations, 1961 and Circulars of DGMS	once in 3 Years	Entry level and once in 3 Years	Audiometric test and pre-placement & periodical medical testsas per Mine Regulations, 1961 and Circulars of DGMS	Compliance of Mine Regulations, 1961 and Circulars of DGMS

6.3.1 Occupational Health and Safety

- Occupational health surveys 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 tests for the workers will be done at regular intervals for workers in the noise prone area. Safety matters also will be reviewed periodically by the safety in-charge.

- Occupational health and safety are very closely related to productivity and good employer-employee relationships. The main factors of occupational health in mines are fugitive dustand 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

7 ADDITIONAL STUDIES

7.1 Introduction

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

- Public consultation
- Risk Identification and Management/Occupational Health and safety studies have been conducted and a safety plan was prepared.
- Disaster Management Plan
- Mine closure plan as per GCDR 1999

7.1.1 Public Consultation

The proposed project is categorized as 'B1' category Schedule 1(a) as per EIA Notification 2006 and its amendments thereafter. The total area of the quarry is 8.46.0 Ha. However, the proposed project falls under 'B1' category, Public Hearing is Mandatory. So, EIA report has been prepared as per the obtained ToR vide SEIAA-TN/F.No.9647/SEAC/ToR-1350/2022, dated: 16.02.2023. The Baseline studies are carried out during the period of Mid December 2023 to Mid-March 2024. Draft EIA report will be submitted for Public Hearing (PH). After PH, the minutes obtained will be incorporated in the EIA report along with action plan by the proponent towards issues raised by during Public Hearing. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

7.1.2 Risk Identification & Management

7.1.2.1 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.
- Assess the overall damage potential of the identified hazardous events and theimpact zones from the accidental scenarios.
- Assess the overall suitability of the site from a 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
- To take care of the above hazard/disasters, the following control measures will be adopted.
- All safety precautionsand provisionsof 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 mine's office complex and mining area.
- Provision of all the safety appliances such as safety boots, 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 off mine, as per approved plans and regularly updating the mine plans.
- Cleaning of mine faces will be regularly done.
- 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.

In this quarry lease applied area, the quarrying does not involve disaster of land etc. In the event of natural calamities like floods and cyclones, the applicant will approach; the Revenue officials will be informed.

The area does not come under earthquake zone. There is no chance of flooding water into working because the area is located away from the rivers at located place compared to the surroundings. The area is formed by massive formation with gentle slopes, there are no chances

for land sliding in the quarry. If there are any chances for disasters, the applicant will take necessary action to prevent the same as per statutory requirement.

The applicant has established a First Aid Room with Emergency Medicines in the event of any minor disaster to the workers. The applicant has sufficient vehicles for taking the injured / ill health persons to the nearest hospitals.

7.1.2.2 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
- Handling of materials
- Heavy Machinery

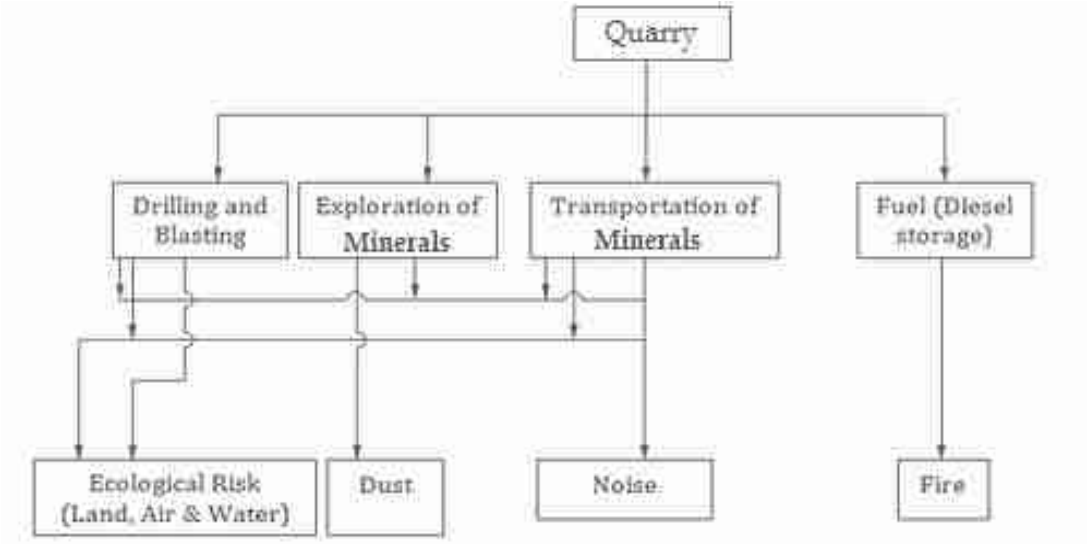


Figure 7-1 Identification of hazards in opencast mine.

7.1.2.3 Drilling

Drill holes of 1.5–3.0m depth will be drilled in a staggered pattern at 3m interval:

- Drill hole diameter :32mmupto1.5–3.0mlong
- Depth and inclination of drill hole : Generally drilled vertically in Alignment.
- Explosive type: Detonator Fuse

Drilling will be done with jack hammers. The conventional 32mm 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 a few cm above the required horizontal plane.

7.1.2.4 Blasting

Separation of the horizontal (bottom) and the vertical (length side) planes by serial blasting simultaneously along the above two planes by using 32mm dia. blast holes charged with mild explosive like gun powder or detonating. The process continued aiming at the liberation of huge volume of the granite body from the parent sheet rock is called 'Primary Cutting'.

7.1.2.5 Secondary Splitting

The 'Secondary Splitting' into required size involves long hole drilling up to the bottom of the separated block along the required planes for which mostly rock breaking powder or expansion mortar is used for splitting. It is chemically called 'Calcium Hydroxide' Ca $(OH)_2$.Removing the defective portions and dressing into the useful 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 consumers are produced by the method described above, which is constantly supervised by experienced Mining Geologist and Mining Engineer.

7.1.2.6 Heavy Machinery

Most of the accidents during the transport of dumpers proclaim and dozers and other heavy vehicles are often attributable to mechanical failure and human errors.

7.1.2.7 Overburden Handling

The waste materials generated during mining activity includerock fragments of different angularity formed. during the removal of naturally defective and uneconomical portions of the deposits and the working waste formed during dressing of the extricated blocks. During the first five years of the Mining Plan period such waste materials are proposed to be dumped along the South side of the lease area where it comprises of country rock terrain.

7.1.2.8 Storage of Explosive

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.

7.1.2.9 Fuel Storage

Most of the HEMM will operate on diesel. However, no major storage is envisaged at the mine Lase area. A diesel tanker will be provided for the crawler mounted machines operating in the mine.

7.1.2.10 Water Logging

Waterlogginginthemineshavebeenavoidedbyadoptingfollowingmeasures.

- Correct marking of position of water bodies with their highest flood level and

keeping the mine protected by suitable bunds.

- Water from the surface water bodies shall not enter the mines.
- Draining of mine water by suitable capacity pumps

7.1.2.11 Safety Measures at the Proposed Open Cast mining Project

- The opencast mine has been planned for working with shovel dumper system which requires proper benching not only for slope stability but also for movement of dumpers and other heavy machinery. The inclination of the quarry sides at the final stage i.e., at the dip most point will not exceed 45o to the horizontal. (This angle is measured between the line joining the toe of the bottom most bench to the crest of the topmost bench and the horizontal line).
- The quarries will be protected by garland drains around the periphery for storm water drainage.
- A minimum safe distance of 100m will be kept between the surface edge of the quarry and the nearest public building, roads etc. When the surface edge of the quarry approaches within a limit of 200m from any road, public building special permission from DGMS will be taken to conduct controlled blasting to prevent damage/injury to public life and property.
- All mining operations both within the quarry and outside will be conducted as per the conditions laid down by DGMS and under strict supervision of competent persons appointed under Metalliferous Mine Regulation Act, 1961.

7.1.2.12 Measures Suggested to Avoid Accidents due to Blasting.

- The blasting operation shall be supervised by a competent person appointed for the purpose.
- The blasting operation shall be strictly conducted as per the guideline given in metalliferous mine regulation, 1961.
- Demarcation of danger zone area falling within a radius of 300 m from the blast site.
- All employees and equipment shall be cleared from the blast area and removed to a safe location prior to any scheduled blasting.
- To prevent unauthorized entry, guards shall be posted at all access points leading to the blast area; and
- Audible signals such as sirens, whistles, etc. shall be used to warn employees, visitors, and neighbors about the scheduled blasting event.
- Only controlled blasting will be done to minimize damage to the nearest structure.

7.1.2.13 Measures to Prevent Failure of Overburden Dump

- In flat areas where the dumping operations have come to an end, the slope angle should be flattened by about 15^{o} lower than the angle of repose which varies from the site to site but not less than 25^{o}.
- Planting vegetation as early as possible over the overburden dump slopes.
- Provide drainage channels along the overburden dump toe for additional protection, in such a way that 15m should be maintained left between the overburden dump and the bench.
- If a mine is abandoned, the bench and overburden dump should be separated from each other by digging a trench of 6 to 10m width.

7.1.2.14 Precautionary Measures to Prevent Accidents due to Trucks & 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 condition 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 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.
- The statutory provision of 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 the equipment.
- The movement of the dumpers will be governed under the Code of Traffic rule, this is already formulated & implemented.
-

7.1.3 Disaster Management Plan

The disaster management plan is 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 objective 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 authoritative information to the news media.
- Secure the safe rehabilitation of affected areas.
- 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.

EmergencyOrganization (EO)

It is recommended to set up 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 firefighting, rescue, rehabilitation, transport and provide essential and support services.

Emergency Communication (EC)

Whoever notices an emergency 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. 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

7.1.3.1 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. An adequate number of external and internal telephone connections shall be installed.

- Fire Protection System
- Off Site Emergency Plan

7.1.3.2 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.

7.1.3.3 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, must 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 must be promptly initiated to deal with the situation in consultation with Collector and other revenue officials.

7.1.4 Progressive Quarry/Mine Closure Plan

Land degradation is one of the major adverse impacts of opencast mining in the form of excavated voids and in the form of waste dumps. As per the Petro genetic character, the depth persistence of the weathered rock, Road metals and boulders body in the area is beyond the workable limits. The proposed mining plan, only 31m 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 31m and there is possibility of technological up-gradation in mining for greater depths.

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.

7.1.4.1 Progressive Mine Closure Plan

In the Black Granite Quarry operations proposed bench height of 6m for the first five years and 31m during the entire life of the quarry, hence the ground water will not be disturbed in any manner. Afforestation will be carried out and maintained in the safety barrier till the plants reach the stabilize level. The Sludge from the toilet will be periodically removed and the same will be used as manure for afforestation.

It is proposed not to back fill the ultimate pit. In as much as good quality of reserves is available below the workable depth of 31m and there is possibility of technology of up gradation in granite mining for greater depths in course of time for safe mining at economic cost beyond 31m depth. The pit boundaries will be fenced and used for agricultural purposes when the pit is filled with underground seepage or rainwater.

7.1.4.2 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 sidedumps. These drains will be aligned in such a way that all the surface drainage water will be carried away from the mining zone to settle 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.

7.1.4.3 Mines Seepage Water

The negligible seepage of water in the mining pit 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.

The lease applied area is a hillock with a height of 18m. Though the area receives scanty average rainfall of 985mm per annum during both Southwest and Northeast monsoons. Though the area receives scanty rainfall, the ground water level is at 15m depth. 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 10 HP oil engines.

7.1.4.4 Air Quality Management

Ambient air quality was monitored twice a week for One (01) season (shall cover 12 weeks), i.e., during Pre-Monsoon season. PM_{10}, $PM_{2.5}$, SO_2, NOx, were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. The following precaution shave been considered for a batement of air pollution in the proposed mining 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 weighbridge areas.
- Proper and regular maintenance of mining Equipment's.
- Development of comprehensive green belt around over burden dumps to reduce fugitive dust emissions to create clean and healthy environment.

7.1.4.5 Solid waste Management

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

The total waste to be generated during the five years of Mining Plan period will be around 2,37,647m^3. This waste will be dumped on the south side of the lease area with dimensions of 368m x 32m x 20m.

Rubble 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.

7.1.4.6 Mine Drainage

The lease applied area is a hillock with a height of 18m. Though the area receives scanty average rainfall of 985mm per annum during both Southwest and Northeast monsoons. Though the area receives scanty rainfall, the ground water level is at 15m depth. 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.

7.1.4.7 Disposal of Waste

The total waste to be generated during the five years of Mining Plan period will be around 2,37,647m^3. This waste will be dumped on the south side of lease area with dimensions of 368m x 32m x 20m.

7.1.4.8 Topsoil 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.

7.1.4.9 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.

7.1.4.10 Other Infrastructure

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

7.1.4.11 Safety & Security

In this area quarrying is proposed at elevated area therefore, the safety of pits will not hurt. The cattle and humans, however, the area will be protected by barbed wire fencing to avoid undo incidences in quarry area.

8 PROJECTBENEFITS

- The quarrying activities in this belt will benefit 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 the construction industry thereby indirectly benefiting the masses.
- CER and CSR benefits to the nearby villages
- Implementation of time bound corporate social responsibility will lead to installation of drinking water plants in the nearby villages will improve the physical Infrastructure.
- A provision for implementation of fish culture activity (optional) will lead to improve the skills of local needy people.
- There will be a change in Land Use of the area due to the proposed mining activity. but project activity will lead to local socioeconomic benefit which will attract change in land use by developing small shops in the area, maybe chance of developing better household infrastructures etc.

9 ENVIRONMENTALCOST&BENEFITANALYSIS

(Not recommended during scoping stage).

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Introduction

This Environmental Management Plan (EMP) for the proposed Black Granite Quarry, identifies the principles, procedures and methods that will be used to control and minimize the environmental impacts of the proposed operational activities associated with the proposed project development. It is intended to ensure that commitments made by the proposed minimize project related environmental and social impacts. As part of our ongoing commitment to excellence in environmental and social performance we will ensure the following:

- Fulfill all environmental conditions associated with project approvals.
- Develop, promote, and foster a shared sense of responsibility for the environment and performance of the project.
- Promote environmental awareness and understanding among employees and contractors through training, identification of roles and responsibilities towards environmental management.
- Linking project performance to overall environmental performance.

To monitor the environmental performance throughout the project and implement an adaptive management approach for continuous improvement and to meet the regulations.

10.2 Objective of Environmental Management Plan

The EMP has the following goals:

- Identifying project activities that may have a detrimental impact on the environment.
- Detailing the mitigation measures that will need to be taken, and the procedures for their implementation.
- Establishing the reporting system.
- An integrated plan for monitoring, assessing, and controlling potential impacts once the project has been approved and all permits and conditions granted.
- Facilitate a continual review of post operation activities.
- Preparation of Greenbelt Development.
- Preparation of rainwater harvesting scheme and energy conservation actions
- To prepare a detailed action plan for implementation of mitigation measures.
- Measure the effectiveness and success of proposed mitigation measures.
- Development of Environment Management Cell
- The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactory prevented or mitigated; corrective action will have to be taken. The document should, therefore, be seen as a guideline that will assist in minimizing the potential environmental

impact of activities.

10.3 Air Quality Management

The Project Proponent is proposed Open Cast Semi mechanized to carry out the mining operations, and there is involvement of labors too. Dust would be generated during site preparation drilling, Blasting, mining, hauling, handling, and transportation of the material. Dust is likely to be generated from emissions of diesel vehicles such as SO_2 NO_x etc. The objective of the EMP will be to reduce air emission due to the proposed project due to Increase in air pollution by the proposed project activities. With proper Implementation of the proposed EMP, can be reduce impact on Ambient Air Quality in and around the site.

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/vehicles/machinery.

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 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.

- PUC certified vehicles will be used for transportation.
- 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 checkups for the workers shall be done.
- Plantation along approach roads and surrounding the Quarry Lease area.
- Water tankers with spraying arrangements 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

10.3.2 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 are being 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 checkups for the workers shall be done.
- Plantation along approach roads and surrounding the Quarry Lease area.
- Water tankers with spraying arrangements will be used for regular water sprinkling on the haul roads to ensure effective dust suppression.

Haulage

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- 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.
- Overloading of trucks is avoided.

10.4 Noise Pollution Control

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

Equipment	NoiseLevel (dB(A))
RotaryDrills	72-100
Compressor(85M^3/min)	50-55
Excavator	75-90
DieselTipper	74-109
DieselGenerator	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 belts all along the boundary of the mining lease area will act as an effective noise barrier.
- Use Diamond Wire Saw machine and crack powder to reduce noise.
- Restriction of blast hole drilling to only daytime hours and usage of sharp drilling bits and delivery of compressed air at optimal pressure during drilling.
- Noise emanating machines such as compressors and diesel generators are enclosed in acoustic enclosure to reduce the noise level.

10.5 Water Pollution Control Measures

- 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.
- Mine water will be used in mechanized cutting of the blocks and for wetting purposes.
- 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.
- Domestic Wastewater will be disposed through Septic tank followed by soak pit. The septic tank will be cleaned periodically.

10.6 Land Environment

The landscape will be slightly changed due to open cast quarry. There will be no land subsidence as the area is made up of hard rock. The aesthetic environment will not be affected, as the quarry is 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.

- Topsoil shall be used in afforestation work.
- A retaining wall and garland drain will be constructed all around to prevent the washing off.
- Landscape will be changed due to open cast quarry. There will be no land subsidence as the area is made up of hard rock. The aesthetic environment will be affected.
- Soil cover and the weathered material accounts for the Over Burden
- Topsoil 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.

10.7 Biological Environment

The Quarry lease applied area does not cover any forest area. Occasionally, few shrubs are grown within the quarry lease applied area, the quarry lease applied area exhibits rocky nature. Some of the fauna presents are mostly domestic animals like cows, buffalos, sheep, Goat, Dogs and Cats. No endangered species are reported from this area. The existing area is not a habitat for migrating fauna, nor does it form a breeding ground. However, Loss of vegetation and habitats will occur due to project activities.

Proposed Mitigation Measure to implement under EMP:

- There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area (Buffer zone). There is no rare or endangered species in the core zone and Buffer zone of the study area.
- There are no National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wildlife migratory routes in core and buffer zones within the 1km radius of the project.
- No wildlife is found in the quarry Lease area. To minimize the impacts and to improve up on the existing eco system Afforestation plan will be envisaged with native plants.
- Lighting will be avoided during nighttime in the quarry. However, the operations will be carried out only in daytime.

10.8 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 biodiversity.

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

10.8.1 Socio Economic Environment

The social management plan proposes to improve the quality of life of inhabitants of potentially affected villages directly. The goal is “a pollution free area with improved quality of life and empowered community “and the three key pillars on which this would be developed are social, health, infrastructure improvements with efforts on minimal disruptions of present lifestyle and any ensuing negative impacts.

10.9 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 Equipment's.

10.10 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 socioeconomics of people living in the nearby villages. A first-aid centre to meet the basic medical needs of employees will be provided.

10.10.1 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.

10.10.2 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 to during temporary discontinuation.

10.10.3 Safety and Security

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

10.10.4 Corporate Social Responsibility

TAMIN will spend 2.5% of project profit under Corporate Social Responsibility (CSR) to the neighborhood villages.

10.10.5 Corporate Environmental Responsibility

As per the provisions of MOEFCC office memorandum F-22-65/2017IA.III dated 1.05.2018, The project proponent has earmarked an investment of Rs. 1,99,940 /- towards CER (being 2% of the total capital cost) and this budget will be allocated as per the committee recommendation during the Public Hearing.

10.10.6 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 10-1EnvironmentalManagementPlanCost

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**

10.11 Environment Policy of TAMIN

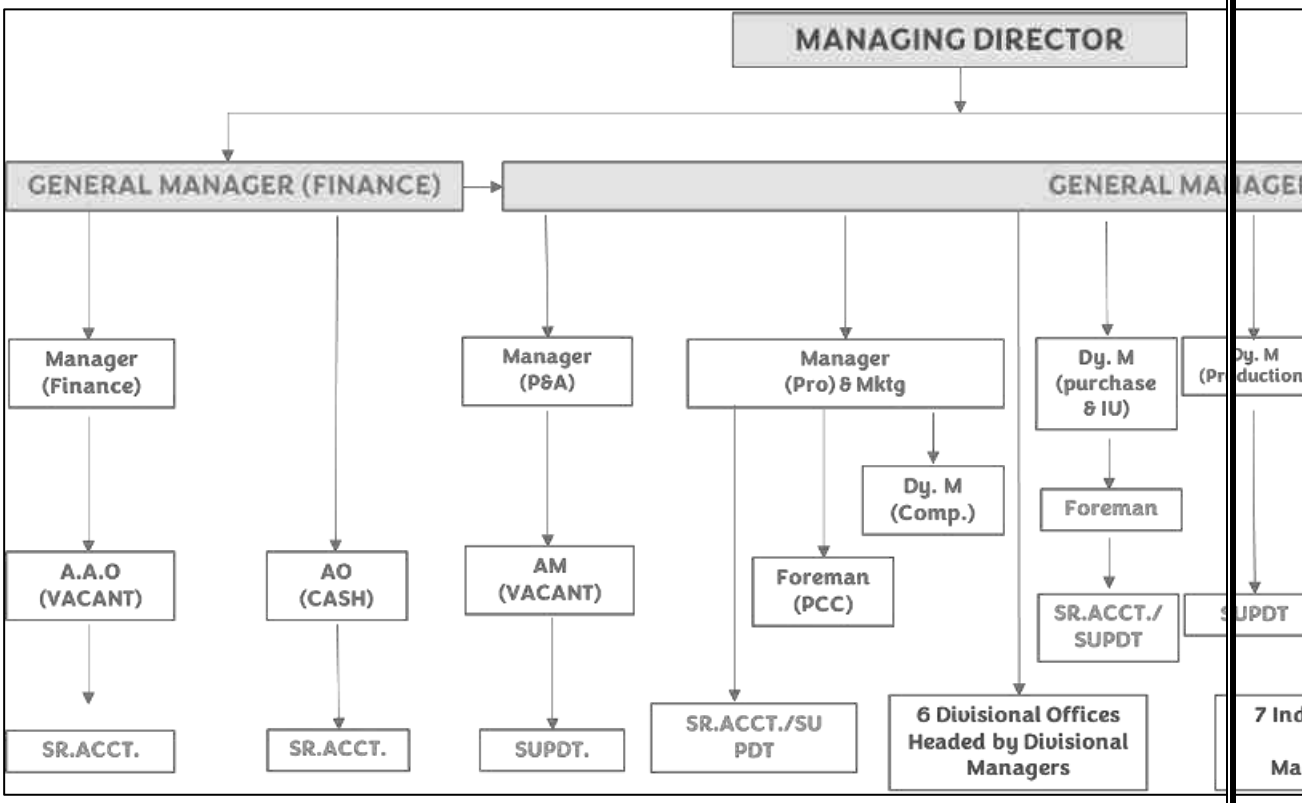
M/s. Tamil Nadu Minerals Ltd believes that good safety, Health & Pollution control practices contribute to individual well-being and organization morale. Our commitment to Safety, Health and Environment stretches beyond statutory obligations and we are committed to managing and continually improving 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 the objective of having no injuries and accidents in the workplace and providing a safe workplace for our employees, contractors and others 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 employeesand contract workmen to ensure safe production and achieve the target of zero accidents. We are committed to supporting actions aimed at increasing employees' safety outside work hours.
- We continuously evaluate and improve our conduct and carry out regular audits, 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.

The TAMIN 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, Metalli ferrous 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


MANAGING DIRECTOR
GENERAL MANAGER (FINANCE)
Manager (Finance)
A.A.O (VACANT)
SR.ACCT.
AO (CASH)
SR.ACCT.
Manager (P&A)
AM (VACANT)
SUPDT.
Manager (Pro) & Mktg
Foreman (PCC)
SR.ACCT./SU PDT
Dy. M (Comp.)
6 Divisional Offices Headed by Divisional Managers
Dy. M (purchase & IU)
Foreman
SR.ACCT./ SUPDT

- Figure 10-1.

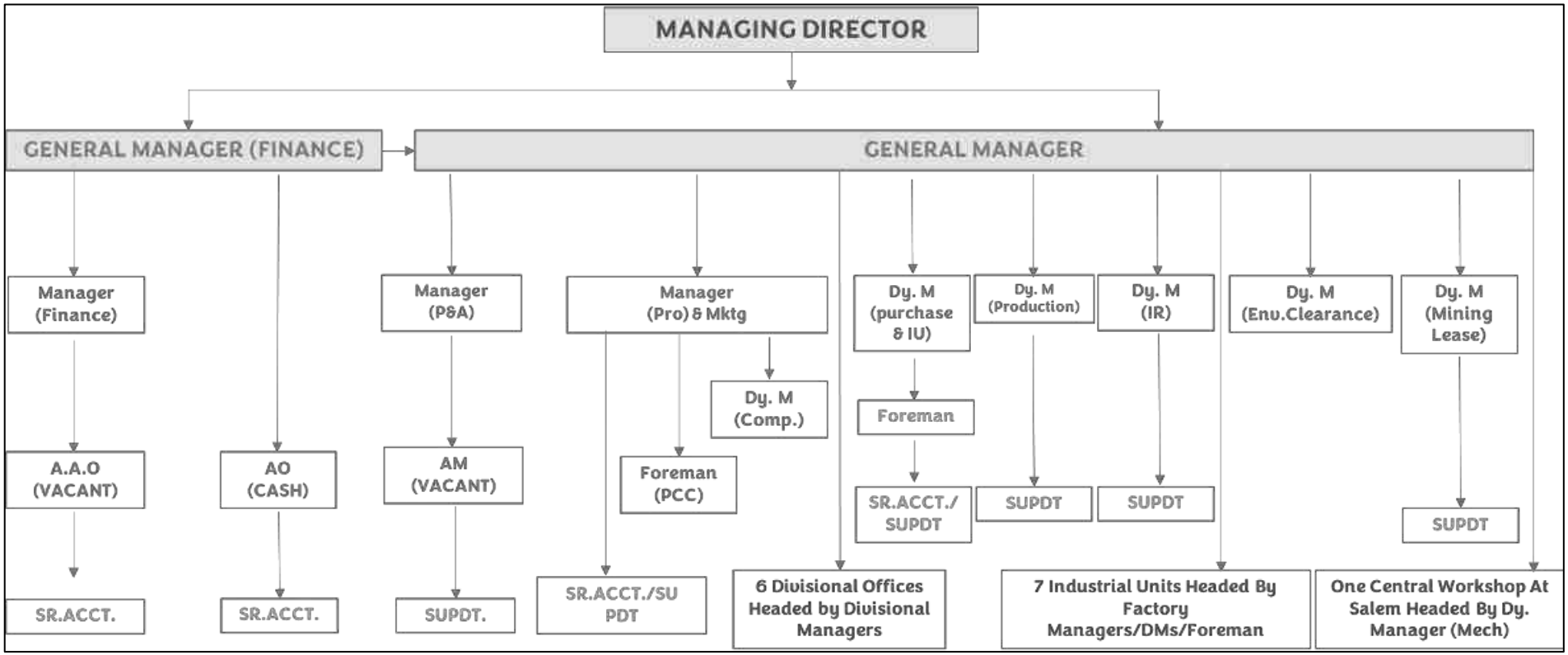


Figure 10-1 Hierarchical System of the TAMIN

11 SUMMARY & CONCLUSION

11.1 Background

The total extent area of the quarry is 8.46.0Ha, situated at S.F.No. 315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State. The Government of Tamil Nadu has issued the precise area communication letter to furnish the approved Mining plan under Rule, 8-C (3b) of the Tamil Nadu Minor Mineral Concession Rules, 1959 for quarrying Black Granite over an extent of 8.46.0Ha of Government poramboke land in SF.No. 315,316 and 317/1 of Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District for a period of 20 years vide Govt. Letter. No.3377/MME. 1/2022-1 dated 03.06.2022.

Accordingly, TAMIN submitted the Mining Plan for the subject area and the same was approved by the Commissionerate of Geology and Mining, Chennai vide letter Rc. No. 1033/MM4/2022, dated: 18.08.2022.

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 Proposal No: SIA: SIA/TN/MIN/409663/2022 Dt.08/12/2022.

The proposal was appraised during 347th SEAC meeting held on 13.01.2023 and 592nd SEIAA meeting held on 11.02.2023 and Terms of Reference was issued vide Lr No SEIAA-TN/F.No.9647/SEAC/ToR-1350/2022, dated: 16.02.2023 for the preparation of EIA/EMP report. The draft EIA/EMP report will be submitted for Public Hearing (PH). After completion of Public Hearing, the minutes issued 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.

TAMIN has appointed M/s. EHS360 Labs Private Limited, Chennai as Environmental Consultants who are accredited by National Accreditation Board for Education and Training (NABET), Quality Council of India (QCI), New Delhi.

The production capacity of the quarry proposed during the mining plan period was 44,044 m^3, of ROM of Black Granite per annum and 4,404 m^3 of recoverable production of granite per annum.

11.2 Project Description

11.2.1Project Salient Features

S. No.	Particulars	Details
1	Latitude & Longitude	12°11'41.61"N, 78°53'46.41"E
2	Site Elevation above MSL (m)	128m (Maximum) AMSL.
3	Topography	Hilly terrain
4	Lease area Topo Sheet details	57 L/16
5	Land classification	Non-Forest, Government Land
6	Nearest highway	SH-6B (Thandrampet - Kottakulam Road) ~ 0.54 Km(N) NH-179B (Near Harur, NH-32 (Bangalore Highway)- 8.55km (N)
7	Nearest Railway station	Tiruvannamalai R. S ~ 20.08 km (E)
8	Nearest Airport	Visakhapatnam International Airport ~ 35.5 Km (S)
9	Nearest Town / City	Chennai Int. Airport ~ 161.01 Km (NE)
10	Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests	

S. No	Name of the Waterbody	Distance (~km)	Direction
1	Sathanur Dam	3.28	W
2	Lake near Kil Vanakambadi	5.39	E
3	Taradapattu	3.9	NE
4	Lake near Naykkanur	1.27	NE
5	Lake near Sattannur	1.34	N
6	Lake near Mallikapuram	0.79	WNW
7	Lake near Site	0.54	SSE
8	Lake near Melkarippur	4.16	NNE
9	Lake near Govindapuram	2.92	N
10	Lake near Melpennathur	5.87	NNW
11	Lake near Sorappanandal	10.79	NW
12	Lake near Eraiyur	9.08	N
13	Lake near Ammapalaiyam	9.83	NNW
14	Lake near Nedungavadi	6.99	NE
15	Lake near Asuvangasuranai	10.16	ENE
16	Lake near Perumbakkam	9.97	E
17	Samudram Tank	14.15	E
18	Lake near Melserumbakkam	10.96	E
19	Lake near Kilserupakkam	13.04	E
20	Lake near Kilvanakkambadi	7.52	ESE
21	Lake near Gudalur	12.1	ESE
22	Lake near Mudiyanur	8.26	SE
23	Lake near Rayantapuraml	11.75	SSE
24	Lake near Kallenta	12.56	S

<table>
<tr><td></td><td></td><td>
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<tr><td>25</td><td>Lake near Tiruvadattanur</td><td>8.44</td><td>S</td></tr>
<tr><td>26</td><td>Lake near Pudurnattam</td><td>7.94</td><td>SSW</td></tr>
<tr><td>27</td><td>Lake near Tandarampattu</td><td>6.21</td><td>SE</td></tr>
<tr><td>28</td><td>Lake near Taradapattu</td><td>2.26</td><td>ENE</td></tr>
<tr><td>29</td><td>Lake near Site</td><td>0.66</td><td>N</td></tr>
<tr><td>30</td><td>Lake near Peyyalampattu</td><td>10.9</td><td>NW</td></tr>
<tr><td>31</td><td>Lake near kottakulam</td><td>11.2</td><td>NNW</td></tr>
<tr><td>32</td><td>Lake near Muttanur</td><td>12.08</td><td>NNW</td></tr>
<tr><td>33</td><td>Lake near Melmudiyanur</td><td>11.57</td><td>N</td></tr>
<tr><td>34</td><td>Lake near Padi Agraharam</td><td>14.23</td><td>N</td></tr>
<tr><td>35</td><td>Lake near Torappadi</td><td>12.41</td><td>N</td></tr>
<tr><td>36</td><td>Lake near Pinjur</td><td>12.46</td><td>WNW</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Reserve Forests</td><td>
<table>
<tr><th>S. No</th><th>Name</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Ponnaiyar RF</td><td>1.16</td><td>SSE</td></tr>
<tr><td>2</td><td>Rayandapuram RF</td><td>11.56</td><td>S</td></tr>
<tr><td>3</td><td>Rayandapuram RF</td><td>13.55</td><td>S</td></tr>
<tr><td>4</td><td>Pumalai RF</td><td>9.86</td><td>SE</td></tr>
<tr><td>5</td><td>Radapuram RF</td><td>5.67</td><td>ENE</td></tr>
<tr><td>6</td><td>Uchhimalai RF</td><td>3.93</td><td>NE</td></tr>
<tr><td>7</td><td>Uchimalai RF</td><td>5.32</td><td>N</td></tr>
<tr><td>8</td><td>Kavuttimalai RF</td><td>11.3</td><td>NNE</td></tr>
<tr><td>9</td><td>Erraiyur Malai RF</td><td>8.11</td><td>N</td></tr>
<tr><td>10</td><td>PInjur RF</td><td>6.59</td><td>NW</td></tr>
<tr><td>11</td><td>Pinjur RF</td><td>7.24</td><td>NW</td></tr>
<tr><td>12</td><td>Pinjur RF</td><td>11.88</td><td>NW</td></tr>
<tr><td>13</td><td>Munnurmangalam RF</td><td>12.51</td><td>N</td></tr>
<tr><td>14</td><td>Munnurmangalam RF</td><td>13.82</td><td>N</td></tr>
</table>
</td></tr>
<tr><td>12</td><td>Seismic Zone</td><td>Zone-III (Moderate Risk Zone)</td></tr>
<tr><td>13</td><td>Defense Installations</td><td>Nil within 15 km radius</td></tr>
<tr><td>14</td><td>Interstate Boundary</td><td>Nil within 15 km radius</td></tr>
<tr><td>15</td><td>HACA Regions</td><td>Nil within 15 km radius</td></tr>
</table>

11.2.2Project Summary

S. No	Particulars	Details
1.	Project Location	SF. No. 315, 316 and 317/1, Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State.
2.	Land classification	Government Land
3.	Extent of lease area (Ha.)	8.46.0
4.	Quarry Lease	Govt. Letter. No.3377/MME. 1/2022-1 dated 03.06.2022
5.	Lease Period	20 years
6.	Estimated Geological Reserves (ROM) M^3	1024350
7.	Estimated Mineable Reserves (ROM) M^3	775804
8.	Black Granite production per annum M^3	RoM 44044 with 10% recovery
9.	Depth of Mining	31m above ground level (from the Top of the hill)
10.	Method of Mining	Open cast semi mechanized method
11.	Water Requirement (KLD)	1.5
12.	Source of Water	Venders and village Panchayat
13.	Power requirement (kVA)	60
14.	Power Backup (DG set) kVA	1* 125
15.	Fuel requirements (Lts/Day)	200
16.	Direct Manpower (Nos)	30
17.	Indirect Manpower (Nos)	20
18.	Municipal Solid Waste Generation (kg/day)	13.5
19.	Waste Oil generation (Lts/Year)	3.0
20.	Project Cost in Lakhs	99.97

11.3 Description of Environment

Summary of Baseline Studies:

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

Study Period: The baseline environmental surveys were carried out during (**Mid December 2023 – Mid March 2024**) within the study area.

Summary of Baseline Studies:

- The site has an undulating terrain with level 128 m (Maximum) above MSL.
- The project site falls under Zone-III (Moderate Risk Zone) as per IS 1893 (Part-I).
- The predominant wind direction is Southeast during study period.
- Max Temperature:37 ^{0}C, Min Temperature: 21 ^{0}C & Avg Temperature:29.7 ^{0}C
- Average Relative Humidity:49.42%
- Average Wind Speed:2.47 m/s.

11.3.1 Ambient Air Quality

Maximum concentrations of PM10, PM2.5, 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 average baseline levels of PM10 (33.0 – 61.0µg/m³) PM2.5 (18.1 – 33.6 µg/m SO2(5.6 – 10.9µg/m³), NO2(13.4 - 25.2 µg/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.

11.3.2Noise 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 daytime noise levels were about 49.3dB (A) and 40.8 dB (A) during nighttime, which is within prescribed limit by CPCB (75 dB (A) Day time & 70 dB (A) Nighttime).

In residential areas daytime noise levels varied from 48.6 dB(A) to 53.2 dB(A) and nighttime noise levels varied from 39.6 dB(A) to 42.6 dB(A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels are well within the prescribed limit by CPCB (55 dB(A) Day time & 45 dB(A) Nighttime).

11.3.3Water Environment

The prevailing status of water quality at 08 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 7.21- 7.71.
- Total Dissolved Solids range from 274mg/l to 690mg/l.
- Chloride ranges from 82.0 mg/l to 228.0 mg/l.
- The sulphate content in the surface water of the study area varies between 20.4 mg/l –56.9 mg/l.
- Total hardness ranges between 111.2mg/l–2896 mg/l.
- The BOD value ranges from 1.1mg/l to 3.9 mg/l
- COD value 20.9 mg/l to 36.2 mg/l.
- The concentration of heavy metals like As, Cd, Cr, Pb, Mn, Hg, Ni and Seat 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 7.16 to 7.65.
- TDS value varied from varied from 444mg/l to 720 mg/l
- The chloride concentration ranged from 124 mg/l to 202mg/l
- Sodium ranges from 53.7 mg/l to 106.8 mg/l
- Potassium concentration ranges from 13.4 to 26.7 mg/l.
- Magnesium ranges from 15.6 to 29.2mg/l within the permissible limit of the IS 10500:2012.
- The sulphate content of the ground water of the study area is varied between 31.1 mg/l– 50.4 mg/l meeting the acceptable limit of the IS 10500: 2012.
- It is observed that all the collected ground water samples meet the drinking water standards (IS 10500:2012)Permissible Limit and can be used for drinking.

11.3.4Land Environment

Assessment of soil characteristics is of paramount importance since vegetation growth, agricultural practices and production are directly related to 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 7.26 to 8.04.
- Conductivity of the soil samples ranged from 236 µmhos/cm to 328 µmhos/cm.
- Nitrogen content ranged from 229 kg/ha to 402 kg/ha.
- Phosphorous ranged from 142 kg/ha to 257 kg/ha.
- Potassium content ranges from192 kg/ha to 615 kg/ha.

11.3.5Biological Environment

Baseline Biological survey was carried out to assess the ecology of the study area. The floral diversity is grouped into trees, shrubs, climbers, and herbs. Similarly, the faunal diversity is grouped into mammals, birds, reptiles, and amphibians. There are 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 the study area as per IUCN status Least concern, vulnerable species are observed within the study area. The detailed List of flora reported/observed in the study area is given in **Chapter 3, Section 3.11.1**.

Fauna

There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area. There iare no rare or endangered species in the study area. List of fauna reported/observed in the study area is given in **Chapter 3**. Observed species are comes under least concern as per IUCN status.

11.3.6 Socio Economic Environment

The project is located at Sathanur Village, Thandarampattu Taluk, Tiruvannamalai District, Tamil Nadu State. There are 30 villages around the study area (10Km) radius, the population around the area accounts to 84466. The literacy rate is less (60.86%, Literates are 51410). compared to the district literacy rate (74.21 %) which can be improved by this project through CSR activities. The area has a good number of health facilities well connected by roads to avail themselves of the emergency services. The rapid industrialization in the locality creates job opportunities for many people and increases the economic vibrancy in the area.

Total Working Population is 43879 Nos, Main Workers is 35690 Nos and Marginal Workers. The detailed information provided in **Chapter 3, Section0.**

11.4 Anticipated Environmental Impacts

11.4.1 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.

It was observedthat the maximum ground level concentration observed due to mining activities and traffic movement without control measures for PM10, PM2.5 and NOx are 3.08 µg/m^3, 1.06 µg/m^3 and 16.1 µg/m^3 respectively. The highest concentration levels identified at the project site only. So, it can be concluded that even during operation of quarry the impact envisaged is moderate.

Impacts:

- Mining operation and associated activities are potentially air polluting, and the major air pollutant is suspended particulate matter.
- Impact of fugitive dust emission on flora and fauna
- Reduce photosynthesis in plants due to dust deposition.
- The intensity of dust generation in the mining is influenced by factors such as hardness of rock, mining technology and material handling etc.
- Fugitive dust from quarrying operation affects the mine workers who are directly exposed.
- Diseases like asthma and bronchitis are induced by particulate emission due to mining activities.

Proposed Mitigation Measure:

- Wet Drilling and Control Blasting will be used.
- Developing green belts which act as pollution sinks.
- Regular water sprinkling on haul and access roads.
- Material coverage during transportation to avoid Dust and Mist.
- Vehicular Emissions will be minimized by proper training and maintenance of vehicles and other oil - operated equipment.
- Speed controls on vehicle movements.
- Periodic health checkups for the workers shall be done.
- Dust masks will be provided to the workers.
- Greenbelt development along approach roads and surrounding the Quarry Lease area.

11.4.2Water Environment

Impacts:

- Runoff from mining areas and contaminated the inland water bodies.
- Impact on groundwater regime/streams/odai/ springs due to mining activities,
- Runoff from Spillage during handling of materials.
- Loss of surface features such as lakes, streams, and ponds through settling.
- Ground water inflows into the quarry & may contact pollutants.

Proposed Mitigation Measure:

- There are no major streams and rivers which can be affected by the proposed mining. Hence there will be no major effect on the surface water environment.
- The Black Granites will not produce any harmful toxic effluence in the form of solid, liquid or gas.
- Garland drains will be constructed on all sides of the quarry.
- All the garland drains will be routed through adequately sized catchpits or settling pits to remove suspended solids from flowing into storm water.
- The water will be used after settling for irrigation/greenbelt and dust suppression.
- The overall drainage planning will be done so that the existing pre-mining drainage conditions will be maintained to the extent possible so that run off distribution is not affected.
- Rainwater harvesting by constructing check dams on natural nallah and developing water bodies should be planned for recharging groundwater.
- Sewage (0.425KLD) is being sent to septic tank followed by soak pit. There is no industrial effluent generation during quarry operation.
- 13.5 kg/ Day Municipal Solid Wastes including food waste are being disposed of into local municipal waste disposal bins.

11.4.3 Noise Environment

The baseline study showed that the noise levels in both the Industrial area and in Residential area were within the limit prescribed by CPCB. Designed equipment with noise levels not exceeding beyond the requirements of Occupational Health and Safety Administration Standard will be employed.

11.4.4Biological Environment

Impacts:

- Loss of vegetation and wildlife habitat.
- Impact on surrounding agricultural land & Impact on groundwater quality due to leachate.

Proposed Mitigation Measure:

- There are Schedule Species like Blue rock pigeon (Columba livia)- Sch – IV and Nalla Pambu (Naja naja)- Sch II (Part II), Vulnerable Species like King Cobra (Ophiophagus hannah)- Sch II (Part II), and Endemic species like Jerdon's carp (Hypselobarbuspulchellus) identified in the study area (Buffer Zone). There is no rare or endangered species Core zone and Buffer in the study area.
- There are no National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wildlife migratory routes in core and buffer zones within the 1km radius of

the project site.

- No wildlife is found in the quarry Lease area. To minimize the impacts and to improve up on the existing eco system Afforestation plan will be envisaged with native plants.
- Lighting will be avoided during nighttime in the quarry. However, the operations will be carried out only in daytime.

11.4.5Socio Economic

Impacts:

- Impact on the cropping pattern and crop productivity in the buffer zone
- Impact on community resources such as grazing land
- Mining activity may affect the health of the workers and village people directly.
- Existing roads shall be damaged due to heavy vehicle movement.
- Spillages of material transportation
- Dust deposition on plants and trees.
- Accidental Risks during mining due to unsafe measures

Proposed Mitigation Measure

- Quarrying in this area is not going to have any negative impact on the social or cultural life of the villagers in the nearby vicinity.
- The quarry activity will provide job opportunities, which will help them to develop economically.
- Around 30 people are directly and 20 people indirectly employed, including mining operations. Local villagers residing in the nearby villages will be employed as semi-skilled workers.
- At the end of quarry operations, the total area excavated will be fenced properly and Greenbelt will be developed.
- Control of Spillages and Regular Water sprinkling.
- Avenue Greenbelt development with native plants.
- Renovation of existing roads will be done.
- Rainwater harvesting by constructing check dam on natural nallah and developing water bodies should be planned for recharging groundwater.
- 2% of the project cost is Rs.1,99,940 is allocated under CER &TAMIN will spend 2.5% of project profit under Corporate Social Responsibility (CSR) to the neighborhood villages.

11.5 Alternative Studies

No Alternative Studies for Site and Technology are considered Since; Quarry project is a Site specific. The open cost mining method is a sustainable method.

11.6 Environmental Monitoring Program

A monitoring schedule with respect to Ambient Air Quality, Water & Wastewater Quality, Noise Quality as per State Pollution Control Board (TNPCB) will be maintained.

11.7 Additional Studies

11.7.1 Public Hearing

As per obtained Terms of Reference, the Draft EIA is prepared and will be submitted for Public Consultation, After Public Hearing the minutes of the same will be incorporated into the Final EIA for appraisal of the project to obtained Environmental Clearance as per EIA Notification 2006, and its amendments thereafter.

11.7.2 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

11.7.3 Corporate Environmental Responsibility

As per the provisions of MOEFCC office memorandum F-22-65/2017IA.III dated 1.05.2018, The project proponent has earmarked an investment of Rs. 1,99,940 /- towards CER (being 2% of the total capital cost) and this budget will be allocated as per the committee recommendation during the Public Hearing.

11.8 Benefits of the Proposed Project

- The quarrying activities in this belt will benefit 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 the construction industry thereby indirectly benefiting the masses.

11.9 Environmental Benefit Analysis

Not recommended during scoping stage.

11.10 Environmental Management Plan

The EMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopted for all project works. For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of significant biophysical and socio-economic impacts identified in the EIA. The project proponent is proposed EMP budget is Rs 2,05,000/.

11.11 Conclusion and Discussion

The proposal is since the current market Black Granite stone material has a good requirement in civil construction & construction & another field. There is no agriculture and forest land are involved in the proposed mining land. There are no areas which are important or sensitive for ecological reasons like Wetlands, coastal zone, biospheres, mountains, other than Ponnaiyar RF ~ 1.16 km (SSE), Uchhimalai RF ~ 3.93 km (NE). Few water bodies are in the 15km radius of the project site are Lake near Site ~ 0.57km (SSE), Lake near Mallikapuram ~ 0.79 km (WNW) etc.

There are no major industries within this area. A comprehensive listing of the mitigation measures (actions) will be prepared and implemented and the parameters that will be monitored to ensure effective implementation of the action. Also, the timing for implementation of the action to ensure that the objectives of mitigation are fully met to minimize the Impacts on environmental attributes. The quarrying activities will provide benefits to the local people both directly 30 Nos & 20 indirect persons. A total cost of Rs.2,05,000 under Environmental Management Plan cost.

11.12 Disclosure of Consultants

The work of undertaking field studies and preparation of EIA/EMP report under B2 par B1 category by M/s. EHS360 Labs Pvt. Ltd., Chennai is accredited by NABET for Schedule 1(a) Mining of Minerals Category B vide Certificate No. NABET/EIA/22-25/IA/0098_Rev.01, valid up to 24.06.2025. Obtained terms of reference (ToR) vide Lr. No. SEIAA-TN/F.No.9647/SEAC/ToR-1350/2022 dated 16.02.2023, The Baseline studies were conducted during the period of **Mid December 2023 to Mid-March 2024** and EIA report is prepared accordingly based on terms of reference with public hearing and additional TORs. The final EIA/EMP report after public hearing will be submitted to the SEAC/SEIAA for Environmental Clearance for the proposed project.

12 DISCLOSURE OF CONSULTANTS

12.1 Change of Consultant Details

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA, TN, the project proponent has appointed Environmental Consultants accredited by National Accreditation Board for Education and Training (NABET)-Quality Council of India (QCI), New Delhi.

The work of undertaking field/baseline studies and preparation of EIA/EMP report under B1 category by M/s. EHS360 Labs Pvt. Ltd., Chennai is accredited by NABET for Schedule 1(a) Mining of Minerals Category B vide Certificate No. NABET/EIA/22-25/IA/0098_Rev.01, valid up to 24.06.2025. The Proponent obtained terms of reference (ToR) vide Lr. No. SEIAA-TN/F.No.9647/SEAC/ToR-1350/2022 dated 16.02.2023, The Baseline studies were conducted during the period of **Mid December 2023 to Mid-March 2024** and EIA report is prepared accordingly based on terms of reference with and additional TORs. The final EIA/EMP report after public hearing will be submitted to the SEAC/SEIAA for Environmental Clearance for the proposed project.

12.2 Brief and Nature of Consultancy

M/s. EHS360 Labs Pvt. Ltd., (EHSL) is one of the pioneer companies in the field of Environmental Consultancy Service providers in India. We are NABET Accredited consultant for conducting Environmental Impact Assessment Studies (EIA) and obtaining Environmental Clearances for 1,7, 8, 21,38 &39 sectors. We also take up services which include Environment Monitoring and Testing, Environment Audit, Risk Assessment Studies, Turnkey solutions, Operation and Maintenance contracts and obtaining various statutory clearances from Ministry of Environment, Forest, and Climate Change (MoEFCC) and State Pollution Control Boards. NABET certificate is attached at the end of this chapter.

12.3 Team Member for EIA report

In addition to the approved experts for NABET, the following members are also involved in the EIA as Team Member/FAA to build their competencies for handling 1 sectors and functional areas:

12.4 EIA Team Members

Name of Internal Team Member	Activity / Area	Involvement – Actual Work Performed	Under Approved Expert
Mr. Santhosh Kumar A	Air Quality Modelling & prediction (AQ)	Assisted with FAE & Coordination for data collection, Secondary data analysis, and validating primary data. coordination with FAEs and team members.	Ms. Tushali Jagwani
Mrs. Tatiparthi Rajani	Air Quality Modelling & prediction (AQ)	Assisted with FAE & Coordination for data collection, Secondary data analysis, and validating primary data. coordination with FAEs and team members.	Ms. Tushali Jagwani
Mrs. Tatiparthi Pranay Kumar	Solid and hazardous waste management (SW &HW)	Assisted FAE during Identification of waste generation, studying adequacy of Mitigation measure for management of hazardous waste and contribution to EIA documentation	Mrs. Tatiparthi Rajani

12.5 Copy of QCI NABET Accreditation

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL OF INDIA

NABET

National Accreditation Board for Education and Training

Certificate of Accreditation

EHS360 Labs Private Limited, Chennai

Old No. 8/2, New No. 10/2, 50th Street, 7th Avenue, Ashok Nagar, Chennai, Tamil Nadu-600083

*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) NABET	Sector (as per) MoEFCC	Cat.
1.	Mining of minerals including opencast/underground mining	1	1 (a) (i)	A
2.	Mineral beneficiation	7	2 (b)	B
3.	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	B
4.	Synthetic organic chemicals industry	21	5 (f)	B
5.	Building and construction projects	38	8 (a)	B
6.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IAAC minutes dated September 2, 2022, and Supplementary Assessment minutes dated December 15, 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/ACO/22/2564 dated October 21, 2022. The accreditation needs to be renewed before the expiry date by EHS360 Labs Private Limited, Chennai following due process of assessment.

Issue Date
January 24, 2024

Valid up to
June 24, 2025

Mr. Ajay Kumar Jha
Sr. Director, NABET

Certificate No.
NABET/EIA/22-25/IA 0098_Rev.01

Prof (Dr) Varinder S Kanwar
CEO-NABET

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

END OF THE REPORT